

ISSN 2224-526X

ҚАЗАҚСТАН РЕСПУБЛИКАСЫ  
ҰЛТТЫҚ ҒЫЛЫМ АКАДЕМИЯСЫНЫҢ  
Қазақ ұлттық аграрлық университеті

# Х А Б А Р Л А Р Ы

---

---

## ИЗВЕСТИЯ

НАЦИОНАЛЬНОЙ АКАДЕМИИ НАУК  
РЕСПУБЛИКИ КАЗАХСТАН  
Казакский национальный  
аграрный университет

## IZVESTIÂ

NATIONAL'NOJ AKADEMII NAUK  
RESPUBLIKI KAZAHSTAN  
Kazakh national  
agrarian university

### SERIÂ AGRARNYH NAUK

## 5 (53)

SEPTEMBER – OCTOBER 2019

PUBLISHED SINCE JANUARY 2011

PUBLISHED 6 TIMES A YEAR

ALMATY, NAS RK

Б а с р е д а к т о р

**Есполов Т.И.,**

э.ғ.д, профессор,

ҚР ҰҒА академигі және вице-президенті

Р е д а к ц и я а л қ а с ы:

**Байзақов С.Б.**, э.ғ.д, проф., ҚР ҰҒА академигі (бас редактордың орынбасары); **Тиреуов К.М.**, э.ғ.д, проф., ҚР ҰҒА академигі (бас редактордың орынбасары); **Елешев Р.Е.**, т.ғ.д., проф., ҚР ҰҒА академигі; **Рау А.Г.**, т.ғ.д., проф., ҚР ҰҒА академигі; **Иванов Н.П.**, в.ғ.д, проф., ҚР ҰҒА академигі; **Кешуов С.А.**, т.ғ.д., проф., ҚР ҰҒА академигі; **Мелдебеков А.**, а.ш.ғ.д., проф., ҚР ҰҒА академигі; **Чоманов У.Ч.**, т.ғ.д., проф., ҚР ҰҒА академигі; **Елюбаев С.З.**, а.ш.ғ.д., проф., ҚР ҰҒА академигі; **Садыкулов Т.**, а.ш.ғ.д., проф., академигі; **Баймұқанов Д.А.**, а.ш.ғ.д., проф., ҚР ҰҒА корр-мүшесі; **Сансызбай А.Р.**, а.ш.ғ.д., проф., ҚР ҰҒА корр-мүшесі; **Умбетаев И.**, а.ш.ғ.д., проф., ҚР ҰҒА академигі; **Оспанов С.Р.**, а.ш.ғ.д., проф., ҚР ҰҒА құрметті мүшесі; **Олейченко С.И.**, а.ш.ғ.д., проф.; **Кененбаев С.Б.**, а.ш.ғ.д., проф., ҚР ҰҒА корр-мүшесі; **Омбаев А.М.**, а.ш.ғ.д., проф. ҚР ҰҒА корр-мүшесі; **Молдашев А.Б.**, э.ғ.д., проф., ҚР ҰҒА құрметті мүшесі; **Сагитов А.О.**, б.ғ.д., ҚР ҰҒА академигі; **Сапаров А.С.**, а.ш.ғ.д., проф., ҚР АШҒА академигі; **Балгабаев Н.Н.**, а.ш.ғ.д., проф.; **Умирзаков С.И.**, т.ғ.д, проф.; **Султанов А.А.**, в.ғ.д., проф., ҚР АШҒА академигі; **Алимкулов Ж.С.**, т.ғ.д., проф., ҚР АШҒА академигі; **Сарсембаева Н.Б.**, в.ғ.д., проф.

Р е д а к ц и я к ең е с і:

**Fasler-Kan Elizaveta**, Dr., University of Basel Switzerland; **Koolmees Petrus Adrianus**, Prof. Dr., Utrecht University, The Netherlands; **Babadoost-Kondri Mohammad**, Prof., University of Illinois, USA; **Yus Aniza Binti Yusof**, Dr., University Putra, Malaysia; **Hesseln Hayley Fawn**, As. Prof., University of Saskatchewan, Canada; **Alex Morgounov**, Pr., International Maize and Wheat Improvement Center Turkey; **Андреш С.**, Молдова Республикасы ҰҒА академигі; **Гаврилюк Н.Н.**, Украина ҰҒА академигі; **Герасимович Л.С.**, Беларусь Республикасының ҰҒА академигі; **Мамедов Г.**, Азербайжан Республикасының ҰҒА академигі; **Шейко И.П.**, Беларусь Республикасының ҰҒА академигі; **Жалнин Э.В.**, т.ғ.д., проф., Ресей; **Боинчан Б.**, а.ш.ғ.д, проф., Молдова Республикасы; **Юлдашбаев Ю.А.**, а.ш.ғ.д, проф., РҒА корр-мүшесі, Ресей.

Главный редактор

**Есполов Т.И.,**

доктор эконом. наук, проф.,  
вице-президент и академик НАН РК

Редакционная коллегия:

**Байзаков С.Б.**, доктор эконом. наук, проф., академик НАН РК (заместитель главного редактора); **Тиреуов К.М.**, доктор эконом. наук, проф., академик НАН РК (заместитель главного редактора); **Елешев Р.Е.**, доктор техн. наук, проф., академик НАН РК; **Рау А.Г.**, доктор техн. наук, проф., академик НАН РК; **Иванов Н.П.**, доктор ветеринар. наук, проф., академик НАН РК; **Кешуов С.А.**, доктор техн. наук, проф., академик НАН РК; **Мелдебеков А.**, доктор сельхоз. наук, проф., академик НАН РК; **Чоманов У.Ч.**, доктор техн. наук, проф., академик НАН РК; **Елюбаев С.З.**, доктор сельхоз. наук, проф., академик НАН РК; **Садыкулов Т.**, доктор сельхоз. наук, проф., академик НАН РК; **Баймуханов Д.А.**, доктор сельхоз. наук, проф., член-корр. НАН РК; **Сансызбай А.Р.**, доктор сельхоз. наук, проф., член-корр. НАН РК; **Умбетаев И.**, доктор сельхоз. наук, проф., академик НАН РК; **Оспанов С.Р.**, доктор сельхоз. наук, проф., Почетный член НАН РК; **Олейченко С.И.**, доктор сельхоз. наук, проф.; **Кененбаев С.Б.**, доктор сельхоз. наук, проф., член-корр. НАН РК; **Омбаев А.М.**, доктор сельхоз. наук, проф. член-корр. НАН РК.; **Молдашев А.Б.**, доктор эконом. наук, проф., Почетный член НАН РК; **Сагитов А.О.**, доктор биол. наук, академик НАН РК; **Сапаров А.С.**, доктор сельхоз. наук, проф., академик АСХН РК; **Балгабаев Н.Н.**, доктор сельхоз. наук, проф.; **Умирзаков С.И.**, доктор техн. наук, проф.; **Султанов А.А.**, доктор ветеринар. наук, проф., академик АСХН РК; **Алимкулов Ж.С.**, доктор техн. наук, проф., академик АСХН РК; **Сарсембаева Н.Б.**, доктор ветеринар. наук, проф.

Редакционный совет:

**Fasler-Kan Elizaveta**, Dr., University of Basel Switzerland; **Koolmees Petrus Adrianus**, Prof. Dr., Utrecht University, The Netherlands; **Babadoost-Kondri Mohammad**, Prof., University of Illinois, USA; **Yus Aniza Binti Yusof**, Dr., University Putra, Malaysia; **Hesseln Hayley Fawn**, As.Prof., University of Saskatchewan, Canada; **Alex Morgounov**, Pr., International Maize and Wheat Improvement Center Turkey; **Андреш С.**, академик НАН Республики Молдова; **Гаврилюк Н.Н.**, академик НАН Украины; **Герасимович Л.С.**, академик НАН Республики Беларусь; **Мамедов Г.**, академик НАН Республики Азербайджан; **Шейко И.П.**, академик НАН Республики Беларусь; **Жалнин Э.В.**, доктор техн. наук, проф., Россия; **Боинчан Б.**, доктор сельхоз. наук, проф., Республика Молдова; **Юлдашбаев Ю.А.**, доктор сельхоз. наук, проф., член-корр. РАН, Россия.

**Известия Национальной академии наук Республики Казахстан. Серия аграрных наук.**

**ISSN 2224-526X**

Собственник: ООО «Национальная академия наук Республики Казахстан» (г. Алматы)

Свидетельство о постановке на учет периодического печатного издания в Комитете информации и архивов Министерства культуры и информации Республики Казахстан № 10895-Ж, выданное 30.04.2010 г.

Периодичность 6 раз в год

Тираж: 300 экземпляров

Адрес редакции: 050010, г. Алматы, ул. Шевченко, 28, ком. 219-220, тел. 272-13-19, 272-13-18

<http://agricultural.kz/index.php/en/>

---

© Национальная академия наук Республики Казахстан, 2019

Адрес типографии: ИП «Аруна», г. Алматы, ул. Муратбаева, 75

## Chief Editor

**Espolov T.I.,**

Dr. economy. Sciences, prof.,  
Vice President and academician of the NAS RK

## Editorial Board:

**Baizakov S.B.**, Dr. of economy sciences, prof., academician of NAS RK (deputy editor); **Tireuov K.M.**, Doctor of Economy Sciences., prof., academician of NAS RK (deputy editor); **Eleshev R.E.**, Dr. Of agricultural sciences, prof., academician of NAS RK; **Rau A.G.**, Dr. sciences, prof., academician of NAS RK; **Ivanov N.P.**, Dr. of veterinary sciences, prof., academician of NAS RK; **Keshuov S.A.**, Dr. sciences, prof., academician of NAS RK; **Meldebekov A.**, doctor of agricultural sciences, prof., academician of NAS RK; **Chomanov U.Ch.**, Dr. sciences, prof., academician of NAS RK; **Yelyubayev S.Z.**, Dr. of agricultural sciences, prof., academician of NAS RK; **Sadykulov T.**, Dr. Farm. Sciences, prof., academician of NAS RK; **Baimukanov D.A.**, doctor of agricultural sciences, prof., corresponding member NAS RK; **Sansyzbai A.R.**, doctor of agricultural sciences, prof., corresponding member NAS RK; **Umbetaev I.**, Dr. Farm. Sciences, prof., academician of NAS RK; **Ospanov S.R.**, Dr. agricultural sciences, prof., Honorary Member of NAS RK; **Oleychenko S.N.**, Dr. Of agricultural sciences, prof.; **Kenenbayev S.B.**, Dr. Agricultural sciences, prof., corresponding member NAS RK; **Ombayev A.M.**, Dr. Agricultural sciences, Prof. corresponding member NAS RK; **Moldashev A.B.**, Doctor of Economy sciences, prof., Honorary Member of NAS RK; **Sagitov A.O.**, Dr. biol. sciences, academician of NAS RK; **Saparov A.S.**, Doctor of agricultural sciences, prof., academician of NAS RK; **Balgabaev N.N.**, the doctor agricultural sciences, Prof.; **Umirzakov S.I.**, Dr. Sci. Sciences, Prof.; **Sultanov A.A.**, Dr. of veterinary sciences, prof., academician of the Academy of Agricultural Sciences of Kazakhstan; **Alimkulov J.C.**, Dr. of tekhnical sciences, prof., academician of the Academy of Agricultural sciences of Kazakhstan; **Sarsembayeva N.B.**, Dr. veterinary sciences, prof.

## Editorial Board:

**Fasler-Kan Elizaveta**, Dr., University of Basel Switzerland; **Koolmees Petrus Adrianus**, Prof. Dr., Utrecht University, The Netherlands; **Babadoost-Kondri Mohammad**, Prof., University of Illinois, USA; **Yus Aniza Binti Yusof**, Dr., University Putra, Malaysia; **Hesseln Hayley Fawn**, As. Prof., University of Saskatchewan, Canada; **Alex Morgounov**, candidate of agricultural sciences, International Maize and Wheat Improvement Center Turkey; **Andresh S.**, academician of NAS of Moldova; **Gavriluk N.N.**, academician of NAS of Ukraine; **Gerasimovich L.S.**, academician of NAS of Belorassia; **Mamadov G.**, academician of NAS of Azerbaijan; **Sheiko I.P.**, academician of NAS of Belorassia; **Zhalnin E.V.**, Dr. of technical sciences, professor, Russia, **Boinchan B.**, doctor of agricultural sciences, prof., Moldova; **Yuldashbayev Y.A.**, doctor of agricultural sciences, prof., corresponding member of RAS, Russia.

**News of the National Academy of Sciences of the Republic of Kazakhstan. Series of Agrarian Sciences.**

**ISSN 2224-526X**

Owner: RPA "National Academy of Sciences of the Republic of Kazakhstan" (Almaty)

The certificate of registration of a periodic printed publication in the Committee of Information and Archives of the Ministry of Culture and Information of the Republic of Kazakhstan N 10895-Ж, issued 30.04.2010

Periodicity: 6 times a year

Circulation: 300 copies

Editorial address: 28, Shevchenko str., of.219-220, Almaty, 050010, tel. 272-13-19, 272-13-18,  
<http://nauka-nanrk.kz / agricultural.kz>

---

© National Academy of Sciences of the Republic of Kazakhstan, 2019

Address of printing house: ST "Aruna", 75, Muratbayev str, Almaty

## NEWS

OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN

SERIES OF AGRICULTURAL SCIENCES

ISSN 2224-526X

Volume 5, Number 53 (2019), 5 – 9

<https://doi.org/10.32014/2019.2224-526X.52>

UDC 632.937.3

A. Adilkhankyzy, K. A. Alpysbaeva,  
A. A. Mukhtarkhanova, B. Zh. Naimanova, A. M. Chadinova

"Kazakh Research Institute of Plant Protection and Quarantine named after J. Jiyembaev" LLP,  
Almaty, Kazakhstan.

E-mail: [adilhan\\_ainura@mail.ru](mailto:adilhan_ainura@mail.ru)

## USE OF PHYTOSEIULUS PERSIMILIS A.-H. IN THE FIGHT AGAINST TETRANYCHUS URTICAE K. IN GREENHOUSES

**Abstract.** Studies to determine the biological activity and voracity of predatory mite *Phytoseiulus persimilis* A.-H. were carried out in the laboratory. According to our observations, *Phytoseiulus* eggs turned out to be the most chosen category of victim. Also, both the adult and the predator nymph have a high selectivity of individuals of the postembryonic stages of the victim during the feeding period. When studying the biological activity of the predator against the phytophagus, we noted that the predator actively suppressed its number to 97%.

**Keywords:** biology, greenhouses, entomophages, pests, plant protection.

**Introduction.** Vegetables are one of the most valuable food products of the population. The share of their use is growing from year to year. In parallel, there is an active increase in the area under vegetable crops in the closed ground. The role of plant protection, which is one of the urgent problems of vegetable growing, is growing [1].

In terms of anthropogenic load, agriculture is among the leaders. Significant environmental damage is caused by land chemicalization [2]. About 2 million tons of pesticides are used in the world every year. Their remains are found in 40% of the studied samples of grain, berries, fruits and vegetables. In the world annually 25 million cases of poisoning by pesticides are registered, including 20 thousand with fatal [3, 4].

Intensification of agriculture around the world, including on the territory of Kazakhstan has now become an extremely urgent economic task at the national and international levels. In this task, the problem of crop and crop protection from pests plays an important role. The application of an integrated plant protection system using biological agents and bioinsecticides is one of the solutions to these problems, which deserve increasing attention as an alternative to chemical methods as their complete replacement, because biomethod has a selective effect on insect pests, harmless to humans and the environment [3].

Growing cucumbers in greenhouses is almost impossible without constant and intensive control of the spider mite (*Tetranychusurticae* K.) – one of the main pests. *Phytoseiuluspersimilis* A.-H. characterized by high fertility, a short period of development under favorable conditions and high voracity against spider mites.

The aim of our research was to determine the biological activity of the predatory tick *Phytoseiulus persimilis* in the fight against spider mites, which can be used in the fight against phytophages in protected areas, as well as to determine its voracity and selectivity of food.

**Material and methods.** Laboratory studies were performed at the laboratory of arthropods useful "KazRIPPQ named after J. Jiyembaev" LLP.

Imago and nymphs of the predatory mite *Phytoseiulus persimilis* A.-H. were used as a test object. all stages of development of the common spider mite *Tetranychus urticae* K were used as prey for predatory mites.

To maintain colonies of spider mites, bean leaves were used, which were grown in accordance with the standard practice of cultivating plants in pots of 2liters.with the same type of fertile soil without fertilization.

In experiments to determine the biological activity of the predatory mite *Phytoseiulus* against phytophagous in all variants of the experiment was made the release of spider mite in the amount of: nymphs-20, adults-5 and eggs-30 pieces. The number of released predatory ticks was 5 adults (3 females, 2 males). Control without start *Phytoseiulus*. Accounts were carried out daily.

In an experiment to determine the voracity and selectivity of predator food, the voracity of 20 adults and 20 nymphs was taken into account. Exposure 5 hours.

The amount of feed offered: eggs – 30 pieces, larvae and nymphs – 20, adult spider mites – 5 individuals.

Laboratory experiments were carried out at a temperature of 26-27°C, relative humidity 70-80% and photoperiod 16:8 hours.

Experimental ticks were kept on leaf cuttings of beans 20x30 mm in size, which were placed on a sponge oasis in ditches with water. Statistical data processing was carried out by statistical complex of MS Excel program.

**Results and discussion.** In the experiment to determine the biological activity of *Phytoseiulus* against spider mites, we obtained the following results: the average number of spider mite eggs in the experiment gradually increased, the number of larvae, nymphs and adults remained relatively constant. On the 6th day the number of eggs and individuals of spider mites decreased significantly. The peak of growth of nymphs spider mite fell on day 7-146 individuals, the maximum number of adults on day 8 was 108 individuals, eggs about 1000 PCs. On day 12 of the experiment, there was a decrease in the number of eggs, nymphs and adult spider mites by 88.3; 97 and 77.8%, respectively.

If the population of the phytophage, we noted the decline in densities, in populations of the predator contrary, recorded an increase (figures 1–3).

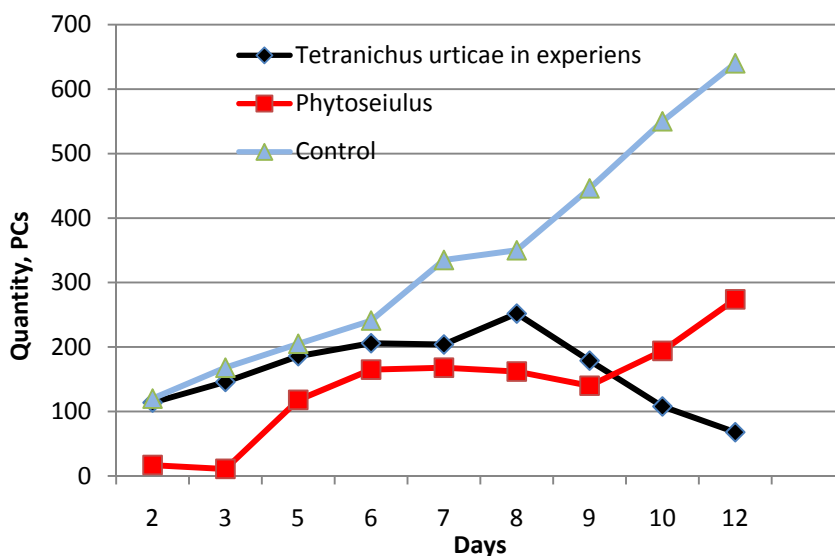


Figure 1 – Biological activity of *Phytoseiulus persimilis* against *Tetranychus urticae*

Thus, the yield of *Phytoseiulus* on day 12 was 180 individuals of nymphs, 94 individuals of adults. In the control variant, the number of phytophagous reached more than 1000 individuals.

Figures 2 and 3 show the dynamics of spider mite and predator abundance in experimental variants.

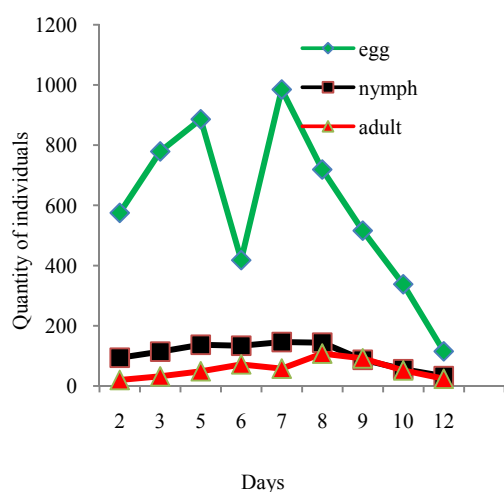


Figure 2 - Dynamics of *Tetranychusurticae* population in the experiment

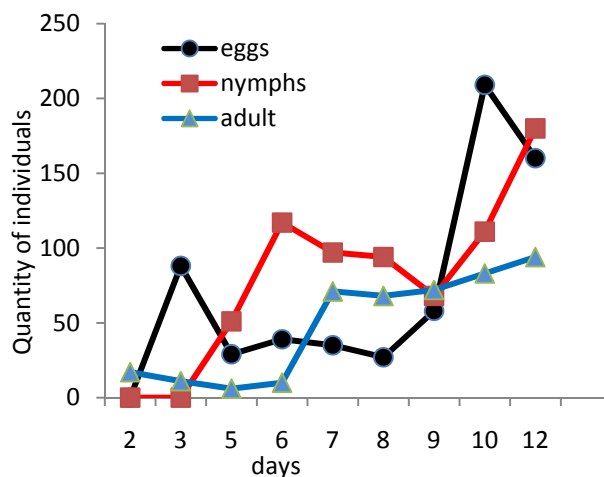


Figure 3 - dynamics of *Phytoseiulus* abundance in the experiment

According to the results of the data, released in the amount of 20 individuals (total predator) at the beginning of the experiment by the end of the experiment increased to 180 individuals (all age stages) and actively suppressed the growth of spider mites in the experiment in a short time. The predator also laid 152 eggs. A predator who preys actively, discourages, and actively inhibits the growth of spider mites. The maximum amount of egg laying by females of *Phytoseiulus* was observed on the 10th day after its settlement, after it went down, as the decrease in the amount of feed began.

In the experiment to determine the voracity and selectivity of *Phytoseiulus* adult predatory mite offered the opportunity to eat equally different-aged individuals spider mite: eggs, nymphs and adults.

Data on gluttony and selectivity of *Phytoseiulus* when feeding by different-aged individuals of the spider mite are presented in figure 4.

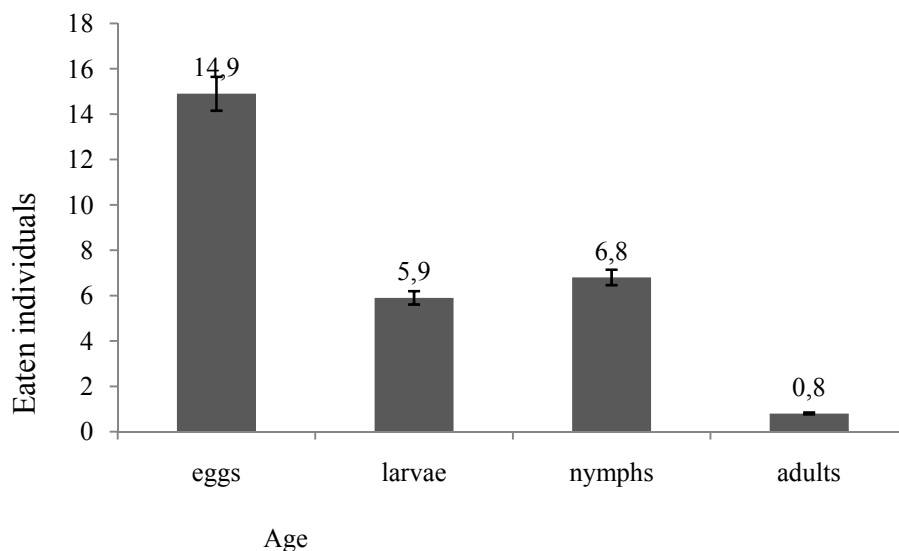


Figure 4 – Evaluation of gluttony and selectivity power of adults *Phytoseiulus* against spider mites

As can be seen from figure 4, the imago of *Phytoseiulus* attacked all age stages of spider mites, but gave preference to the balls. So, at an exposure of 5 hours adult predatory mites used in an average of 14.9 eggs; larvae 5.9; 6.8 specimens of nymphs and adults of 0.8 individuals of the phytophag.

In our studies, it was found that *Phytoseiulus* adults prefer nymphs to larvae, whereas predator nymphs prefer larvae (figure 5). According to some literature data [5, 6], such behavior is typical for female predators. It consumes mainly nymphs and spider mite adults, leaving larvae and phytophagous eggs to feed its offspring.

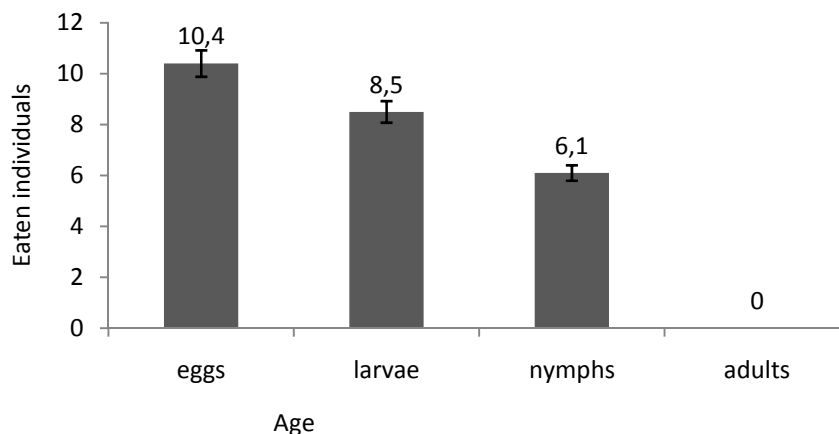


Figure 5 – assessment of the voracity and power of the selectivity of nymphs of *Phytoseiulus* against spider mites

*Phytoseiulus* is known to consume 24 spider mite eggs per day [6]. In our experiments, the average nymph *Phytoseiulus* (figure 2) destroyed 10.4 eggs in 5 hours. Also during this time, they used the food of 8.45 specimens of larvae and nymphs of 6.1 individuals of the phytophage.

**Conclusion.** According to our observations, *Phytoseiulus* eggs turned out to be the most chosen category of victim. The predator's food selectivity remained stable for both adults and nymphs.

Imago *Phytoseiulus persimilis* A.-H. found a tendency to feed on larger-sized individuals of the spider mite. Most of the elected stage of the food for predatory mites appeared to be spider mite eggs. Also, both the adult and the predator nymph have a high selectivity of individuals of the postembryonic stages of the victim during the feeding period.

When studying the biological activity of the predator against the phytophagous, we noted that the predator actively develops in the presence of abundant food and can suppress its number up to 97%. Due to the accumulation of acariphage during its active predatory activity, there is no need for the use of acaricides.

А. Әділханқызы, Қ. А. Алпысбаева,  
А. А. Мұхтарханова, Б. Найманова, А. М. Чадинова

«Ж. Жиенбаев атындағы Қазақ өсімдік қорғау және карантин ғылыми-зерттеу институты» ЖШС,  
Алматы, Қазақстан

#### ЖАБЫҚ АЛАҢ ЖАҒДАЙЫНДА *TETRANYCHUS URTICAE* К. ҚАРСЫ КҮРЕСТЕ *PHYTOSEIULUS PERSIMILIS* А.-Н. ПАЙДАЛАНУ

**Аннотация.** *Phytoseiulus persimilis* А.-Н. жыртқыш кенесінің биологиялық белсенділігі мен өсімталдылығын анықтау мақсатында зертханалық жағдайда зерттеулер жүргізілді. Біздің бақылауымыз бойынша фитосейулос фитофаг жұмыртқалары қоректенгенді жөн көреді. Сондай-ақ, жыртқыштың имагосы да, нимфасы да қорекретінде құрбанның эмбрионалды кезеңіндегі дарақтарды тандайды. Жыртқыштың фитофагқа қарсы биологиялық белсенділігін зерттеу кезінде жыртқыштың зиянкестің сан мөлшерін 97%-ға дейін жоятындығына көз жеткіздік.

**Түйін сөздер:** биология, жабық алаң, энтомофагтар, зиянкестер, өсімдік қорғау.

А. Адилханкызы, К. А. Алпысбаева,  
А. А. Мухтарханова, Б. Найманова, А. М. Чадинова

ТОО «Казахский научно-исследовательский институт защиты и карантина растений им. Ж. Жиембаева»,  
Алматы, Казахстан

## ИСПОЛЬЗОВАНИЕ *PHYTOSEIULUS PERSIMILIS* А.–Н. В БОРЬБЕ ПРОТИВ *TETRANYCHUS URTICAE* К. В ЗАКРЫТОМ ГРУНТЕ

**Аннотация.** Исследования по определению биологической активности и прожорливости хищного клеща *Phytoseiulus persimilis* А.–Н. проводили в лабораторных условиях. По нашим наблюдениям для фитосейулюса наиболее избираемой категорией жертвы оказались яйца фитофага. Также и у имаго, и у нимфы хищника высокая избирательность особей постэмбриональных стадий жертвы за период питания. При изучении биологической активности хищника в отношении фитофага нами было отмечено, что хищник активно подавил его численность до 97%.

**Ключевые слова:** биология, закрытый грунт, энтомофаги, вредители, защита растений.

### Information about authors:

Adilkhankyzy A., biotechnologist-breeder of KazNAU, senior researcher of laboratory of useful arthropods of KazRIPPQ named after J. Jiyembaev, Almaty, Kazakhstan; adilhan\_ainura@mail.ru; <https://orcid.org/0000-0001-8048-7987>

Alpysbaeva K. A., master of Agriculture Sciences, KazNAU, researcher, laboratory of useful arthropods of KazRIPPQ named after J. Jiyembaev, Almaty, Kazakhstan; erke07naz05@mail.ru; <https://orcid.org/0000-0002-8962-384X>

Mukhtarkhanova A. A., master of agriculture of S. Seifullin KazATU, junior researcher laboratory of useful arthropods of KazRIPPQ named after J. Jiyembaev, Almaty, Kazakhstan; aida.mukhtarkhanova@mail.ru; <https://orcid.org/0000-0003-2730-2802>

Naimanova B. Zh., master of agriculture of S. Seifullin KazATU, junior researcher laboratory of useful arthropods of KazRIPPQ named after J. Jiyembaev, Almaty, Kazakhstan; baljan-sun93@mail.ru; <https://orcid.org/0000-0003-1827-7115>

Chadinova A. M., acting head of the laboratory of useful arthropods of KazRIPPQ named after J. Jiyembaev, Almaty, Kazakhstan; aizhan-chadinova@mail.ru; <https://orcid.org/0000-0001-9648-6719>

### REFERENCES

- [1] Duisembekov B.A., Chadinova A.M., Alpysbayeva K.A. Optimization of the technology of mass breeding of cereal aphids (*Schizaphis graminum*) using an aeroponic cultivation and the breeding of the aphidiusbioagent (*Aphidiusmatricariae*) // News of the National academy of sciences of the Republic of Kazakhstan. Series of agricultural sciences. 2018. N 6. P. 74-80.
- [2] Lysov A.K. the European Union is concerned about the further restriction of the use of pesticides // Plant Protection and Quarantine. 2010. N 4. P. 32-36.
- [3] Monastic O.A. whether the biological products and biological plant protection agriculture? // Plant protection. 2006. N 11. P. 6-9.
- [4] Rogozin M.Yu., Beketova E.A. Environmental effects of pesticides in agriculture // Young scientist. 2018. N 25. P. 39-43.
- [5] Sabelis M.W. Biological control of two-spotted spider mite using belongs to predator. Part 1: Modeling the predator – prey interaction at the individual level // Agric. Res. Reports. 1981. N 910. Pudoc West, Wageningen, the Netherlands.
- [6] Bernstein C. Prey and predator emigration responses in the acarine system *Tetranychusurticae* – *Phytoseiuluspersimilis* // Oecologia (Berlin). 1984. 61. P. 134-142.

NEWS

OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN

SERIES OF AGRICULTURAL SCIENCES

ISSN 2224-526X

Volume 5, Number 53 (2019), 10 – 15

<https://doi.org/10.32014/2019.2224-526X.53>

UDK 633.34:632.7

A. O. Sagitov<sup>1</sup>, N. S. Mukhamadiyev<sup>2</sup>, G. Zh. Mengdibayeva<sup>2</sup>, M. A. Uzakbayeva<sup>3</sup>

<sup>1</sup>LLP «Agropark Ontustik», Almaty, Kazakhstan,

<sup>2</sup>LLP «Kazakh Research Institute for Plant Protection and Quarantine named after Zh. Zhiembaev»,  
Almaty, Kazakhstan,

<sup>3</sup>Kazakh National Agrarian University, Almaty, Kazakhstan.

E-mail: a\_sagitov@mail.ru, nurzhan-80@mail.ru, uzakbaeva-1992@mail.ru

## INTEGRATED SYSTEM OF PROTECTION OF SOYBEANS FROM PESTS AND THE INNOVATIVE TECHNOLOGY OF CULTIVATION

**Abstract.** The article presents data on research on crops, LLP "Bayserke agro", LLC "Agropark Ontustik" in Almaty region.

Developed an innovative scheme of soybean cultivation is introduced in the crops of LLP "bayserke agro" on an area of 650 hectares, 2013-2016 and since 2018 all work is carried out in LLP "Ontustik Agropark".

The question of the best ways of sowing soybeans in different soil and climatic zones, remained unresolved. This is a consequence of various natural and agrotechnical conditions, as well as varietal composition.

**Keywords:** soybean, innovative technology, integrated protection system, processing, method.

**Introduction.** In line with the strategic course of development of the Republic of Kazakhstan Strategy "Kazakhstan-2050", President's address, "the Third modernization of Kazakhstan: global competitiveness" (2017), the President's address "New opportunities of development in the context of the fourth industrial revolution" (2018), the State program of development of agriculture of the Republic of Kazakhstan for the years 2017-2021, a priority and an important direction of development of plant breeding is to increase productivity, production of competitive products to meet the domestic needs of the population and the development of the export potential of the country on the basis of increasing the knowledge intensity of agricultural technologies. It is emphasized that the agricultural sector of the country should become a new driver of the economy, the task of increasing the efficiency of land use, increasing the area of irrigated land by 40 %, thereby bringing them to 2 million hectares [1-4].

**Methods of research.** When implementing innovative technologies of soybean cultivation, an innovative patent was used [5, 6], which provides soil enrichment with trace elements in a natural way, that is, an increase in fertility due to the green mass of siderate crops of the upper soil layer. After the harvest of agricultural crops is carried out sealing of crop residues in the upper layer of the soil followed by sowing of beds sigaretnyj cultures and fueling intense irrigation for irrigation grooves. Once sprouted siderate culture and the weeds, give the green weight of them crushed and buried in the upper layers to a depth of 12-15 cm with subsequent cutting of seed beds and irrigation furrows for the harvest of the following crops in the crop rotation [7], after the snow melts, spend a harrowing two tracks, followed by formation of raised beds with a width of 60-140 cm, depending on soil type and planting materials, and irrigation after cutting grooves with a depth of 12-15 cm early spring sowing is carried out with intensive nourishing irrigation, providing effective control of the surface crust as well as pests before leaving. Sowing and fertilization is carried out simultaneously.

This method increases the moisture storage and moisture-saving ability of the soil, effectively destroys weeds, increases the yield of soybeans, reduces the consumption of herbicides, contributes to the full germination of seeds. This ensures effective control of weeds and root rot [8], seeds and mineral

fertilizers are evenly distributed in the seed beds, and seed sowing and fertilization is carried out in one horizon while continuous processing also destroys sprouted weeds. Device for seeding and fertilizing comprises hoses made of metal pipes, and the tines United on the frame rigid bracket. The method contributes to an increase in yield due to the uniform distribution of seeds and fertilizers both on the field area and on the depth of incorporation, which leads to improved nutrition and illumination of plants [9]. Sowing is carried out in seed beds with a high seeding rate of soybean seeds 850-1000 thousand/ha, with a subsequent fueling of intense irrigation, and the sprouting is carried out processing of crops with herbicides on damp soil fertility. The method helps to increase yields regardless of weather conditions and save herbicide consumption.

**Research result.** The analysis showed that currently there are traditional methods of cultivation of soybeans that have significant disadvantages and costs. When the reservoir is rotated to a depth of 25-30 cm, there is a large fuel consumption of 25-32 l/ha, there are irregularities in the microrelief, which must be leveled and bear additional costs, also this treatment is accompanied by the destruction of the microbiota in the soil and the structure of the soil as well as rapid evaporation of moisture.

Traditional one-component fungicidal seed treatment with the proposed methods and preparations is not always accompanied by sufficient efficiency.

Wide-row sowing with a distance of 60 cm between paired rows (crowding of sown seeds in paired rows, which in turn is the cause of uneven feeding area of soybean plants).

There is no guarantee of obtaining a full uniform germination as spring presowing treatment of soil quickly dries the top layer of soil to a depth of seeding, and in the absence of spring rain creates a real threat of getting full of seedlings. That subsequently adversely affects the growth and further development of plants, and this in turn leads to low yields, low quality of products, with high cost.

The consequence of the above factors is the insufficient number of soybean plants per unit area. The herbicide treatment occurs mostly in dry agricultural conditions, which leads to ambiguous efficacy of herbicides. When watering by the usual method, water erosion of the soil occurs, namely fine-grained parts of the soil, organic substances, introduced mineral fertilizers are washed away by irrigation water and demolished in the direction of movement of irrigation water, and all this leads to environmental pollution.

Implementation of the developed innovative scheme of soybean cultivation eliminates all these shortcomings.

The use of minimal technology in basic tillage. The main advantage of minimum and zero technologies in the economic sense, is a significant increase in productivity, increase the profitability of grain production, and in the technological sense, the minimization of processing reduces the duration of work, making them the most optimal, which in turn has a positive impact on crop yields.

Continuous cultivation contributes to the significant destruction of weeds.

Pre-sowing tillage (spring).

Early spring harrowing in two tracks at the first opportunity to enter the field. Cultivation to a depth of 10-12 cm or disking in 2 tracks with harrowing, produce two-fold continuous cultivation of the field in order to destroy sprouted weeds. Herbicide with a tank mix combination products produced before and after shadowee depending on the monitoring and evaluation of the UAV. Edge processing fields, as on the roadside to reside and overwinter pests which spreads by new shoots.

Hack seed beds with a width of 90-140 cm (depending on soil type) and cutting lateral grooves ensures the implementation of the feed irrigation immediately after sowing and there is no fear of drying out the top layer of soil to a depth of seeding, because after sowing in the fields is fueling watering, which is calling and vegasredcasino at the same time. This ensures the production of uniform friendly shoots of soybean seeds and weeds in the "one wave".

Irrigated immediately after planting, providing for water loading irrigation and outdoor watering is no gap in time. Watering is done in the mode of feeding (feed watering) without slyvania, the minimum water soil erosion, as the bottom of irrigation furrows through the loosened layer of soil in the horizon untouched minimum tillage.

## Technological scheme of integrated protection system and innovative technologies on soybean crops in the South-East of Kazakhstan

| Action                                                                                                             | The timing of     | Purpose                                                                                                                                               | Tools and equipment used                                                                                                                                                                        |
|--------------------------------------------------------------------------------------------------------------------|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The application of mineral fertilizers under the main processing of the soil                                       | October-November  | Enriching the soil and providing plants with basic nutrients, increasing resistance to a complex of diseases                                          | P <sub>2</sub> O <sub>5</sub> 90 kg / ha<br>Spreader of mineral fertilizers<br>RUM-1200 LANDINI tractor                                                                                         |
| Application of organic fertilizers                                                                                 | October-November  | Soil enrichment with nutrients of organic origin                                                                                                      | Manure 60 tons / ha<br>Spreader of organic fertilizers<br>ROWE – 6000 tractor LANDINI                                                                                                           |
| Fidexperta and recovery of seeds protective-stimulating composition No. 28978<br>Innovation patent of RK No. 28978 | March-April       | Improvement of seeds from the complex of fungal and bacterial infection, pests and stimulation of germination and growth of the root system.          | The fungicide TMTD FAC. - 6-8 kg / ton,<br>Extrasol 4-6 l / ton.<br>Cruiser 2-4 l/ton<br>Ekorost 4 l / ton of<br>Etching machine PSM-25.                                                        |
| Tillage<br>Innovation patent of RK No. 25383,<br>No. 24791                                                         | March-April       | Enrichment of soil by trace elements in a natural way, the activation of soil microflora, including mikroorganizmov antagonists                       | Seeding of siderates into the soil, combined machine for soil tillage<br>DANTE SPS-3. Tractor NEW HOLLAND                                                                                       |
| Application of innovative method of sowing soybean seeds<br>Innovation patent of RK No. 26825,<br>No. 25202        | April-May         | The increase in yield due to uniform distribution of seed and fertilizer in area fields and the seeding depth of soybeans, cost savings of herbicides | Combined pneumatic seed drill KAPPA SP 5 tractor LANDINI                                                                                                                                        |
| The fight against a complex of weeds prior to emergence of soybeans                                                | April-May         | Suppression of growth of weeds in the early stages of development and as reservoirs of sucking pests and viral infection.                             | A tank mix of Zenkor Ultra 0.5-0.6 l/ha + Tornado 500 2l/ha.<br>Borey 0.1 l/ha, Bitoksibatsillin 2 kg /ha maximum flow 600 l/ha.<br>Sprayer RICOSMA ATTILA EVO 24 tractor LANDINI               |
| Struggle with the complex of weeds after emergence in the phase before the appearance of 5-6 real leaves           | May-June          | Suppression of growth of weeds in the early stages of development and as reservoirs of sucking pests and viral infection.                             | A tank mix of pulsar 0.8 l/ha + basagran 1.5 l/ha. Bitoksibatsillin 2 kg/ha rate of the working fluid 300 l/ha.<br>Sprayer RICOSMA ATTILA EVO 24 tractor LANDINI                                |
| Cultivation of soil between rows                                                                                   | May-June          | Loosening of the top layers of soil, improvement of soil aeration, pest population reduction and root rot damage                                      | Spiky rotary harrow<br>ROMPICROSTA MTZ – 82.1 tractor                                                                                                                                           |
| Subsoil Irrigation                                                                                                 | June-August       | Поддержание оптимального водного баланса почвы, снижение и поражения корневыми гнилями                                                                | Система подпочвенного орошения Irritec                                                                                                                                                          |
| Pest control                                                                                                       | June              | Pest population suppression and reducing the spread of viral diseases                                                                                 | Akarin 0.15 l/ha. Bitoksibatsillin 2 kg/ha or AK kobelek 2 kg/ha. Extrasol 4-6 l/ha. Northwind 0.1-0.2 l/ha rate of the working fluid 300 l/ha<br>Sprayer RICOSMA ATTILA EVO 24 tractor LANDINI |
| Harvest                                                                                                            | September-October | Timely harvesting, minimization of losses, minimal injury of soybeans in accordance with the characteristics of each variety                          | Combine harvester CASE 5040 with the system of threshing and separation of grain and harvest AXIAL FLOW part is equipped with a system TERRA FLEX                                               |

Feeding irrigation without a time gap between sowing and irrigation ensures the germination of soybeans and weeds in the "one wave". This is a guarantee of active vegetation at an early stage of plant growth and, accordingly, the key to increasing the average yield.

Processing of crops by herbicides in the early phase of development on damp soil fertility, and are actively vegetating plants almost ensures the complete elimination of weeds while reducing pesticide loads in 1.5-2 times.

By increasing the seeding rate of soybeans allows you to bring the density of standing plants before harvesting to 600 000 – 800 000 on one hectare. Sowing of soybeans is carried out by a specially designed seeder in the seed beds and seeds of cultivated plants are placed evenly, and this in turn provides the most rational area of nutrition for each plant, due to this significantly increases the productivity of each plant, and has a positive effect on increasing the yield of cultivated crops and improves product quality.

When feeding irrigation according to the proposed innovative solution, the length of the rut increases to 1000 meters (this depends on the type of soil and the slope of the field).

The use of rational irrigation increases the productivity of the irrigator up to 50-70 ha, conducted feed irrigation and good quality without blemishes and without water erosion of the soil.

Tillage with minimal technology preserves its natural structure, does not reduce its natural fertility and retains moisture. The innovative scheme of soybean cultivation is effective in the development of waste early irrigated land.

Rational science-based use of plant protection against weeds, diseases and pests. The decline and rejection of the use of massive chemical treatments (application of herbicides and other pesticides) and increased biological on organic products.

The proposed innovative scheme of soybean cultivation is effective in that it requires less labor per unit area compared to traditional methods (irrigators, handymen), which in modern conditions is important (table).

For the analysis of economic efficiency of applied innovations 3 variants of comparison of technological schemes were used (figures 1, 2).

– Option 1 on the background of natural soil fertility (without fertilizer) and monopoies soy for 3 years: Option 1 according to the traditional scheme, Option 1 innovative scheme.

– Option 2 against the background of the use of minimum doses of fertilizers, where the predecessor was winter cereals: Option 2 according to the traditional scheme, Option 2 according to the innovative scheme.

– Option 3 with application of macro and micronutrients and growth regulators on the predecessor of corn: Option 3 according to the traditional scheme, Option 3, innovative scheme.

### Analysis of soybean yield depending on applied technologies (ton/ha)

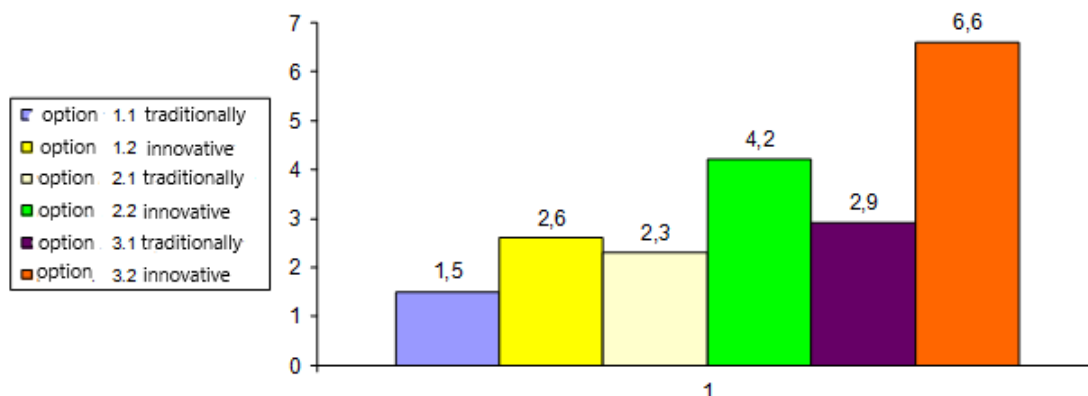


Figure 1 – Soybean yield Analysis

## Difference in profit when using traditional and innovative technologies (tenge)

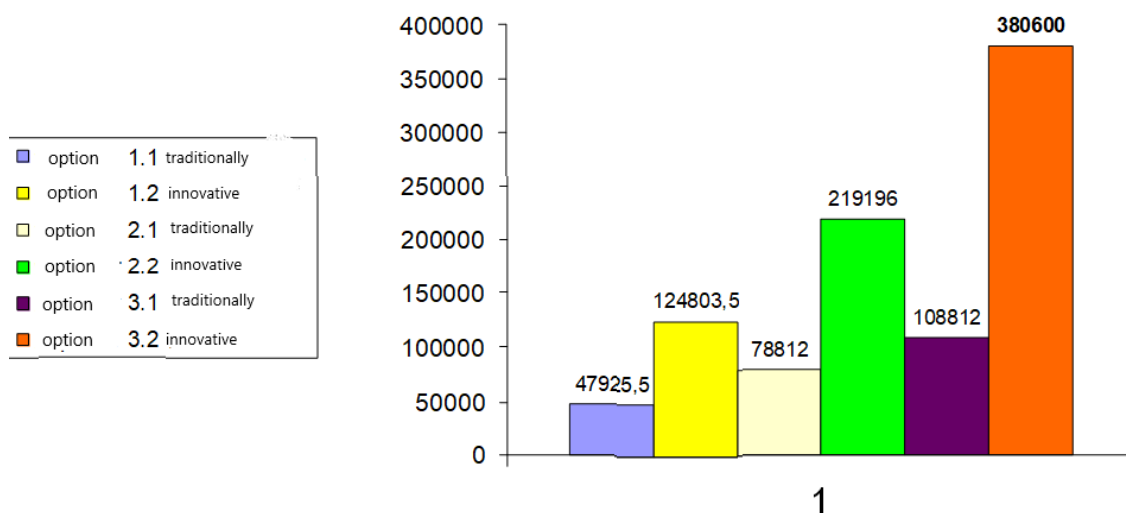


Figure 2 – Difference in soybean profits under different technologies

As illustrated in the graphic format above, our innovative approach has resulted in a yield of 4 times more soybeans per 1 hectare compared to the traditional soybean cultivation technology widely used in this region. Despite the fact that the cost of growing soybeans by innovative technology was slightly higher than the traditional net profit per 1 hectare was 8 times more.

**Conclusion.** The results of field testing of our technology show the possibility of obtaining a high yield and a significant profit compared to the established technology of soybean cultivation in the South-East of Kazakhstan.

Research was conducted in the framework of the budget program 267 "Increasing availability of knowledge and scientific research", the routine 101 "program-oriented funding of research and activities", according to the specifics 156 "Payment of consulting services and research" on the scientific and technical program "Creation of innovative agro-technology Park for the implementation of precision farming". Research work continues.

А. О. Сағитов<sup>1</sup>, Н. С. Мұхамдиев<sup>2</sup>, Г. Ж. Мендібаева<sup>2</sup>, М. А. Ұзақбаева<sup>3</sup>

<sup>1</sup>«Agropark Ontustik» ЖШС, Алматы, Қазақстан,

<sup>2</sup>«Ж. Жиенбаев атындағы Қазақ өсімдік қорғау және карантин ғылыми зерттеу институты» ЖШС, Алматы, Қазақстан,

<sup>3</sup>Қазақ ұлттық аграрлық университеті, Алматы, Қазақстан

### МАЙБҰРШАҚ ДАҚЫЛЫН ИННОВАЦИЯЛЫҚ ТЕХНОЛОГИЯМЕН ӨСІРУ ЖӘНЕ ЗИЯНДЫ АҒЗАЛАРДАН БІРЕГЕЙ ҚОРҒАУ ЖҮЙЕСІ

**Аннотация.** Мақалада Алматы облысы «Байсерке Агро» ЖШС және «Agropark Ontustik» ЖШС егістігінде жүргізілген зерттеулердің нәтижесі келтірілген.

Майбұршақ дақпын егудің инновациялық технологиясының сызбасы 2013-2016 жылдары «Байсерке Агро» ЖШС-нің 650 га егістігіне енгізіліп, 2018 жылдан бастап «Agropark Ontustik» ЖШС-де жүргізілуде.

Әр түрлі топырақ-климаттық аймақтарда майбұршақ тұқымын себудің ең оңтайлы әдістері жөніндегі мәселелер шешімін таппай келеді. Бұл әртүрлі табиғи және агротехникалық жағдайлардың, сондай-ақ сорттық құрамның салдарынан.

**Түйін сөздер:** майбұршақ, инновациялық технология, бірегей қорғау жүйесі, өңдеу, әдіс.

А. О. Сагитов<sup>1</sup>, Н. С. Мухамадиев<sup>2</sup>, Г. Ж. Мендибаева<sup>2</sup>, М. А. Узакбаева<sup>3</sup>

<sup>1</sup>ТОО «Agropark Ontustik», Almaty, Kazakhstan,

<sup>2</sup>ТОО «Казахский научно-исследовательский институт Защиты и Карантина растений им. Ж. Жиенбаева», Алматы, Казахстан,

<sup>3</sup>Казахский национальный аграрный университет, Алматы, Казахстан

## ИНТЕГРИРОВАННАЯ СИСТЕМА ЗАЩИТЫ СОИ ОТ ВРЕДИТЕЛЕЙ И ИННОВАЦИОННАЯ ТЕХНОЛОГИЯ ВОЗДЕЛЫВАНИЯ

**Аннотация.** В статье изложены данные о проведении исследований на посевах ТОО «Байсерке Агро» и ТОО «Agropark Ontustik» Алматинской области.

Разработанная инновационная схема возделывания сои внедрена на посевах ТОО «Байсерке Агро» на площади 650 га, 2013-2016 гг. и начиная с 2018 г все работы проводятся в ТОО «Agropark Ontustik».

Вопрос о лучших способах посева сои в различных почвенно-климатических зонах, остался не разрешенным. Это является следствием различных природных и агротехнических условий, а также, сортового состава.

**Ключевые слова:** сои, инновационные технологий, интегрированной системы защиты, обработка, способ.

### Information about authors:

Sagitov A. O., Academician of NAS RK, General Director of LLP "Agropark Ontustik", Almaty, Kazakhstan; a\_sagitov@mail.ru; <https://orcid.org/0000-0002-5137-979X>

Mukhamadiev N. S., candidate of biological sciences, head of the sector protection of forest and tree plantations, LLP «Kazakh Research Institute for Plant Protection and Quarantine named after Zh. Zhiembaeva» Ministry of Agriculture of the RK, , Almaty, Kazakhstan; nurzhan-80@mail.ru; <https://orcid.org/0000-0003-3199-2447>

Mengdibayeva G. Zh., PhD-doctor, Research Fellow, Forest and Tree Protection Sector, LLP «Kazakh Research Institute for Plant Protection and Quarantine named after Zh. Zhiembaeva» Ministry of Agriculture of the RK, Almaty, Kazakhstan; [www.gulnaz87.kz@mail.ru](mailto:www.gulnaz87.kz@mail.ru); <https://orcid.org/0000-0002-0929-061X>

Uzakbayeva M. A., PhD-doctoral student Faculty of Forest, Land Resources and Phytosanitary, of Kazakh National Agrarian University, Almaty, Kazakhstan; [uzakbaeva-1992@mail.ru](mailto:uzakbaeva-1992@mail.ru); <https://orcid.org/0000-0002-1053-9566>

### REFERENCES

- [1] State program of development of agriculture of the Republic of Kazakhstan for 2017-2021. Astana, 2017. 66 p.
- [2] Kuryushin V.I. On the development of agricultural technologies and the formation of state policy in agriculture. M., 2005. 32 p.
- [3] Bakharev G.I. Zoning of arable land in the aggregate agro-ecological characteristics // Proc. Dokl. Intl. scientific.-practice. conf. intensification, resource saving and soil protection in adaptive landscape systems of agriculture. Kursk, 2008. P. 74-77.
- [4] Temreshev I.I., Ageenko A.V., Sagit I.N. Leafhoppers, treehoppers and spittlebugs (Hemiptera, Auchenorrhyncha) – soybean pests in the South-East of the Republic of Kazakhstan (in Russian) // News of the National academy of sciences of the Republic of Kazakhstan. Series of agricultural sciences. 2018. Vol. 1, N 43. P. 87-94. ISSN 2224-526X.
- [5] Yelnazarkyzy R., Kenenbayev S.B., Didorenko S.V. Agrotechnological peculiarities of soybean cultivation in the irrigated zone of south and the Southeast Kazakhstan // News of the National academy of sciences of the Republic of Kazakhstan. Series of agricultural sciences. 2019. Vol. 3, N 51. P. 68-72. ISSN 2224-526X (in Rus.). <https://doi.org/10.32014/2019.2224-526X.38>
- [6] Ageenko A.V., Sagitov A.O., etc. Innovative patent of RK No. 25383 from 16.01.2012 "Method of primary tillage».
- [7] Ageenko A.V., Sagitov A.O. Innovative patent of RK No. 24791 dated 15.11.2011, the "Method of soil treatment».
- [8] Ageenko A.V., Sagitov A.O., etc. Innovative patent of RK No. 26825 from 15.05.2013 "Method of sowing and device for its implementation».
- [9] Ageenko A.V., Sagitov A.O., etc. Innovative patent of RK No. 25202 from 15.12.2011 G. "The Method of cultivation of soybean».

NEWS

OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN

SERIES OF AGRICULTURAL SCIENCES

ISSN 2224-526X

Volume 5, Number 53 (2019), 16 – 21

<https://doi.org/10.32014/2019.2224-526X.54>

UDK 633.1:631.531.011.5

**N. Zh. Sultanova, M. M. Bekezhanova, G. B. Sarsenbaeva,  
A. A. Jaimurzina, Zh. S. Ussembaeva, A. O. Sagitov**

LLP “Kazakh SRI of Plant Protection and Quarantine named after Zh. Zhiembaev”

Ministry of Agriculture of Republic of Kazakhstan, Almaty, Kazakhstan.

E-mail: nadira.sultanova@mail, madina.bekezhanova.80@mail.ru,

aziza\_niizr@mail.ru, jako\_mai@mail.ru, a\_sagitov@mail.ru

## **RESULTS OF PHYTO EXPERTISE OF AGRICULTURAL CULTURES SEEDS**

**Abstract.** In laboratory condition of Kazakh Research Institute of Plant Protection and Quarantine was conducted an evaluation of seed germination and infestation of barley, wheat, zeas and soybeans with soil born fungus spp. It was found that the greatest prevalence on the seeds of all the studied crops belongs to the fungi of the genera *Alternaria* and *Fusarium*, as well as mold (*Aspergillus*, *Penicillium*, *Mycorales*), with a lower frequency found *Bipolaris oryzae*. The laboratory germination of crops grain seeds (wheat, barley, zeas and soybeans) amounted to 23.8-71.4%, the prevalence of *Alternaria* spp. – 28.5-76.6%, *Fusarium* spp. – 14.3-33.3%, *Aspergillus* spp. and *Penicillium* spp. – 11.9-27.3%, respectively. It was found that the greatest prevalence in the seeds of all the studied crops belongs to the fungi of the genera *Alternaria* and *Fusarium*, as well as mold (*Aspergillus*, *Penicillium*, *Mycorales*).

**Keywords:** seeds, fungal microflora, microorganisms, crops, germination, phyto examination.

**Introduction.** Plant diseases produce the cereal crops loss on average by 20%. Seed infection takes a special place among the pathogenic flora of cereal crops. It is well known that more than 60% of all pathogens of cereal crops are distributed by seeds. 2 types of microbial population occurs on seeds. They are: saprotrophic microbial population (*Penicillia*, *Aspergilla*, *Mucor*, *Alternaria*, etc.) and pathogenic microbial population (smut, helminthosporia, fusarium, septorios, etc.) [1]. The composition of the pathogenic seed complex includes by the dozens of fungi and bacteria species. This whole complex of pathogenic and saprophytic microbial population causes enzyme-mycotic depletion of seed which negatively affects on germinating ability of seeds, germination readiness and plant development during the growing season. They accumulate in the rhizosphere of the root system in case of the seed sprouting therefore they cause of root disease and radical root disease [2].

Massive infection of seeds with pathogenic fungi often reduces germination energy and their growing. Harmfulness hardly depends on the depth of mycelium and the number of affected seeds localization. In addition, when seed lots are used for food and feed purposes, it is necessary to know not only the degree of infection but also the species composition of pathogens.

Sowing infected seeds lead to the transmission of diseases to vegetative plants and thereby creates and maintains foci of infection in the field. Infection of seed microflora occurs at different times – during the growing season, when harvesting, especially in conditions of high humidity, during threshing or the post-harvest processing of grain, during storage due to a violation of its regime, as well as during storage of seeds with high humidity [2, 3].

Phytoevaluation of seeds is an integral part of modern agricultural production technologies, it allows one to foresee the possible susceptibility of plants to diseases and as result thus makes it possible to preserve the crop and the quality of grain. Only the correct diagnosis of diseases, knowledge of the occurrence causes and the characteristics of development are the basis for the successful implementation of

preventive and protective measures [1, 4]. High-quality seed treatment with fungicides should begin with a mandatory phytoexpert. Based on the results of phyto examination, a conclusion is made on the possibility of using a grain batch for seed purposes and on the need for grain processing [1].

The aim of our research was to evaluate seed germination and infestation of barley, wheat, zea mays and soybeans with soil born fungus spp. and bacterias in laboratory condition.

The work was carried out in the framework of the project BR06349590 "Creation of an innovative agrotechnological park for the implementation of precision farming".

**Material and methods.** We evaluated seed germination and infestation of barley, wheat, zea mays and soybeans with soil born fungus spp. in laboratory condition. Phytoevaluation of crop seeds to isolate fungal and bacterial mycophlora was carried out on nutrient media: potato glucose agar, Chapek's medium, and also in wet chambers. The studies were carried out according to the method generally accepted in phytopathology [4]. Identification of fungi was carried out on the basis of the colonies type on the Chapek nutrient medium and by microscopic examination on the morphological signs of sporulation [5]. Was done statistical analysis.

**Results and discussion.** We conducted a photo examination of seeds of agricultural crops to determine their infection with pathogenic microorganisms (figures 1–5). According to the phytoexpert data, it was found that the greatest prevalence on the seeds of all the studied crops belongs to the fungi of the genera *Alternaria* and *Fusarium*, as well as mold (*Aspergillus*, *Penicillium*, *Mycorales*), with a lower frequency found *Bipolaris sorokiniana*. High infection rates of bacteriosis were found, which may adversely affect seed germination, cause damage to crops by root rot, fusarium wilt and bacterial diseases.



Figure 1 – Affected barley seeds in a humid chamber

The results of the examination showed that the laboratory germination of crops seeds amounted to 23.8-71.4%, the prevalence of *Alternaria spp.* – 28.5-76.6%, *Fusarium spp.* - 14.3-33.3%, *Aspergillus spp.* and *Penicillium spp.* - 11.9-27.3%, respectively (table). Some saprotrophs in certain conditions are able to move to parasitism and partially or completely destroy the grain, changing the physical properties and chemical composition. At the same time, they cause significant damage during the storage of seeds, reducing their quality and even causing death. Seeds affected by saprotrophic fungi can be repackaged during storage. This is reflected in sowing qualities because germination decreases.

## The frequency of isolation of microorganisms from seed crops on nutrient media

| Crop                            | Germination,<br>% | Selected microorganisms, % |                   |                                     |                  |
|---------------------------------|-------------------|----------------------------|-------------------|-------------------------------------|------------------|
|                                 |                   | <i>Fusarium</i>            | <i>Alternaria</i> | <i>Aspergillus,<br/>Penicillium</i> | bacterialexudate |
| Barley                          | 57,2              | 14,3*                      | 76,6              | 25,9                                | 85,7             |
| Wheat                           | 71,4              | 14,3                       | 31,4              | 27,3                                | 85,7             |
| Zea mays                        | 48,6              | 16,7                       | 28,5              | 11,9                                | 12,4             |
| Soybeans                        | 23,8              | 33,3                       | 52,3              | 21,3                                | 37,1             |
| * <i>Bipolarissorokiniana</i> . |                   |                            |                   |                                     |                  |

Fungus of the genus *Alternaria spp.* were isolated from the seeds of all crops and ranged from 28.5% to 76.6%, respectively. *Alternaria* grain caused by fungi of the genus *Alternaria*, which usually do not lead to a significant decrease in the quantitative indicators of grain yield, but can pollute agricultural products with their metabolites, is a widespread disease of cereals. The species of the genus often found in grain (*A. tenuis*, *A. alternata*, etc.) synthesize a number of substances that are toxic to various organisms, including plants, birds, and mammals. Toxins produced by *alternaria* fungi have high activity, which helps the pathogen colonization of the tissues of living plants. Toxication is manifested in the delay in the germination of grain and the development of the root system. Alternaric acid, which retains toxicity throughout the growing season, inhibits the growth of other pathogens. According to S.F. Bug [2], with early lesion



Figure 2 – Affected barley seeds on nutrient media and isolated conidia of the fungus *Bipolarissorokiniana*



Figure 3 – Affected barley seeds in a humid chamber



Figure 4 – Affected wheat seeds on nutrient media and isolated conidia of a fungus of the genus *Alternaria* spp.



Figure 5 – Affected soybean seeds on nutrient media

of the ear of barley, alternaria fungi can cause grain and a decrease in its mass by 38%. The harmfulness of *Alternaria* is also a decrease in the photosynthetic surface of the leaves, molding of seeds and a decrease in yield [6–9].

**Conclusion.** On the basis of laboratory studies, it was found that the greatest prevalence in the seeds of all the studied crops belongs to the fungi of the genera *Alternaria* and *Fusarium*, as well as mold (*Aspergillus*, *Penicillium*, *Mycorales*), with a lower frequency found *Bipolaris sorokiniana* which is a dangerous pathogen causing root rot of grain crops. Also, high infection of seeds by bacteriosis pathogens, which can adversely affect the field germination of seeds, cause damage to crops by root rot, tracheomycosis and bacterial diseases. Such a phytopathological state of seeds of spring grain crops necessitates their obligatory disinfection.

Н. Ж. Султанова, М. М. Бекежанова, Г. Б. Сарсенбаева,  
А. А. Джаймурзина, Ж. С. Усембаева, А. О. Сагитов

ТОО Казахский научно-исследовательский институт защиты и  
карантина растений им. Ж. Жиёмбаева МСХ РК, Алматы, Казахстан

#### АУЫЛШАРУАШЫЛЫҚ ДАҚЫЛДАР ТҰҚЫМЫНЫҢ ФИТОТАЛДАУ НӘТИЖЕЛЕРІ

**Аннотация.** Зертханалық жағдайда арпа, бидай, жүгері және майбұршақ тұқымдарының өнгіштігі мен топырақ саңырауқұлағымен зақымдалуы бағаланды. Барлық зерттелген ауылшаруашылық дақылдарының тұқымдарында *Alternaria* және *Fusarium* саңырауқұлақтары, сонымен қатар *Aspergillus*, *Penicillium*, *Mycorales* коздырғыштары кең таралған, ал *Bipolaris sorokiniana* аз мөлшерде кездесті. Ауылшаруашылық дақылдарының (арпа, бидай, жүгері, майбұршақ) зертханалық өнгіштігі 23,8-71,4 пайыз құрады, *Alternaria spp.* таралуы – 28,5-76,6 пайыз, *Fusarium spp.* – 14,3-33,3 пайыз, *Aspergillus spp.* және *Penicillium spp.* сәйкесінше 11,9-27,3 пайыз болды.

**Түйін сөздер:** тұқымдар, саңырауқұлақ микрофлорасы, микроорганизмдер, ауылшаруашылық дақылдары, өнгіштік, фитоталдау.

Н. Ж. Султанова, М. М. Бекежанова, Г. Б. Сарсенбаева,  
А. А. Джаймурзина, Ж. С. Усембаева, А. О. Сагитов

ТОО Казахский научно-исследовательский институт защиты и  
карантина растений им. Ж. Жиёмбаева МСХ РК, Алматы, Казахстан

## РЕЗУЛЬТАТЫ ФИТОЭКСПЕРТИЗЫ СЕМЯН СЕЛЬСКОХОЗЯЙСТВЕННЫХ КУЛЬТУР

**Аннотация.** В лабораторных условиях Казахского научно-исследовательского института защиты растений и карантина была проведена оценка семян ячменя, пшеницы, кукурузы и соина всхожесть и заражение почвенным грибом spp. Выяснилось, что наибольшая распространенность на семенах всех изученных сельскохозяйственных культур принадлежит грибам родов *Alternaria* и *Fusarium*, а также плесени (*Aspergillus*, *Penicillium*, *Mucorales*), с более низкой частотой встречается *Bipolaris sorokiniana*. Лабораторная всхожесть сельскохозяйственных культур (пшеница, ячмень, кукуруза и соя) составила 23,8-71,4%, распространенность *Alternaria* spp. – 28,5-76,6%, *Fusarium* spp. – 14,3-33,3%, *Aspergillus* spp. и *Penicillium* spp. – 11,9-27,3% соответственно.

**Ключевые слова:** семена, грибная микрофлора, микроорганизмы, сельскохозяйственные культуры, всхожесть, фитоэкспертиза.

### Information about authors:

Sultanova N. Zh., LLP "Kazakh SRI of Plant Protection and Quarantine named after Zh. Zhiembayev" Ministry of Agriculture of Republic of Kazakhstan, Almaty, Kazakhstan; nadira.sultanova@mail.ru; <https://orcid.org/0000-0002-9538-3512>

Bekezhanova M. M., LLP "Kazakh SRI of Plant Protection and Quarantine named after Zh. Zhiembayev" Ministry of Agriculture of Republic of Kazakhstan, Almaty, Kazakhstan; madina.bekezhanova.80@mail.ru; <https://orcid.org/0000-0001-6480-4030>

Sarsenbaeva G. B., LLP "Kazakh SRI of Plant Protection and Quarantine named after Zh. Zhiembayev" Ministry of Agriculture of Republic of Kazakhstan, Almaty, Kazakhstan; aziza\_niizr@mail.ru; <https://orcid.org/0000-0003-0276-8569>

Jaimurzina A. A., LLP "Kazakh SRI of Plant Protection and Quarantine named after Zh. Zhiembayev" Ministry of Agriculture of Republic of Kazakhstan, Almaty, Kazakhstan; nadira.sultanova@mail.ru; <https://orcid.org/0000-0001-6830-7525>

Ussembaeva Zh. S., LLP "Kazakh SRI of Plant Protection and Quarantine named after Zh. Zhiembayev" Ministry of Agriculture of Republic of Kazakhstan, Almaty, Kazakhstan; jako\_mai@mail.ru; <https://orcid.org/0000-0003-0702-2125>

Sagitov A. O., LLP "Kazakh SRI of Plant Protection and Quarantine named after Zh. Zhiembayev" Ministry of Agriculture of Republic of Kazakhstan, Almaty, Kazakhstan; a\_sagitov@mail.ru; <https://orcid.org/0000-0002-5137-979X>

## REFERENCES

- [1] Khilevsky V.A. Phyto-examination and dressing of winter wheat seeds in the Rostov region // Science and education. Collection of scientific papers. Materials of the IV International Scientific and Practical Conference (July 31, 2015). M.: "Feather", 2015. P. 102-106 (in Russ.).
- [2] Buga S.F. Tactics and economics of protecting winter wheat and spring barley from disease // Protection and Plant Quarantine. 2012. N 7. P. 18 (in Russ.).
- [3] Gagkaeva T.Yu. Infection of wheat grain with *Fusarium* and *Alternaria* mushrooms in southern Russia in 2010 // Protection and quarantine of plants. 2012. N 1. P. 37-43 (in Russ.).
- [4] Angelo G., Giovanna G., Lodovica G.M. Seed transmission of *Fusarium oxysporum* f. sp. lactucae // Phytoparasitica. 2004. 32. N 1. P. 61-65 (in Eng.).
- [5] Naumova N.A. Seed analysis for fungal and bacterial infections. M., 1970. P. 173-175 (in Russ.).
- [6] Sanin S.S., Cherkashin V.I., Nazarova L.N. et al. Phytosanitary examination of grain crops (plant diseases): recommendations. M.: Federal State Institution "Rosinformagroteh", 2002. 140 p. (in Russ.).
- [7] Bilay V.I., Kurbatskaya Z.A. Determinant of toxin-forming micromycetes. Kiev: Nauk. Dumka, 1990. 236 p. (in Russ.).
- [8] Khilevsky V.A. Seed dressing is a significant preventive measure in the protection of crops // Innovative Science. 2015. N 11 - 3. P. 86-88 (in Russ.).
- [9] Toropova E.Yu., Kirichenko A.A., Kazakova O.A., Porsev I.N. Alternariosis of spring wheat and barley grain in Western Siberia and Eastern Trans-Urals // Plant Protection and Quarantine. 2015. N 1. P. 20-22 (in Russ.).

**NEWS**

OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN

**SERIES OF AGRICULTURAL SCIENCES**

ISSN 2224-526X

Volume 5, Number 53 (2019), 22 – 26

<https://doi.org/10.32014/2019.2224-526X.55>

UDC 636.2.084.522

**A. A. Spanov<sup>1</sup>, D. T. Sultanbai<sup>1</sup>, A. D. Baimukanov<sup>2</sup>**

<sup>1</sup>Educational Scientific and Production Center Bayserke-Agro LLP, Talgar district, Almaty region, Kazakhstan,

<sup>2</sup>Russian State Agrarian University -Moscow Agricultural Academy named after K. A. Timiryazev,  
Moscow, Russia.

E-mail: abzal16@mail.ru, darinasultan@lenta.ru, aidartaidar98@mail.ru

**COMPARATIVE RESULTS OF PRODUCTIVITY  
OF MEAT-TYPE BULL-CALVES  
IN THE CONDITIONS OF BAYSERKE-AGRO LLP**

**Abstract.** The article presents the results of the research work on fattening of meat-type bull-calves belonging to 4 breeds (Angus, Hereford, Auliekol, Kazakh whiteheaded). Staged diets of intensive fattening and their chemical indices are presented, including the content of digestible protein and the exchange energy of 1 kg of dry matter. The dry matter consumption of the experimental animals was established, as well as the prime cost of product unit in the structure of the diet for the studied breeds was calculated. The average daily weight gains were established depending on the methods of feed distribution, including the terms of breeds.

The diet of the experimental and control groups consisted of 4 components (corn silage, alfalfa haylage, grain mixture, vitamin-mineral premixes for cattle) and was approved taking into account the adjustment in palatability with the rest of the feed table from a daily rate of not more than 5%. According to the results of chemical analysis of feed, the content of digestible protein per 1 kg of dry matter was 10.3% and the concentration of exchange energy was 11.3 MJ, the ratio of concentrated feed in dry matter of the diet was 29.5% against 70.5% of the structural feed.

According to the technology of intensive fattening, a share of concentrated feed in the dry matter of the diet was gradually increased by 6.5-7% with an interval of 10-12 days in order to adapt the rumen microflora and avoid acidosis, with a duration of up to 3 months. The ultimate goal was to increase the share of concentrated feed in the dry matter of the diet to 75%.

In the 1st fattening stage, the average ratio of dry matter of concentrated to structural feed was 56.4% versus 43.6%. The duration of the 1st stage was 60 days, while the increase in the proportion of concentrated feed was carried out every 10 days (an increase in grain mixture by 500 grams in natural weight or 430 grams in dry matter per animal), the share of dry matter in structural feed was reduced proportionally. At the end of the 1st stage, taking into account the adjustment of the diet by palatability, the average dry matter consumption was 8.38 kg per head in the group. According to the results of feeding at the 2nd stage with a duration of 30 days, the average ratio of dry matters of concentrated feeds to structural ones was 66.9% to 33.1%, while the change in dry matter consumption in the group was not observed. The increase in the proportion of concentrated feed in the dry matter of the diet was also carried out with an interval of 10 days, while the increase in the diet was produced by 330 g in natural weight or 280 g in dry matter.

**Keywords:** feeding, diet, breed, meat productivity, production prime cost, fattening, weight gain, dry matter, protein, energy, concentrated feed.

**Introduction.** The level and efficiency of the productivity of animals, the duration of their economic use primarily depend on the balance and full-value of feeding [1-3]. The increase in beef production is possible only with the introduction of advanced technology. According to detailed feeding standards, balance in the diet will allow to maximize the genetic capacity of animals, while reducing the growing period and reducing the prime cost of the final product [4-6].

Beef cattle is currently one of the most promising livestock industries in Kazakhstan. But a number of problems related to the profitability of the industry due to inadequate scientific and innovative support

have led to some reduction in efficiency. The low level of growth intensity at high cost of maintenance is conditional upon the insufficient supply of nutrients due to the diets imbalance in energy, protein, and other nutrients.

Currently, achievements in the feeding of ruminants have allowed creating new approaches in assessing feed protein and energy, including processes in the forestomachs, which have a decisive influence on providing the body with protein and amino acids and rationing it for groups in accordance with the expected productivity [7, 8].

In this regard, the research work was conducted on the comparative assessment of average daily weight gains of meat-type bulls of four breeds when balancing the diets in energy, protein, and vitamin-mineral premixes, as well as the impact of various distribution methods on animals.

**Material and methods of the research.** The research work was performed on the feeding platform of Bayserke-Agro LLP using meat-type bull-calves of the Hereford, Kazakh whiteheaded, Auliekol, and Angus breeds. The total livestock on the platform at the time of the experiment was 987 heads. The average age of selected bulls for experimental fattening was 11-14 months with an average live weight of 312 kg (lim. 295-330 kg.). The total livestock population of selected experimental animals was 212, of which Hereford - 41 animals, Angus - 64 animals, Auliekol - 56 animals, Kazakh whiteheaded - 51 animals. Keeping condition was untied grouped 60-80 heads in each, divided by age [2, 9]. The distribution of feed was carried out twice with an interval of 8 hours in trays with filling the feeding table with animals no more than 80%, in order to avoid fodder competition during distribution.

**The research results.** In order to determine the impact of various feeding methods on the meat productivity of animals, in the first month of the experiment, the control group was fed holistically, i.e. distributing the components of the diet separately in accordance with the approved feeding diet. For the animals of the experimental group, it was used monofeed, a homogeneous mixture of all components by distribution through a vertical feeder. The diet of the experimental and control groups was composed of the fodder available on the farm (table 1).

Table 1 – Feeding diets for bull-calves (starting)

| Name of the fodder                      | Average per animal, kg | Dry matter, kg |
|-----------------------------------------|------------------------|----------------|
| Corn silage                             | 9                      | 2.61           |
| Alfalfa haylage                         | 5.6                    | 2.52           |
| Grain mixture (75% barley, 25% corn)    | 2.5                    | 2.15           |
| Vitamin and mineral premixes for cattle | 0.06                   | –              |
| Total                                   | 15.86                  | 7.28           |

The diet of the experimental and control groups comprised of 4 components (corn silage, alfalfa haylage, grain mixture, vitamin-mineral premixes for cattle) and approved taking into account the adjustment in palatability with the rest of a daily rate on the feed table not more than 5%. According to the results of chemical analysis of feed, the content of digestible protein per 1 kg of dry matter was 10.3% and the concentration of exchange energy was 11.3 MJ, the share of concentrated feed in dry matter of the diet was 29.5% versus 70.5% of the structural feed.

The experimental groups have been fed for 30 days after which there was a control weighing of animals. The results are shown in table 2.

Table 2 – Dynamics of average daily gains of experimental bulls

| Indicators               | Group        |           |
|--------------------------|--------------|-----------|
|                          | Experimental | Control   |
| Number of animals        | 98           | 114       |
| Average daily gain, g    | 960±1.3      | 846±1.1   |
| Live weight, kg          | 341±5.3      | 337.9±4.9 |
| Absolute weight gain, kg | 28.8±1.09    | 25.3±1.14 |

According to the results of the control weighing of the experimental and control groups with an identical feeding diet, the difference in absolute weight gain for 30 days averaged 3.5 kg per animal. When calculating the prime cost of 1 kg of the average daily weight gain in the feed structure, the values in the experimental and control groups averaged 318.2 and 361.1 tenge respectively, which characterizes the best feed conversion of animals from the experimental group.

Further, according to the technology of intensive fattening, a gradual increase in the share of concentrated feed in the dry matter of the diet by 6.5-7% with an interval of 10-12 days was made in order to adapt the rumen microflora and to avoid acidosis, with a duration of up to 3 months. The ultimate goal was to increase the share of concentrated feed in the dry matter of the diet to 75%.

Table 3 – Feeding diet of bull-calves (intensive feeding)

| Name of the fodder                      | 1 stage                |                | 2 stage                |                |
|-----------------------------------------|------------------------|----------------|------------------------|----------------|
|                                         | Average per animal, kg | Dry matter, kg | Average per animal, kg | Dry matter, kg |
| Corn silage                             | 7                      | 2.03           | 4.6                    | 1.33           |
| Alfalfa haylage                         | 3.6                    | 1.62           | 3.2                    | 1.44           |
| Grain mixture (75% barley, 25% corn)    | 5.5                    | 4.73           | 6.5                    | 5.6            |
| Vitamin and mineral premixes for cattle | 0.06                   | –              | 0.06                   | –              |
| Total                                   | 15.86                  | 8.38           |                        | 8.37           |

As can be seen from the table, at the 1st stage of fattening, the average ratio of dry matter of concentrated feed to structural feed was 56.4% versus 43.6%. The duration of the 1st stage was 60 days, while the increase of the share of concentrated feed was carried out every 10 days (increase in grain mixture by 500 grams in natural weight or 430 grams in dry matter per animal), the proportion of dry matter in structural feed was reduced proportionally. At the end of the 1st stage, taking into account the palatability adjustment of the diet, the average dry matter consumption for the group was 8.38 kg per animal. According to the results of fattening on the 2nd stage with a duration of 30 days, the average percentage ratio of dry matters of concentrated feeds to structural ones was 66.9% to 33.1%, while the change in dry matter consumption in the group has not been observed. The increase in the share of concentrated feed in the dry matter of the diet was also performed with an interval of 10 days, while the enlargement of the diet was produced by 330 g in natural weight or 280 g in dry matter.

In the comparative analysis of average daily gains in weight for 90 days of the fattening period, the average weight gains for the 4 breeds were 1.82 kg (table 4).

Table 4 – Dynamics of average daily weight gains of experimental bull-calves in the context of breeds.

| Indicators               | Breed     |           |           |                    |
|--------------------------|-----------|-----------|-----------|--------------------|
|                          | Hereford  | Angus     | Auliekol  | Kazakh whiteheaded |
| Number of animals        | 41        | 64        | 56        | 51                 |
| Average daily gain, g    | 1.86±1.25 | 1.96±1.3  | 1.75±1.41 | 1.68±1.38          |
| Live weight, kg          | 507±4.8   | 516.4±5.3 | 497.3±6.2 | 491.2±5.7          |
| Absolute weight gain, kg | 167.5±3.1 | 175.4±3.5 | 160.3±4.1 | 153.2±3.8          |

In terms of breeds, the highest average daily weight gains were found in Angus and Hereford bull-calves, which were 1.96 and 1.86 kg, respectively. When calculating the prime cost of 1 kg of weight gain in the structure of the diet, the average for 4 breeds was 250 tenge, of which 232.1 tenge for Angus breed, 244.6 tg for Hereford, 260 tg for Auliekol and for Kazakh whiteheaded 270.8 tg.

**Conclusion.** According to the results of the research work on the comparative analysis of the productivity of meat-type bull-calves, it was found that the highest growth rate and feed efficiency were in Angus breed, which exceeded the indicators of the compared breeds on average by 10.1%, including Hereford by 5.1%, Auliekol and Kazakh whiteheads by 10.7 and 14.2%, respectively.

**The basis for doing research.** The scientific and technical program of the Ministry of Agriculture of the Republic of Kazakhstan for 2018-2020. “Creation of “pattern” farms for breeding beef cattle in various regions of Kazakhstan”.

А. А. Спанов<sup>1</sup>, Д. Т. Султанбай<sup>1</sup>, А. Д. Баймұқанов<sup>2</sup>

<sup>1</sup>"Байсерке-Агро" оқу ғылыми-өндірістік орталығы" ЖШС, Талғар ауданы, Алматы облысы, Қазақстан,

<sup>2</sup>Ресей мемлекеттік аграрлық университеті – К. А. Тимирязева атындағы

Мәскеу ауылшаруашылық академиясы, Мәскеу, Ресей

### **"БАЙСЕРКЕ-АГРО" ЖШС ЖАҒДАЙЫНДА ЕТ БАҒЫТЫНДАҒЫ БҰҚАШЫҚТАРДЫҢ ӨНІМДІЛІГІНІҢ САЛЫСТЫРМАЛЫ НӘТИЖЕЛЕРІ**

**Аннотация.** Мақалада 4 тұқым (ангус, герефорд, Әулиеқол, қазақ ақ басы) бөлінісінде етті бағыттағы бұқашықтарды бордақылау бойынша ғылыми-зерттеу жұмыстарының нәтижелері келтірілген. Қарқынды бордақылаудың кезең-кезеңімен рационы және олардың химиялық көрсеткіштері, оның ішінде 1 кг құрғақ затта қорытылатын протеин мен алмасу энергиясының құрамы ұсынылған. Тәжірибе жасалатын жануарлардың құрғақ затты тұтынуы белгіленді, сондай-ақ зерттелген тұқымдар бойынша рацион құрылымында өнім бірлігінің өзіндік құны есептелген. Жем-шөп тарату тәсілдеріне, оның ішінде тұқымдарға байланысты орташа тәуліктік қоспалар орнатылды.

Тәжірибелік және бақылау тобының рационы 4 компоненттен (жүгерінің сүрлемі, люцерн пішенажы, дән қоспасы, ІҚМ үшін витамин-минералды қоспалар) ұсынылды және тәуліктік нормадан 5%-дан аспайтын азық үстеліндегі қалдықпен тамақтану бойынша түзетуді ескере отырып бекітілді. Азықты химиялық талдау нәтижелері бойынша 1 кг құрғақ затта қайнатылатын протеиннің құрамы 10,3% және алмасу энергиясының концентрациясы 11,3 МДж, рационның құрғақ затында концентрацияланған азықтың үлесі құрылымдық 70,5% қарсы 29,5% құрады.

Қарқынды бордақылау технологиясына сәйкес тыртықтың микрофлорасын бейімдеу және 3 айға дейінгі ұзақтықпен ацидозды болдырмау мақсатында рационның құрғақ затындағы құнарлы азықтың үлесін 10-12 күн аралықпен 6,5-7% біртіндеп ұлғайту жүргізілді. Соңғы мақсат рационның құрғақ затындағы құнарлы азықтың үлесін 75% - ға дейін арттыру болып табылады.

Бордақылаудың 1-ші кезеңі бойынша құнарлы азықтың құрғақ затының құрылымға арақатынасы 43,6% қарсы 56,4% құрады. 1-ші кезеңнің ұзақтығы 60 күнді құрады, бұл ретте құнарландырылған азықтар үлесінің артуы әрбір 10 күн сайын жүргізілді (500 гр. астық қоспасының артуы). табиғи салмақта немесе 430 гр. Құрғақ затта), құрылымдық азықтың құрғақ затының үлесін пропорционалды түрде төмендетті. 1-ші кезең аяқталғаннан кейін тамақтану рационын түзетуді есепке ала отырып, құрғақ заттың орташа тұтынылуы бір басына 8,38 кг-ды құрады. Ұзақтығы 30 күн болатын 2-кезең бойынша азықтандыру нәтижелері бойынша концентрацияланған азықтың құрғақ заттарының құрылымға орташа пайыздық арақатынасы 33,1%-ға 66,9%-ды құрады, бұл ретте топ бойынша құрғақ заттарды тұтынудың өзгеруі байқалған жоқ. Рационның құрғақ затында концентрацияланған азықтардың үлесін арттыру 10 күнде интервалмен жүзеге асырылды, бұл ретте рационда өсім 330 г табиғи салмақта немесе 280 г құрғақ затта жүргізілді.

**Түйін сөздер:** азықтандыру, рацион, тұқым, ет өнімділігі, өнімнің өзіндік құны, бордақылау, салмақ, құрғақ зат, протеин, энергия, концентрацияланған азық.

А. А. Спанов<sup>1</sup>, Д. Т. Султанбай<sup>1</sup>, А. Д. Баймұқанов<sup>2</sup>

<sup>1</sup>ТОО «Учебный научно-производственный центр «Байсерке-Агро»,

Талгарский район, Алматинская область, Республика,

<sup>2</sup>Российский государственный аграрный университет –

Московская сельскохозяйственная академия им. К. А. Тимирязева, Москва, Россия

### **СРАВНИТЕЛЬНЫЕ РЕЗУЛЬТАТЫ ПРОДУКТИВНОСТИ БЫЧКОВ МЯСНОГО НАПРАВЛЕНИЯ В УСЛОВИЯХ ТОО «БАЙСЕРКЕ-АГРО»**

**Аннотация.** В статье приведены результаты научно-исследовательской работы по откорму бычков мясного направления продуктивности в разрезе 4-х пород (ангус, герефорд, аулиеколь, казахская белоголовая). Представлены поэтапные рационы интенсивного откорма и их химические показатели, в том числе содержание переваримого протеина и обменной энергии в 1 кг сухого вещества. Установлено потребление сухого вещества подопытных животных, а также рассчитана себестоимость единицы продукции в структуре рациона в разрезе изученных пород. Установлены среднесуточные привесы в зависимости от способов раздачи кормов, в том числе и по породам.

Рацион опытной и контрольной группы был представлен из 4-х компонентов (силос кукурузный, сенаж люцерновый, зерносмесь, витаминно-минеральные добавки для крс) и утвержден с учетом корректировки по поедаемости с остатком на кормовом столе от суточной нормы не более 5%. По результатам химического анализа кормов содержание переваримого протеина в 1 кг сухого вещества составило 10,3% и концентрация обменной энергии 11,3 МДж, соотношение доли концентрированных кормов в сухом веществе рациона 29,5% против 70,5% структурных.

Согласно технологии интенсивного откорма производилось постепенное увеличение доли концентрированных кормов в сухом веществе рациона на 6,5-7% с интервалом в 10-12 дней с целью адаптации микрофлоры рубца и избежание ацидоза, с продолжительностью до 3-х мес. Конечной целью явилось увеличение доли концентрированных кормов в сухом веществе рациона до 75%.

По 1-му этапу откорма в среднем соотношение сухого вещества концентрированных кормов к структурному составило 56,4% против 43,6%. Продолжительность 1-го этапа составила 60 дней, при этом увеличение доли концентрированных кормов проводили через каждые 10 дней (увеличение зерносмеси на 500 гр. в натуральном весе или на 430 гр. в сухом веществе на голову), долю сухого вещества структурных кормов снижали пропорционально. По окончании 1-го этапа с учетом корректировки рациона по поедаемости среднее потребление сухого вещества составило по группе 8,38 кг на голову. По результатам кормления по 2-му этапу с продолжительностью 30 дней среднее процентное соотношение сухих веществ концентрированных кормов к структурным составило 66,9% к 33,1% при этом изменение потребления сухого вещества по группе не отмечено. Повышение доли концентрированных кормов в сухом веществе рациона осуществлялось так же с интервалом в 10 дней, при этом увеличение в рационе производили по 330 г в натуральном весе или по 280 г в сухом веществе.

**Ключевые слова:** кормление, рацион, порода, мясная продуктивность, себестоимость продукции, откорм, привес, сухое вещество, протеин, энергия, концентрированный корм.

#### Information about authors:

Spanov Abzal Abushakipovich, Senior Researcher, ESPC Bayserke-Agro LLP, Talgar District, Almaty Region, Kazakhstan; [abzal16@mail.ru](mailto:abzal16@mail.ru), <https://orcid.org/0000-0001-9303-3722>

Sultanbai Darina Tavaldivna, Senior Researcher, ESPC Bayserke-Agro LLP, Talgar District, Almaty Region, Kazakhstan; [darinasultan@lenta.ru](mailto:darinasultan@lenta.ru); <https://orcid.org/0000-0001-9502-7481>

Baimukanov Aidar Dastanbekouly, Master student of the Faculty of Zootechnics and Biology of the Russian State Agrarian University - Moscow Agricultural Academy named after K. A. Timiryazev, Moscow, Russia; [aidartaidar98@mail.ru](mailto:aidartaidar98@mail.ru); <https://orcid.org/0000-0001-9669-864X>

#### REFERENCES

- [1] Boyarsky L.G., Vetrova P.N. (1997). Fattening of young cattle with the use of grain haylage // Zootechnics. N 3. P. 23-24 (in Russ.).
- [2] Baimukanov D.A., Pristupa V.N., Kolosov Yu.A., Donnik I.M., Torosyan D.S., Kolosov A.Yu., Orlova O.N., Yuldashbayev Yu.A., Chylbak-ool S.O. (2019). Improvement of breeding and productive traits of Kalmyk cattle breed // Bulletin of the National Academy of sciences of the Republic of Kazakhstan. Vol. 2, N 378 (2019). P. 128-145. <https://doi.org/10.32014/2019.2518-1467.51> ISSN 2518-1467 (Online), ISSN 1991-3494 (Print).
- [3] Semenov V.G., Baimukanov D.A., Kosyaev N.I., Alentayev A.S., Nikitin D.A., Aubakirov Kh.A. (2019) Activation of adaptogenesis and bioresource potential of calves under the conditions of traditional and adaptive technologies // Bulletin of the National academy of sciences of the Republic of Kazakhstan. Vol. 1, N 377 (2019). P. 175-189. <https://doi.org/10.32014/2019.2518-1467.20> ISSN 2518-1467 (Online), ISSN 1991-3494 (Print).
- [4] Belomytsev E.S. (1994). Ways to increase beef production in beef cattle breeding based on the improvement of technology in various natural-economic zones: Author. dis. ... doctor of science in agricult. Orenburg. 64 p. (in Russ.).
- [5] Kireenko N. (2006). The protein cleavability and digestibility of the dry matter of rapeseed cake in bull-calves // Feeding farm animals and fodder production. N 8. P. 45-48 (in Russ.).
- [6] Kutuzov V.V. (2005). Features of digestion and metabolism of nitrogenous substances in young cattle with different methods of feeding: Author. dis. ... cand. biol. sciences: 03.00.13. Oryol. 20 p. (in Russ.).
- [7] Kharitonov E.V., Materikin A.M., Mysnik N.D. (1999). Digestion of protein in the intestines of ruminants. Modern problems of biotechnology and biology of productive animals. Collection of scientific works. T.HHHUSH. Borovsk. P. 330-343 (in Russ.).
- [8] Kharitonov L.V., Matveev V.A., Kharitonova O.V., Baranova A.P. (2000). The participation of amino acids in the regulation of nitrogen metabolism in calves. Actual biological problems in animal husbandry. Borovsk. P. 362-363 (in Russ.).
- [9] Baimukanov D.A., Seidaliyev N.B., Alentayev A.S., Abugaliyev S.K., Semenov V.G., Dalibayev E.K., Zhamalov B.S., Muka Sh.B. (2019) Improving the reproductive ability of the dairy cattle // Reports of the National academy of sciences of the Republic of Kazakhstan. Vol. 2, N 324 (2019). P. 20-31. <https://doi.org/10.32014/2019.2518-1483.33> ISSN 2518-1483 (Online), ISSN 2224-5227 (Print).

## NEWS

OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN

SERIES OF AGRICULTURAL SCIENCES

ISSN 2224-526X

Volume 5, Number 53 (2019), 27 – 31

<https://doi.org/10.32014/2019.2224-526X.56>

UDC 636.295.25

**D. A. Baimukanov**

Educational Scientific and Production Center Bayserke-Agro LLP, Almaty region, Kazakhstan.

E-mail: dbaimukanov@mail.ru

**EFFICIENT TECHNIQUES OF ESTIMATION  
AND ENHANCING MILKING CAPACITY  
OF THE KAZAKH BACTRIAN CAMELS**

**Abstract.** The effective techniques for assessing and increasing the milk yield of a camel of the Kazakh Bactrian of the South Kazakhstan type were determined. It was established that in the third month of lactation, Kazakh Bactrian camels with a cup-shaped udder produce more milk by 11.8% compared with peers of the rounded and lobular udder shapes, by 18.8% with flat udder forms.

It was found that for 150 days of lactation, the maximum milk yield of  $943.7 \pm 17.1$  kg is observed in female camels with a full-value lactation degree of 75-84%.

Female camels with a coefficient of milkiness of up to 1.4 produce  $385.7 \pm 17.3$  kg in 120 days of lactation, with 1.5-1.9 coefficient -  $529.4 \pm 15.7$  kg, and with 2.0 and higher -  $623.1 \pm 24.5$  kg

Camels with a fertility index up to 42% are able to produce milk  $684.8 \pm 23.2$  kg in 120 days of lactation, with the index of 42-47% -  $857.6 \pm 17.9$  kg, and with 47% and higher -  $879.4 \pm 28.1$  kg.

**Keywords:** camel milk, the full-value of lactation degree, coefficient of milkiness, wool clipping coefficient.

**The relevance of the topic.** Camel breeding is a profitable branch of productive animal breeding, which successfully develops in the desert and semi-desert zones of the south-east of the Republic of Kazakhstan.

Camel breeding in the Almaty region is successfully combined with herd horse breeding and meat-greasy sheep breeding. According to A. Baimukanov et al., Kazakh Bactrians are capable of producing milk of high technological quality, which are superior to Arvan breed of camels by biochemical parameters [1]. Moreover, Kazakh Bactrians of the South Kazakhstan type are of particular interest as milk camels [2].

The specific vegetation of semi-deserts and deserts - saltwort, sagebrush, wormwood, sclerocaulous graminaceous plants, and others form a large forage reserve, which is perfectly eaten by camels [2]. Therefore, according to D.A. Baimukanov, Yu.A. Yuldashbayev, D.A. Doshanov [4], a variety of feed promote the expansion of the distribution area of camels.

According to FAO/UNEP [5], purebred Kazakh Bactrians are the most valuable in their productive qualities, well adapted to the sharply continental climate of Kazakhstan.

In the conditions of the Almaty region, Kazakh Bactrians of the South Kazakhstan type, most popular for the selection process, are of particular interest.

Kazakh Bactrians are a unique breed of two-humped camels, which is widely distributed in Kyzylorda, Mangystau, Atyrau, Turkestan regions. There has been a positive increase dynamic in the population of camels of the Kazakh Bactrian breed of the South Kazakhstan type in Zhambyl and Almaty regions.

On January 1, 2019, the population of camels in the Almaty region for the first time in 25 years reached 7,106 animals [6]. The main livestock is concentrated in agricultural formations - 4,458 animals or 62.7% of the total livestock in the Almaty region.

One of the topical issues in camel breeding is the fruit-bearing long term of camels of the Kazakh Bactrian breed and a low fertility rate of up to 42%. Despite the existing selective breeding results in relation to the Kazakh Bactrian, effective technique of assessing milk, meat and wool productivity has not yet been developed. Rational techniques for the reproduction of the breeding stock of camels with regard to the technological parameters of productivity have not been worked out.

In connection with the above-mentioned, the choice of the direction of research to improve the breeding efficiency and to increase the capacity by means of the targeted selection and breeding of purebred camels of the Kazakh Bactrian under the conditions of Bayserke – Agro Educational center is correct.

The studies were carried out according to the program of the Ministry of Agriculture of the Republic of Kazakhstan for 2018-2020. URN: BR06249249-OT-18 Development of a complex system of enhancing productivity and improving the breeding qualities of farm animals, by the example of Bayserke-Agro LLP.

**The aim of the research.** To determine the dairy productivity of breeding stock of the Kazakh Bactrians depending on the technological parameters of the udder;

**Methods of research.** The research work was carried out on the camel breeding farm of the Kerbulak branch of Bayserke-Agro LLP in the Talgar district, Almaty region

The object of the study was the purebred Kazakh Bactrian breed of the South Kazakhstan type.

It was studied milk productivity in female camels according to the Instructions for the bonitation of camels [7], taking into account the duration of active lactation, the average daily milk yield in the third month of lactation; the actual milk yield for the entire period of lactation; the full-value of lactation degree and coefficient of milkiness.

Morphological and functional features of the udder of camels were investigated according to the method of A. Baimukanov (1972) [8].

The degree of full-value of lactation in camels was determined according to the recommendation of professor A. Baimukanov using the formula:

$$C\P\P I = \frac{Y\Phi \times 100}{YC \times n},$$

where C\P\P I – full-value of lactation degree;  $Y\Phi$  – the actual milk yield for the entire lactation period;  $YC$  – average daily milk yield in the third month of lactation;  $n$  – number of days of lactation.

The technological parameters of the selection of camels according to dairy productivity were determined by the degree of full-value of lactation and its impact on milk yield for 5 months of lactation and the fat content in milk.

The female camel gradation according to the degree of lactation full-value was carried out in three ranks: up to 65 - 74; 75-84; 85 and higher.

The coefficient of milkiness was determined at the requirement of the Patent of the Republic of Kazakhstan No. 22213 by the ratio of the actual milk yield for the active lactation period to the live weight.

$$KM = YM / \mathcal{K}M,$$

where  $KM$  – coefficient of milkiness;  $YM$  – milk yield for the lactation;  $\mathcal{K}M$  – live weight [9].

Gradation according to the coefficient of milkiness was performed in three ranks: up to 1.4; 1.5-1.9; 2.0 and higher.

The effect of the fertility index on actual milk yield in experimental Kazakh Bactrian female camels of the South Kazakhstan type was defined according to the generally accepted method [4]. The fertility index was determined by the formula proposed by professor A. Baimukanov:

$$\Pi = 365 \times (n-1) \frac{100}{N},$$

where  $\Pi$  – fertility index;  $n$  – number of coltings;  $N$  – the number of days between the first and last coltings.

Gradation according to the fertility index was carried out in three ranks: up to 42; 42 - 47; 47 and higher.

Biometric processing of digital materials was performed according to the common methods. [10].

**Research results.** The study of the technological parameters of the udder in dairy camel breeding is given focused attention. The technological parameters of dairy cattle are influenced by the shape and uniformity of the development of udder parts, the length and width of nipples, the distance between nipples [11, 12].

The length of the nipples in the experimental female camels was 3.0–6.0 cm, the width of the nipples was 2.0–4.0 cm, with a distance between the front nipples of 12–20 cm, a distance between the rear nipples of 10–18 cm, and a distance between the front and rear nipples of 1622 cm.

It was established that in the third month of lactation, Kazakh Bactrian camels with a cup-shaped udder produce more milk by 11.8% compared with peers with the rounded and lobular udder shapes, by 18.8% more than peers with flat udder shapes (table 1).

Table 1 – Average daily milk yield and fat content in milk in the third month of lactation in female camels

| Udder shape | Number of animals | Average daily milk yield, kg |       |          | fat content, %    |      |          |
|-------------|-------------------|------------------------------|-------|----------|-------------------|------|----------|
|             |                   | $\bar{X} \pm m_x$            | Cv    | $\delta$ | $\bar{X} \pm m_x$ | Cv   | $\delta$ |
| Cup-shaped  | 10                | 5.7±0.24                     | 6.21  | 0.71     | 5.4±0.17          | 4.81 | 0.52     |
| Rounded     | 10                | 5.1±0.36                     | 10.47 | 1.07     | 5.4±0.17          | 4.79 | 0.51     |
| Flat        | 5                 | 4.8±0.34                     | 10.62 | 1.02     | 5.1±0.10          | 3.04 | 0.31     |
| Lobular     | 5                 | 5.1±0.18                     | 5.41  | 0.55     | 5.4±0.20          | 5.62 | 0.60     |

The effective techniques for assessing and selecting camels for milk production was developed.

The female camel gradation according to the degree of lactation full-value was carried out in three ranks: up to 65-74; 75-84; 85 and higher (table 2).

It was found that for 150 days of lactation, the maximum milk yield of 943.7±17.1 kg is observed in camels with a degree of lactation full-value of 75-84%.

Table 2 – Estimation of female camels according to the degree of full-value of lactation (n=5;  $\sum n=15$ )

| Traits                               | degree of full-value of lactation, % |            |               |
|--------------------------------------|--------------------------------------|------------|---------------|
|                                      | 65-74                                | 75-84      | 85 and higher |
| Milk yield for 150 days of lactation | 765.3±22.7                           | 943.7±17.1 | 845.4±25.3    |
| Fat content in milk, %               | 5.4±0.09                             | 5.5±0.05   | 5.4±0.07      |

Gradation according to the coefficient of milkiness was performed in three ranks: up to 1.4; 1.5-1.9; 2.0 and higher (table 3). Camels with the coefficient of milkiness of up to 1.4 are produced 385.7±17.3 kg of milk in 120 days of lactation, with 1.5-1.9 - 529.4±15.7 kg and 2.0 and higher - 623.1±24.5 kg

Table 3 – Estimation of female camels according to the coefficient of milkiness (n=5;  $\sum n=15$ )

| Traits                               | Coefficient of milkiness |            |                |
|--------------------------------------|--------------------------|------------|----------------|
|                                      | up to 1.4                | 1.5-1.9    | 2.0 and higher |
| Milk yield for 150 days of lactation | 385.7±17.3               | 529.4±15.7 | 623.1±24.5     |
| Fat content in milk, %               | 5.6±0.09                 | 5.5±0.06   | 5.3±0.08       |

Table 4 – Estimation of female camels according to the fertility index (n=5;  $\sum n=15$ )

| Traits                               | Fertility index |            |               |
|--------------------------------------|-----------------|------------|---------------|
|                                      | up to 42        | 42-47      | 47 and higher |
| Milk yield for 150 days of lactation | 684.8±23.2      | 857.6±17.9 | 879.4±28.1    |
| Fat content in milk, %               | 5.6±0.04        | 5.5±0.05   | 5.5±0.06      |

Gradation according to fertility index was performed in three ranks: up to 42; 42 - 47; 47 and higher (table 4). Camels with the fertility index of up to 42% are able to produce milk in 120 days of lactation of  $684.8 \pm 23.2$  kg, with 42-47% -  $857.6 \pm 17.9$  kg and with 47% and above -  $879.4 \pm 28.1$  kg.

**Conclusion.** In the breeding of the Kazakh Bactrian camel breed, it is necessary to tighten regulations for selecting breeding stock according to the degree of full-value of lactation, coefficient of milkiness and fertility index. The optimal parameters of selecting female camel of Kazakh Bactrian of the South Kazakhstan type according to the fertility index are from 42% and higher, according to the coefficient of milkiness from 1.5 and higher, according to the degree of full-value of lactation - from 75% and higher.

Д. А. Баймұқанов

ЖШС "Байсерке-Агро" Оқу ғылыми-өндірістік орталығы, Алматы облысы, Қазақстан

### ҚАЗАҚ БАКТРИАН ТҰҚЫМЫНЫҢ ТҮЙЕЛЕРІНІҢ СҮТТІЛІГІН БАҒАЛАУ МЕН АРТТЫРУДЫҢ ТИІМДІ ТӘСІЛДЕРІ

**Аннотация.** Оңтүстік Қазақстан типті қазақ бактриан тұқымды түйелердің сүтін бағалау мен өсірудің тиімді тәсілдері анықталды. Үшінші айда кесе түріндегі желіні бар түйенің дөңгелек және жарты пішінді түрлерімен салыстырғанда сүтті 11,8% - ға, желіннің жазық түрлерімен салыстырғанда 18,8% - ға артық өндірілетіні анықталды. Лактацияның 150 күн ішінде  $943,7 \pm 17,1$  кг ең жоғары сауу лактация деңгейі 75-84% болатын түйелерде байқалады.

Сүт коэффициенті 1,4-ке дейінгі түйелер 120 күн ішінде  $385,7 \pm 17,3$  кг, 1,5-1,9  $529,4 \pm 15,7$  кг және 2,0 және одан жоғары  $623,1 \pm 24,5$  кг өнім шығарады.

Өсімталдық индексі 42%-ға дейінгі түйе сүттің 120 күн ішінде  $684,8 \pm 23,2$  кг, 42-47%  $857,6 \pm 17,9$  кг және 47% және  $879,4 \pm 28,1$  кг-дан жоғары өнім шығаруға қабілетті.

**Түйін сөздер:** түйе сүті, лактация дәрежесі, сүт коэффициенті, жүн қырку коэффициенті.

Д. А. Баймуканов

ТОО «Учебный научно-производственный центр Байсерке-Агро», Алматинская область, Казахстан

### ЭФФЕКТИВНЫЕ ПРИЕМЫ ОЦЕНКИ И ПОВЫШЕНИЯ МОЛОЧНОСТИ ВЕРБЛЮДОВ ПОРОДЫ КАЗАХСКИЙ БАКТРИАН

**Аннотация.** Определены эффективные приемы оценки и повышения удоя молока у верблюдоматок породы казахский бактриан южно-казахстанского типа. Установлено, что на третьем месяце лактации верблюдоматки казахского бактриан с чашевидной формой вымени продуцируют молока больше на 11,8% в сравнении со сверстницами округлой и дольковидной формами вымени, на 18,8% с плоской формами вымени

Установлено, что за 150 дней лактации максимальные удои  $943,7 \pm 17,1$  кг наблюдаются у верблюдоматок со степенью полноценности лактации 75-84%.

Верблюдоматки имеющие коэффициент молочности до 1,4 продуцируют за 120 дней лактации  $385,7 \pm 17,3$  кг, 1,5-1,9  $529,4 \pm 15,7$  кг и 2,0 и выше  $623,1 \pm 24,5$  кг.

Верблюдоматки с индексом плодовитости до 42% способны продуцировать молока за 120 дней лактации  $684,8 \pm 23,2$  кг, 42-47%  $857,6 \pm 17,9$  кг и 47% и выше  $879,4 \pm 28,1$  кг.

**Ключевые слова:** молоко верблюжье, степень полноценности лактации, коэффициент молочности, коэффициент настрига шерсти.

#### About the author:

Baimukanov Dastanbek Asylbekovich, Corresponding member of the National Academy of Sciences of the Republic of Kazakhstan, Doctor of Science in Agriculture, chief researcher of the Educational Scientific and Production Center Bayserke-Agro LLP, Talgar district, Almaty region, Kazakhstan; dbaimukanov@mail.ru; <https://orcid.org/0000-0002-4684-7114>

## REFERENCES

- [1] Baimukanov A., Ombayev A.M., Alibayev N.N., Baimukanov D.A., Turumbetov B.S., Alikhanov O., Akhmet I., Tastanov A., Shaidolla M., Ermakhanov M., Doshanov D. Recommendations on the selection of camels of the Kazakh Bactrian breed. Almaty: Bastau, 2011. 55 p. (in Russ.).
- [2] Baimukanov A. Priorities of the development of agrarian science in the camel breeding // Selection and technological aspects of the development of productive camel breeding, karakul sheep breeding and arid fodder production in Kazakhstan: Proceedings of scientific-practical conf. (Shymkent, November 25-26, 2012). Shymkent, 2012. P. 158-159 (in Russ.).
- [3] Baimukanov A., Turumbetov B.S., Baimukanov D.A., Ermakhanov M. Prospects for the development of camel breeding in the Republic of Kazakhstan // Zootechnical science of Kazakhstan: past, present, and future. International Scientific and Practical Conference dedicated to the 85th anniversary of academician K. U. Medeubekov. Almaty, 2014. P. 241-246 (in Russ.).
- [4] Baimukanov D.A., Yuldashbayev Yu.A., Doshanov D.A. Camel breeding (Bachelor degree): (ISBN 978-5-906818-14-0). Textbook. Moscow: KURS Publishing House, SIC INFRA M., 2016. 184 p. (in Russ.).
- [5] FAO/UNEP. World Watch for domestic animal. Rome: FAO, 1995. 769 p.
- [6] Livestock of camels. Statistical data. Astana: Ministry of Agriculture, 2019 (in Russ.).
- [7] Instructions for the bonitation of Bactrian and Dromedary camel breeds including the basics of breeding. Astana, 2014. 25 p. (in Russ.).
- [8] Baimukanov A. Morpho-functional features of the udder of female camels (03.00.13 - Human and Animal Physiology): Author's abstract. thesis... biol. sci: 30.05.1972. Alma-Ata: AZVI, 1972. 18 p. (in Russ.).
- [9] Patent of the RK №22213 // Method of selection of camels of the Kazakh Bactrian according to the milking capacity. Published January 15, 2010, Bulletin number 1. (Baimukanov A., Turumbetov B.S., Baimukanov D.A., Alikhanov O.). (in Russ.).
- [10] Merkurieva E.K., Shangin-Berezovsky G.N. Genetics with the basics of biometrics. M.: Kolos, 1983. 399 p. (in Russ.).
- [11] Abugaliyev S.K., Seidaliyev N.B., Dalibayev E.K., Zhamalov B.S., Muka Sh.B. Procedure of custom mating and genomic analysis of bull-calves in dairy cattle breeding // Reports of the National academy of sciences of the Republic of Kazakhstan. ISSN 2224-5227. Vol. 5, N 321 (2018). P. 41-47. <https://doi.org/10.32014/2018.2518-1483.5>
- [12] Seidaliyev N.B., Dalibayev E.K., Zhamalov B.S., Muka Sh.B. Monitoring data of the existing system of organization of the selective process in the dairy cattle breeding of the Republic of Kazakhstan // News of the National academy of sciences of the Republic of Kazakhstan: Series of agricultural sciences. ISSN 2224-526X. Vol. 5, N 47 (2018). P. 81-86. <https://doi.org/10.32014/2018.2224-526X.11>

**NEWS**

OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN

**SERIES OF AGRICULTURAL SCIENCES**

ISSN 2224-526X

Volume 5, Number 53 (2019), 32 – 38

<https://doi.org/10.32014/2019.2224-526X.57>

UDC 619.9:615.2.014

**B. F. Kerimzhanova, L. N. Ivanova, A. I. Ilyin**

JSC "Scientific Center for Anti-Infectious Drugs", Almaty, Kazakhstan.

E-mail: scaid@scaid.kz, scaid@mail.ru, kbf19@mail.ru

**EFFICIENCY OF THE IODINE-CONTAINING COMPLEX  
AGAINST AVIAN INFLUENZA A VIRUS SERIES**

**Abstract.** The paper contains materials on the study of exposure to avian influenza A virus iodine-containing complexes synthesized in the JSC "Scientific Center of Anti-Infectious Drugs". Conducted screening of educed the most active iodine-containing complex from a nine investigational. It was found that the iodine-containing complex is a low-toxic compound and exhibiting antiviral activity against influenza A virus. It has a high potentiating effect when combined with commercial antiviral drugs.

**Keywords:** iodine-containing complexes, cytotoxicity, acute toxicity, influenza viruses, antiviral activity, potentiating action.

**Introduction.** The problem of improving systems of ant epizootic measures for the prevention and treatment of infectious diseases has always been and remains very relevant. According to the literature, an analysis of the epizootic situation shows that in recent years there has been an increasing threat of widespread infectious diseases throughout the world, which brought a significant economic damage and posing a danger to human infection. Among viral diseases, bird flu comes first. This virus - refers to a highly contagious and widespread viral infection. The causative agent of the infection - the influenza virus is divided into three serological types: A, B and C. Type A viruses causes diseases in animals and humans [1-6].

Currently, bird flu remains a global problem in veterinary medicine. According to the World Organization for Animal Health (OIE), in 2018 507 foci of highly pathogenic avian influenza were registered in 35 countries such as Afghanistan (3), Bangladesh (2), Bulgaria (25), United Kingdom (21), Vietnam (10), Germany (5), Denmark (30), India (11), Iraq (15), Cambodia (7), China (13), Russia (82), Saudi Arabia (22), Sweden (11), Japan (14) and etc. The virus have been reported in herds of agricultural and wild bird populations in 15 countries in Asia, Africa, Europe and United States. There were registered cases of highly pathogenic influenza in the world: H5N1 (17 countries), H5N2 (3 countries), H5N5 (Germany, Holland, Montenegro), H5N6 (5 countries), H5N9 (France), H7N7 (Italy), H7N1 (Algeria). The most propagation is the H5N6 influenza virus, as well as similar viruses of the subtypes H5N8, H5N1. Seasonal migrations of birds from Southeast Asia to the Russian Federation during the nesting period are the main prerequisites for the possibility of influenza infection of poultry in industrial bird's farms and private farmsteads. The likelihood of a bird flu virus entering the territory of Kazakhstan with migratory flows of migratory birds remains quite high. According to the WHO experts, every year from 3 to 5 million people become ill with severe forms of influenza and from 250,000 to 500,000 people die around the world (Uchaykin V.F., 2004, I. Toshihiro, 2001).

Despite this, the practice of modern veterinary medicine uses a relatively small set of drugs with a wide range of antiviral effects. The emergence of drug resistance in viral pathogens to antiviral drugs leads to a decrease or complete loss of the effectiveness of the therapy and the flightiness of spread of infection goes down, this leads with searching of new drugs (Sidorenko S.V., 2004, Abraham EP, 1940, Walsh C. 2000). One of the main directions in the development of antiviral drugs is the synthesis of

analogues from known drugs. So iodine-containing drugs widely used in veterinary medicine and medicine, determine high biological activity and versatile pharmacological action, without causing resistance in the pathogen [7-10]. This work will present the results of studies, which will indicate new synthesized iodine – containing complexes for avian influenza virus type A [11, 12].

**Methodology and research method.** For the research were used: transplantable cell line MDCK (Madin-Darby canine kidney); - seven-day-old chickens weighing 250-350 g, - sexually mature outbred mice of both sexes, weighing 18-24 g, rats weighing 160-230 g, 7-18 day old developing chicken embryos. During the conducting of research the following strains of influenza viruses were used: - Waybrige strain A/78, (H7N7)/FPV /; Rostock strain A/34, (H7N1), /FPV/black laughter strain A, Atyrau 744/04, (H13N6); Almaty strain A 5/98, (H3N2).

Cell and virus types were cultured in a monolayer using DMEM medium and 10% cattle serum was added (Applichem, Sigma, USA). The propagation of influenza viruses was carried out on seven to nine chicken embryos by introducing 0.2 ml of the virus into the allantois cavity and on the MDCK cell culture by infection of the cell monolayer. Infectious virus titer was determined in a hem agglutination reaction (RGA according to Reed & Muench).

**Results of own research.** A study was made of 9 iodine-containing  $\alpha$ -dextrin complexes capable of penetrating the membrane and nucleus of a microbial cell. The molecular iodine of the active drugs' complex compound is located inside of the  $\alpha$ -dextrin helix and is coordinated by alkali metal halides and polypeptides. In this structure, molecular iodine difficulty to interact with blood components and reaches the pathogen cell unchanged, because only nucleotides of the DNA of a pathogen can compete with polypeptides for complexation with iodine. The biopharmaceutical solubility of the iodine-containing complexes which were taken for the study was researched in the pH range of 1.2; 4.5; 6.8 corresponding to physiological fluids of the gastrointestinal tract. The determination of the permeability of iodine-containing complexes was carried out on an MDCK cell culture. In 96 well plates with MDCK cell culture, 0.2 ml of DMEM medium containing the test substances at a concentration of 0.5 mg / ml was added. The results of studies of the active complex substance's ability to dissolve when applied internally are presented in figures 1.

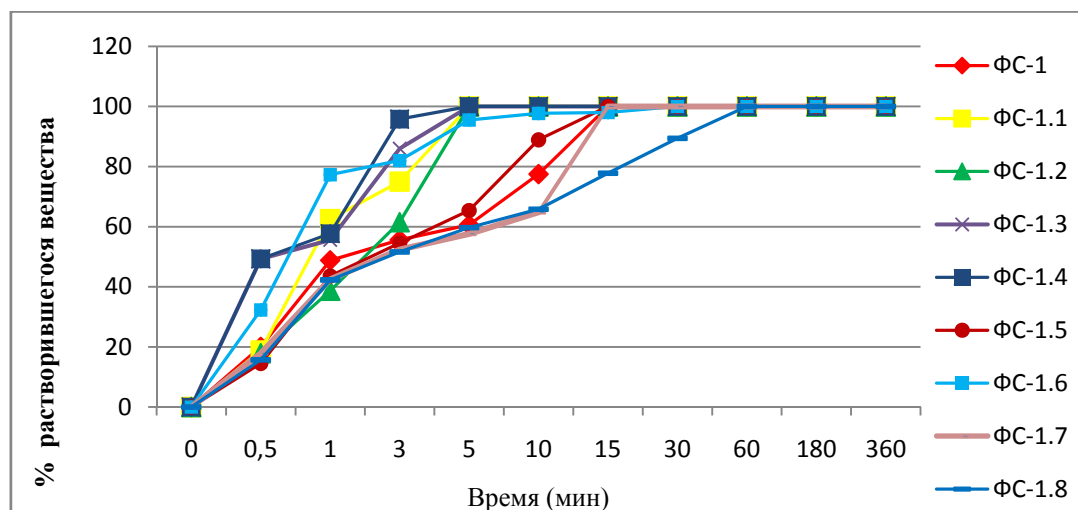


Figure 1 – Pharmacopoeia solubility of FS-1 in water, a buffer solution with a pH of 1.2, 4.5 and 6.8

According to the results of the studies, it was found that the biopharmaceutical properties of all iodine-containing complexes based on the degree of their solubility in water, buffer solutions with a pH of 1.2; 4.5; 6.8 and permeability in an experiment on an MDCK cell culture corresponded to class III bioequivalence of drugs. The studied complexes divided by substances with “high” solubility and “low” permeability.

The safety of iodine-containing complexes was determined on an MDCK cell culture by the MTT test and by using concentrations from 0.03 to 25.0 mg/ml.

Although, an experiment in mice by determining toxicological studies of the maximum tolerated doses of the active substance from 0.6 - 13.4 ml/kg. The results of the MTT test on the MDCK cell line for iodine-containing complexes are shown in figures 2 and 3. The results of acute toxicity of iodine-containing complexes in an experiment in mice with intraperitoneal administration are shown in figure 4.

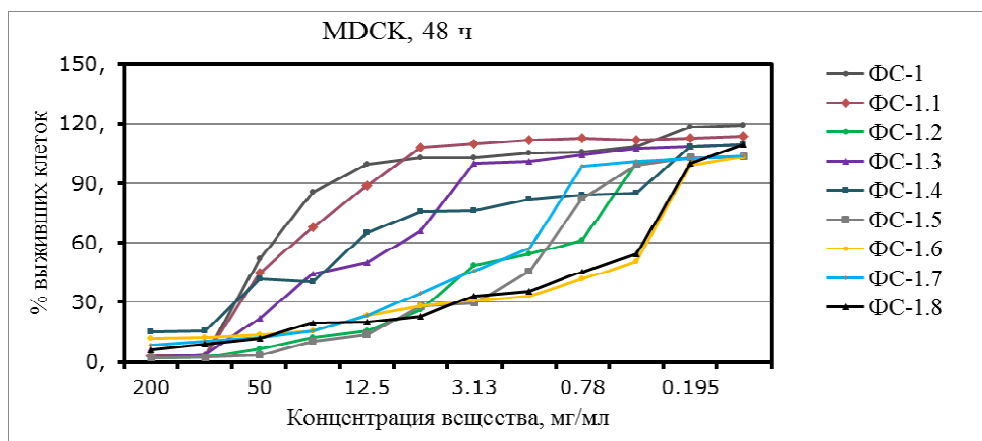


Figure 2 – The effect of iodine-containing complexes on the survival of the MDCK cell line after 48 hours of incubation

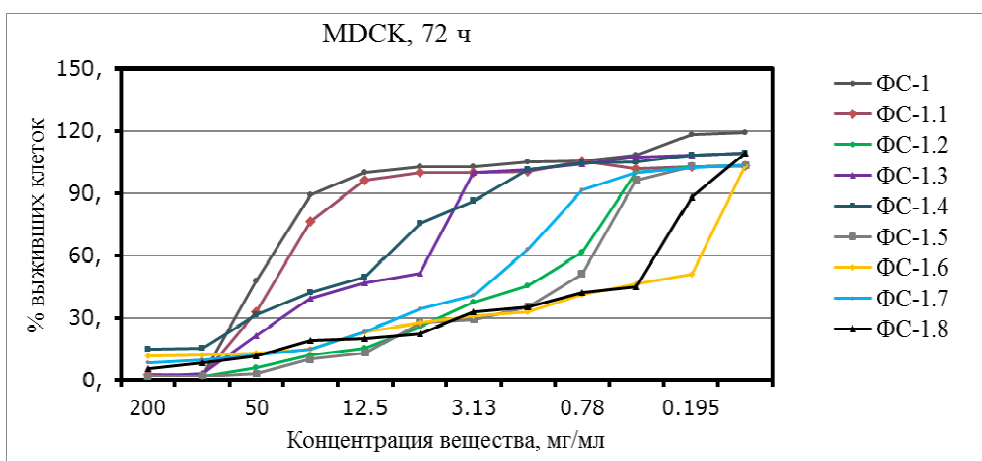


Figure 3 –The effect of iodine-containing complexes on the survival of the MDCK cell line after 72 hours of incubation

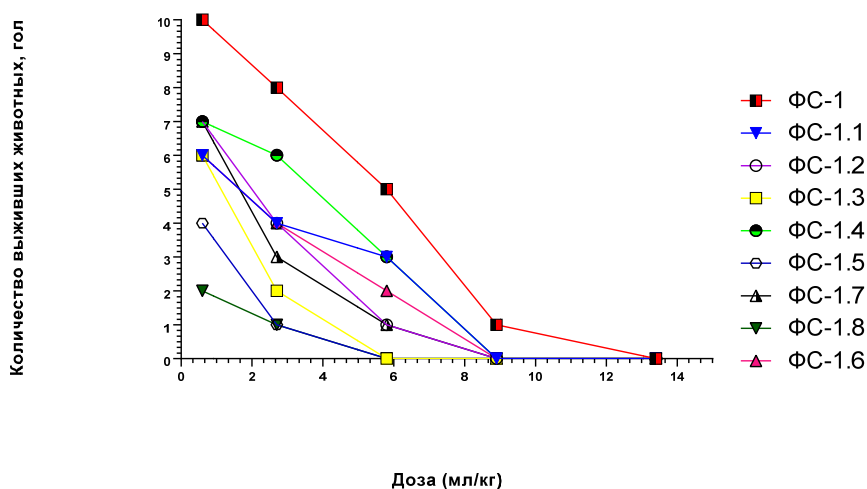


Figure 4 – Determination of FS-1's acute toxicity in an experiment in mice with intraperitoneal administration

As shown in figure 2 and figure 3 iodine-containing complexes FS-1, FS-1.1, FS-1.3, FS-1.4 have a low toxic. The  $CC_{50}$  of complexes FS-1, FS-1.1, FS-1.3, FS-1.4 after 48 hours of cultivation was in the concentration range from 10.0 to 50.0 mg/ml and after 72 hours of cultivation was in the concentration range from 5.0 to 50.0 mg/ml. Toxicity did not increase depending on the duration of cultivation. The iodine-containing complexes FS-1.2, FS-1.5, FS-1.6, FS-1.7, FS-1.8 had moderate toxicity. Their  $CC_{50}$  ranged from 0.39 to 2.13 mg/ml after 48 hours of incubation on an MDCK cell culture and from 0.20 to 1.77 mg/ml after 72 hours.

Determination of acute toxicity in mice from Figure 4 showed that all the iodine-containing compounds FS-1.1, FS-1.2, FS-1.3, FS-1.4, FS-1.5, FS-1.6, FS-1.7, FS-1.8, except FS-1, in doses of 0.6 up to 13.4 ml/kg caused a pronounced toxic effect. At the same time, the FS-1 complex under study showed the least toxic properties in doses from 0.6 to 5.8 ml/kg.

An in vitro study of the antiviral effect of iodine-containing compounds was carried out using the Waybrige/78 strain A virus (H7N7) as an example. It was found that the reproduction of influenza A virus on an inoculated cell culture of MDSK was suppressed under the influence of complexes FS-1.1, FS-1.2, FS-1.3, FS-1.5, FS-1.6, FS-1.8 in comparison with the control titer by no more than 2.0 log. At the same time, the FS-1.4 complex reduced the titer of the virus by 5.0-6.0 log in comparison with the control. The greatest antiviral effect among the studied iodine-containing complexes was found in the FS-1 and FS-1.7 complexes, which reduced the virus titer by 6.0-8.0 log. However, the FS-1.7 complex showed high toxicity in further experiments on animals. Therefore, as a result of studies of iodine-containing complexes based on physicochemical properties, determination of cytotoxicity in an MDCK cell culture, acute toxicity in an experiment in mice, antiviral activity using the example of influenza virus strain A Waybrige/78, (H7N7), in vitro, showed the most effective composition of the iodine-containing complex FS-1. Our further studies were aimed at studying the antiviral activity of the iodine-containing complex FS-1 against avian influenza A virus in experiments on chicken embryos, chickens, as well as determining the potentiating effect in experiments in vitro, in ovo, in vivo.

By determining the safety of the FS-1 complex in mice, an accumulation coefficient of 1.45 was calculated, and the absence of chronic toxicity of the FS-1 complex with repeated administration (24 times) to animals was established.

Studies of the determination of acute toxicity in rats showed that oral administration of FS-1 made it possible to calculate active doses effective in 50% of cases and toxic (lethal) doses equal to  $LD_{16}$  - 571 mg/kg,  $LD_{50}$  - 922 mg/kg,  $LD_{84}$  - 1273 mg/kg,  $LD_{100}$  - 1449 mg/kg.

According to the toxicity scale of substances administered per os (Hodg G., Gleason S., 1975; S. A. Kutsenko, 2002) the studied complex FS-1 can be attributed to low-toxic substances of the third class of biological safety.

The study of embryo toxicity of FS-1 was carried out on 10, 12 and 18 day old chicken embryos. Into the chorion-allantois cavity 0.2 ml of the studied concentrations of FS-1. Based on the data obtained, it was found that the studied FS-1 in concentrations from 0.8 to 1.6 mg/ml did not have a toxic effect. In concentrations from 3.3 to 6.6 mg/ml, 10 % to 20 % of embryos died. The embryo toxic effect of FS-1 is expressed in concentrations from 13.1 to 52.5 mg/ml, where from 50 % to 100 % of chicken embryos died. It is also shown that the embryo toxicity of FS-1 depends not only on its concentrations, but also on the timing of development of the chicken embryo. With the introduction of FS-1 to embryos with a developmental period of 10; 12 and 18 days at a concentration of 52.5 mg/ml killed 100 %, 80 % and 50 % of chicken embryos, respectively. With the introduction of FS-1 at a concentration of 26.3 mg/ml, 80% of chicken embryos died with a development period of 10 days, 60 % of 12-day-old chicken embryos and 10 % of 18-day-old chicken embryos.

The lowest toxic concentration that caused the death of 70 % - 10-day-old embryos is 13.1 mg/ml. With the introduction of FS-1 at a concentration of 26.3 mg/ml, 80 % of chicken embryos died with a development period of 10 days, 60 % of 12-day-old chicken embryos and 10% of 18-day-old chicken embryos. The obtained concentration of toxicity of FS-1 in an experiment on embryos was used to study antiviral activity. The study of acute toxicity of FS-1 was carried out in an experiment on seven-day-old chickens. Studies have shown that - the dose of  $LD_{50}$  for FS-1 was 52.5 mg/kg when administered orally and subcutaneously to the chicken. Medium toxic doses were established with subcutaneous administration of FS-1 in concentrations from  $1/8 LD_{50}$  to  $1/2 LD_{50}$  mg/kg. At the same time, the tolerated

concentration of the antiviral drug named «remantadine» (control substance) was fixed at a dose of 8.33 mg/kg.

Studies of the antiviral activity of FS-1 were measured in experiments with influenza viruses with various strains: strain A Rostock / 34, (H7N1), black-headed laughter, strain A Atyrau 744/04, (H13N6); Almaty strain A 5/98, (H3N2) on ten-day-old chicken embryos by neutralizing the virus at a dose of 100 EID<sub>50</sub> /0.2 ml with experimental concentrations. It was found that FS-1 at a concentration of 3.3 mg/ml suppressed the reproduction of viruses by 2.0 log, and at a concentration of 6.6 mg / ml completely suppressed 100 infectious doses of influenza A virus of different strains: strain A Rostock / 34, (H7N1); black-headed laughter, Atyrau strain A 744/04, (H13N6); Almaty strain A 5/98, (H3N2).

The determination of the antiviral therapeutic efficacy of FS-1 was carried out in an experiment on seven-day-old chickens against the influenza virus strain A/Rostock/34, (H7N1). Three doses of FS-1 were used in the experiment: 6.6 mg/kg, corresponding to 1/8 LD<sub>50</sub>; 13.1 mg/kg corresponding to 1/4 LD<sub>50</sub> and 26.3 mg/kg corresponding to 1/2 LD<sub>50</sub>. As a control, a commercial drug «remantadine» was used at a therapeutic dose of 8.33 mg/kg for comparison. The results of the study are presented in figure 5.

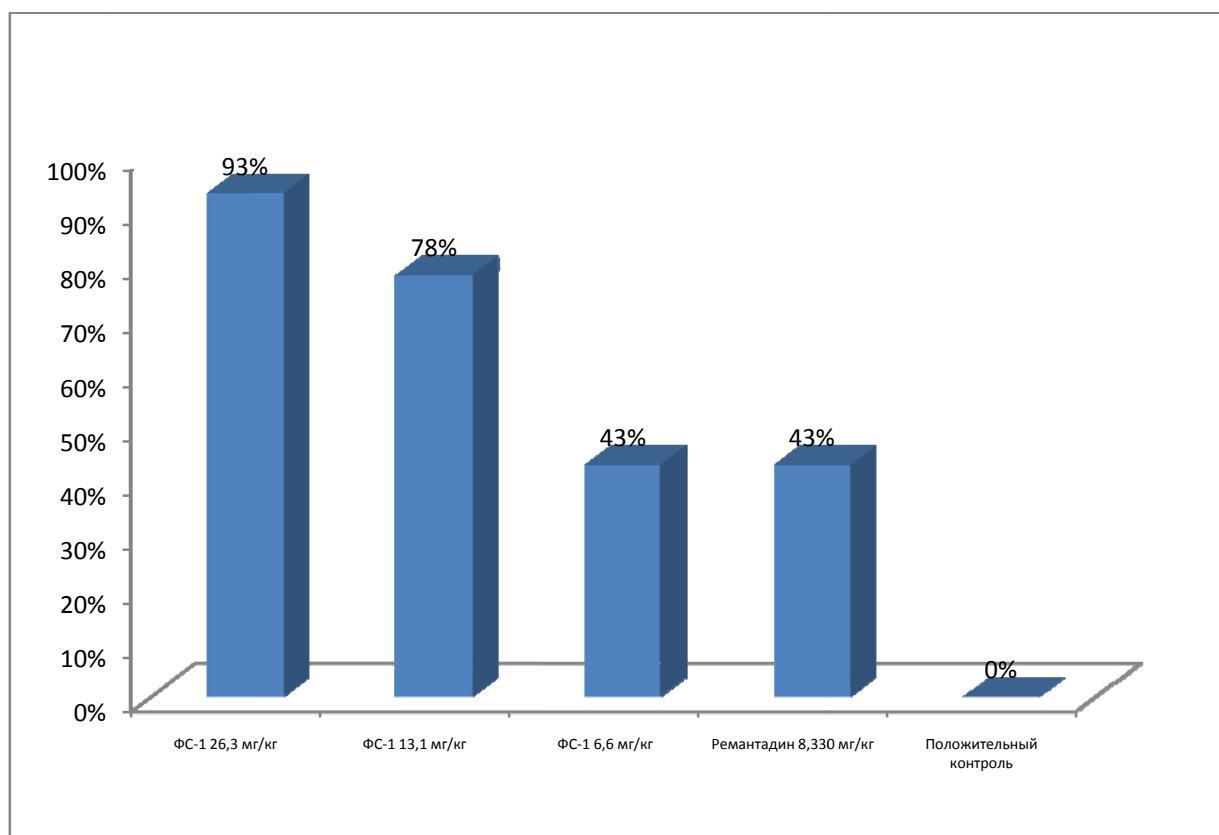


Figure 5 – The therapeutic effect of the drug FS-1

The results indicate that FS-1 showed high therapeutic efficacy at doses of 13.1 and 26.3 mg/kg against influenza virus in infected chickens. The use of the FS-1 complex as a therapeutic agent in doses of 26.3 and 13.1 mg/kg led to 93 % and 78 % survival of chickens, while the use of the drug «remantadine» in a therapeutic dose of 8.33 mg/ml retained only 43 % of the livestock.

The antiviral prophylactic efficacy of FS-1 was determined in an experiment on seven-day-old chickens against the influenza virus strain A Rostock / 34, (H7N1). In this case, four doses of FS-1 were used: 3.3 mg/kg corresponding to 1/16 LD<sub>50</sub>; 6.6 mg/kg, corresponding to 1/8 LD<sub>50</sub>; 13.1 mg/kg corresponding to 1/4 LD<sub>50</sub> and 26.3 mg/kg corresponding to 1/2 LD<sub>50</sub>. The multiplicity of per os administration of the studied iodine-containing complexes and «remantadine» was seven days. As a control, a commercial drug «remantadine» at a dose of 8.33 mg/kg was used for comparison. The results of the study are presented in figure 6.

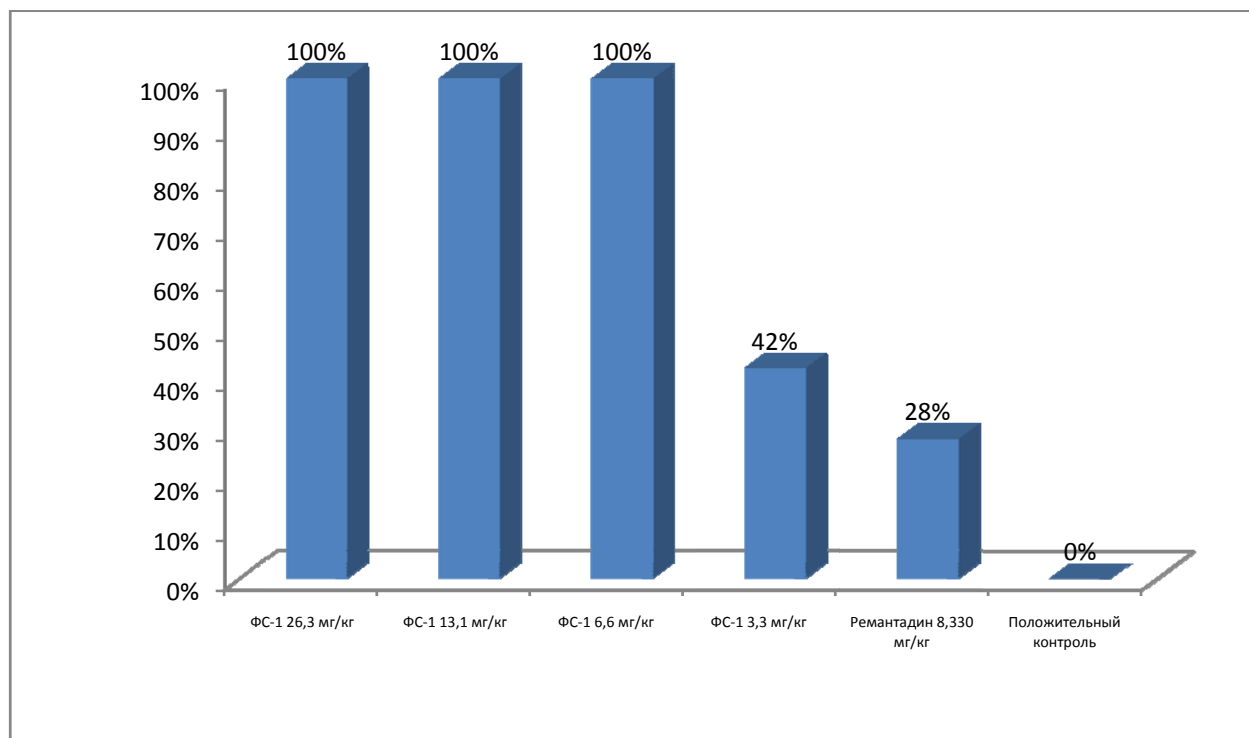


Figure 6 – The preventive effect of the drug FS-1's action

The results of studying the antiviral prophylactic effectiveness of FS-1 in experiments on chickens infected with Rostock/34 strain A influenza virus, (H7N1), showed pronounced prophylactic efficacy (100 %) in the studied doses of 26.3; 13.1 and 6.6 mg/kg more than three times the prophylactic effectiveness of the control antiviral drug «remantadine». However, at a dose of 3.3 mg/kg, the prophylactic efficacy of the investigated iodine-containing complex FS-1 is 1.5 times higher than the prophylactic dose of 8.33 mg/kg of the antiviral drug «remantadine».

In our experiments, we also established a significant pharmacological effect on influenza A virus. In various models with antiviral drugs widely used in practice, remantadine, oseltamivir, ribazole and amixin revealed a potentiation effect under the influence of the FS-1 iodine-containing complex. The results of potentiation with the combined use of the iodine-containing complex FS-1 with the studied antiviral drugs were accompanied by an increase in their therapeutic effect. Based on the results, we have compiled and filed an application for an invention with the patent department of NTsGNTe RK.

Thus, the studies and the results obtained allow us to conclude that the iodine-containing complex FS-1 is a low-toxic compound, exhibits antiviral activity against influenza A virus, and has a high potentiating effect when used in conjunction with commercial drugs. Further studies of the drug are actively continues.

**Б. Ф. Керимжанова, Л. Н. Иванова, А. И. Ильин**

«Инфекцияға қарсы материалдардың ғылыми орталығы» АҚ, Алматы, Қазақстан

#### **ҚҰСТАРДЫҢ А ТҰМАУЫНА ҚАРСЫ КҮРЕСТЕ ИОДТЫ ҚОСЫЛЫСЫНЫҢ ЭФФЕКТИВТІЛІГІНЕ БАҒА БЕРУ**

**Аннотация.** Жұмыста «Инфекцияға қарсы дәрі-дәрмектердің ғылыми орталығы» АҚ-да синтезделген құрамында йод бар кешендерді зерттеуге арналған материалдар ұсынылған. Зерттелген зерттеуінде кешендер құрамында ең белсенді йод бар кешені анықталды. Алынған құрамында йод бар кешендердің құс тұмауы вирусына әсерін зерттеу нәтижелері сипатталған.

**Түйін сөздер:** құрамында йод бар кешендер, цитотоксикалық, жедел уыттылық, тұмау вирустары, вирусқа қарсы белсенділік, потенциалды әсер.

Б. Ф. Керимжанова, Л. Н. Иванова, А. И. Ильин

АО «Научный центр противоинфекционных препаратов», Алматы, Казахстан

## ОЦЕНКА ЭФФЕКТИВНОСТИ ИОДСОДЕРЖАЩЕГО КОМПЛЕКСА В БОРЬБЕ С ГРИППОМ ПТИЦ А

**Аннотация.** В работе изложены материалы по изучению воздействия на вирус гриппа птиц А иодсодержащих комплексов, синтезированных в АО «Научный центр противоинфекционных препаратов». Проведенный скрининг из девяти исследованных комплексов выявил наиболее активный иодсодержащий комплекс. Установлено, что иодсодержащий комплекс является малотоксичным соединением, проявляет противовирусную активность в отношении вируса гриппа А, обладает высоким потенцирующим действием при совместном применении с коммерческими противовирусными препаратами.

**Ключевые слова:** иодсодержащие комплексы, цитотоксичность, острая токсичность, вирусы гриппа, противовирусная активность, потенцирующее действие.

### Information about authors:

Kerimzhanova Bakhytzhana Fazylzhanovna, Deputy Head of the laboratory, Doctor of Veterinary Sciences, Professor of JSC "Scientific Center for Anti-Infectious Drugs", Almaty, Kazakhstan; kbf19@mail.ru; <https://orcid.org/0000-0002-6860-3751>

Ilin Alexander Ivanovich, Doctor of chemical sciences, Chairman of the board. JSC "Scientific Center for Anti-Infectious Drugs", Almaty, Kazakhstan; ilin\_ai@mail.ru; <https://orcid.org/0000-0001-9528-9721>

Ivanova Ludmila Nikolaevna, Deputy Head of Virology Laboratory, JSC "Scientific Center for Anti-Infectious Drugs", Almaty, Kazakhstan; lyudmila\_69.69@mail.ru; <https://orcid.org/0000-0002-7194-0556>

### REFERENCES

- [1] Antipov V.A., Talanovsky V.F. (1997) Iodine preparations in veterinary. Krasnodar. 47 p. (in Russ.).
- [2] Gendon Yu.Z. (1995) Pandemic flu: can you fight it? Questions of virology. 2:8-12 (in Russ.).
- [3] Ito Toshihiro, Goto Hideo, Yamamoto Eiji et al. (2001) Generation of a highly pathogenic avian influenza virus from an avirulent field isolate by passaging in chickens // J. Virol. 75:9:4439-4443.
- [4] Karpukhin G.I. Influenza: A Guide for Doctors. (2001). SPb.: Hippocrates, 360 p. (in Russ.).
- [5] Monto A.S., Fleming D.M., Henry D. (1999) Efficacy and neuraminidase inhibitor zanamivir in the treatment of influenza A and B infections // J. Infect. Dis. 180(2):254-261.
- [6] Monto A.S., Robinson D.P., Herlocher L. et al. (1999) Zanamivir in healthy adults // J. Am. Med. Assoc. 282:31-36.
- [7] Mokhnach V.O. (1967) Yodvysokopolymer and their application in medicine and veterinary medicine. Iodinol in medicine and veterinary medicine. L.: Nauka. 188 p. (in Russ.).
- [8] Mokhnach V.O. (1974) Iodine and the problems of life. M.: Kolos. 254 p. (in Russ.).
- [9] Nikitin V.Ya., Kucheruk N.Kh., Kuzmenko P.I., Vinnikov V.V. (1999) Iodine and its preparations as antiseptics with a wide spectrum of action // Bulletin of veterinary medicine. 12:3-52 (in Russ.).
- [10] Uchaikin V.F., Kharlamov S.G., Cheshik S.G. (2004) The use of arbidol and amixin as etiotropic treatment of influenza and ARVI in children // Pediatrics. 5:73-77 (in Russ.).
- [11] Paretskaya N.A., Tamazyan R.A., Akhmatullina N.B., Amanzholyzy A., Sabitov A.N., Berdibai S.B., Kerimzhanova B.F., Dzhumagazieva A.B., Korotetskii I.S., Ilin A.I. (2019) New Semiorganic Iodine Complex, Its structure And Biological Activity // News of NAS RK. Series of chemistry and technology. ISSN 2224-5286. 1:433:9:70-76 (in Russ.).
- [12] Kulmanov M.E., Ivanova L.N., Sokolova N.N., Korotetsky I.S., Kerimzhanova B.F., Ilyin A.I. (2015) Anti-influenza effect of the drug substance FS-1 in the experiment on chickens Series biological and medical. ISSN 2224-5308. 5:311:27-35 (in Russ.).

## NEWS

OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN

## SERIES OF AGRICULTURAL SCIENCES

ISSN 2224-526X

Volume 5, Number 53 (2019), 39 – 44

<https://doi.org/10.32014/2019.2224-526X.58>

UDC 658:338. 341: 62

IRSTI 06.81

**Gulmira Nurmanbekova<sup>1</sup>, Raigul Duiskenova<sup>2</sup>**<sup>1</sup>Kazakh National Agrarian University, Almaty, Kazakhstan,<sup>2</sup>Kazakh Humanitarian Juridical Innovative University, Semey, Kazakhstan.

E-mail: Almira 7777; raigul19@mail.ru

**REALIZATION OF REGIONAL INNOVATION POLICY**

**Abstract.** The innovative policy which is a priority for the states seeking to find their own niche and strongly occupy certain positions in the world economy, is considered. Regions of Kazakhstan have got significant resource and raw materials, production, human resources. It is noted that despite the positive trends that have emerged in recent years, there are a number of unsolved problems in the regions of the Republic, including low innovative activity of enterprises, low proportion of production of knowledge-intensive and high-tech products, insufficient funding for scientific research and development works. An important stage of innovation and technological development and increasing of competitiveness of regional economies is highlighted as the development of innovative structures and management mechanisms. Formation of the innovation system; the introduction of mechanisms to stimulate innovation; the organization of innovative business structures will contribute to the development of competitiveness of the region. The levels of realization of regional innovation policy are considered: republican and regional (including local). Large export-oriented domestic enterprises began to introduce the technologies of the fourth industrial revolution in their industries in order to improve competitiveness.

**Key words:** region, mechanism, innovation, digital economy, activity, technologies, potential, conception, stimulation, interaction.

**Introduction.** The formation of an economy that based on knowledge and corresponds to modern trends of techno globalism, supposes the transition to an innovative way of development of the country's regions. Regions of Kazakhstan have got significant resource and raw materials, production, human resources. However, despite the positive trends that have emerged in recent years, there are a number of unsolved problems in the regions of the Republic, including low innovative activity of enterprises, a small proportion of production of knowledge-intensive and high-tech products, insufficient funding for scientific research and development works and, as a result, a low proportion of the implementation of their results in production. This situation is mainly explained by the lack of worked-out schemes of searching ideas, incubation of scientific and technical developments and their following commercialization [1]. Development of innovative structures and management mechanisms is an important stage of innovation and technological development and increasing of competitiveness of regional economies. The following contribute to the development of competitiveness of the region: the formation of an innovation system; the introduction of mechanisms to stimulate innovation; the organization of innovative business structures.

Innovations should be the main factor determining the competitiveness of the national economy. Development of economic relations in the region is carried out through various types and forms of integration on the basis of direct economic relations. Selection of the processes of integration of production is conditioned on the need for a complex approach to solving the problems of the innovation system of the region and the development of high-tech sectors of the national economy. The nature of the tasks itself facing us today requires the coordinated efforts of many sectors, scientific institutions and economic bodies.

**Research methodology.** Innovation policy of the region should provide [2]:

- development and effective use of innovative potential of the region;
- formation and realization of promising regional scientific, technical and innovative programs and projects for the benefit of providing sustainable social and economic development of the region;
- investments from budget and out of budget sources through the development of public-private partnership mechanisms for the realization of scientific, technical and innovative programs and projects of regional importance;
- maximum possible use of the achievements of domestic and foreign science during the realization of structural and technological modernization of industries in the region;
- initiating the introduction of a regional contract system in the sphere of scientific and technical developments;
- solving of social and economic problems of regional importance due to increasing the orientation of the regional order for scientific, technical and innovative products;
- stimulating of innovation and inventive activity, increasing of the level of patent protection of products and technologies that are created in the region;
- assistance to protect national interests in getting the results of scientific research performed at the expense of budgets of all levels, and ensuring the improvement of national content in products and technologies that are created in the region;
- development of business planning of innovative activity;
- monitoring and control over observance of legislation requirements by all entities of the scientific, scientific – technical and innovative activity of the region.

**Research results.** Regional innovation policy should be realized at two levels: republican and regional (including local) [3]. The basic concept of the formation of a system of mechanisms for the realization of regional innovation policy at the republican level should be based on the following regulations:

- national interests have got priority over the interests of individual regions;
- it is necessary to weaken regional differentiation. Formation of rational territorial proportions and effective spatial development of the country is possible only if the territorial economic and social asymmetry and economic growth of all regions are softened by self-force;
- not only depressed regions have got the right for state support, but also developed regions which are able to provide high returns on invested funds;
- assistance to backward regions can be provided only for the realization of innovative projects which ensure high production efficiency during their realization;
- state support is necessary to create zones of advanced development, appealed to become centers of formation of innovative economy and to ensure the growth of competitiveness of the economies not only of the region, but also of the whole country [4].

Innovation policy, as the core of general economic policy of the state should be connected first of all with the innovative restructuring of industrial production [5].

In 2017 work was carried out on development of measures for technological re-equipment of the industry, including elements of the fourth industry of the revolution. Measures have been developed which are directed to create a necessary ecosystem to support domestic enterprises planning to digitize and stimulate more active introduction of digital technologies. These measures are included in the state program "Digital Kazakhstan».

Creation of model digital factories on the basis of existing enterprises is one of the main projects. In this regard, seven enterprises were selected and work continued with the Fraunhofer Institute for technological diagnostics and development of digitalization plans: in JSC "Kantau transformer plant" (machine building), JSC "Eurasian foods" (food industry), JSC "Chimpharm" (pharmaceutical industry), JSC "AK Altynalmas" (metallurgy), LLP "Karlskrona" (machine building), LLP "Almaty Fan Plant" (machine building), LLP "Bal Textile" (light industry).

At the present moment, the work on technological diagnostics, selected enterprises and the development of roadmaps for the introduction of digital technologies on them has been completed.

In total, experts recommended more than 200 measures (projects), from 20 to 38 measures for each enterprise, held meetings with companies to discuss the offered measures.

Improving of industrial safety, especially in dangerous industries is an important effect of the introduction of digital technologies. In this regard, the draft Rules of industrial safety for dangerous production facilities that lead mining and exploration, taking into account the use of digital technologies to improve safety in the workplace. In December this year, these Rules will be approved by the MID RK [6].

For innovative cooperation in the mining sector, the project "Production 4.0" (testing and transfer of domestic solutions at the production site) is being realized.

In order to encourage business to introduce advanced digital technologies within the framework of the "Productivity-2020" program, appropriate changes were made to the Rules for providing state support to the entities of industrial and innovative activities aimed at increasing productivity. The main innovation is the focus on reimbursement of expenses on introduction of Industry 4.0 technologies.

Work on realization of projects on digitalization of backbone enterprises is carried out simultaneously. Totally 14 projects amounting to 140,2 billion tg are planned to be realized until 2025. The economic effect from their realization is expected to reach at the level of 239.8 billion tenge (GVA) until 2025. From them 3 projects (2 projects ERG, 1 project "KazZinc") were realized last year.

Plans for the digitalization of regions with different terms of realization in the period up to 2025 have been developed, 143 digitalization projects (86 enterprises) are expected to be realized, from which 72 projects (49 enterprises) are to be implemented in 2018.

With the purpose to improve competitiveness, large, export-oriented domestic enterprises have begun to introduce the technologies of the fourth industrial revolution in their industries [7].

"Maker" LLP (Karaganda region) modernized its production with modern robotic equipment and complex software. Economic effect - 8.9 billion tenge in 2018 and 11.2 billion tenge in 2019. LLP "Prom-mashkomplekt" (Pavlodar region) applies robotic manipulators which install parts on different machines and send ready parts to the warehouse. Economic effect - increase of to be produced product range in 2.35 time, increase of volume of to be exported product in 9.68 time.

Generally, it is necessary to note that the measures taken to stimulate the transition of industry to "Industry 4.0" will assist to increase the share of large and medium-sized enterprises in 2022 that have realized digital technologies up to 11%. To the labor productivity growth, including due to digital technologies for 39.8% (by 2016) and will be about 30 million tenge in the mining sector and 48.9% (13.9 million tenge) in the processing industry.

The concept of the State program of industrial and innovative development for 2020-2025 years provides such areas as the development of the "economy of simple things", the saturation of the internal market with domestic goods, support for exporters in the processing industry and the realization of large, breakthrough projects through the attraction of private investments, including foreign ones. At the same time this ensures continuity with the "Strategic development plan-2025", taking into account key initiatives and principles.

The approaches to the Concept of the Third industrialization program are based on the key challenges for further qualitative growth and steady competitiveness of the processing industry: insufficient inflow of investments in fixed capital, unformed critical mass of enterprises, low "complication" of to be produced products.

The purpose of industrial innovation policy is to stimulate the competitiveness of the processing industry in the domestic and foreign markets [8]. Achievement of this purpose will be provided by solving three tasks:

1. Deepening of industrialization. The task is directed to improve the efficiency of enterprises, provide the internal market with domestic goods, rational placement of enterprises in the points of growth and the creation of a pool of competitive producing enterprises.

2. Expansion of the production volume, range and complication of the processed goods which are in demand in foreign markets. This is a task on exporters.

3. Increase of industrial capacities. This task will be solved by stimulating the development of new industries, creating of capital-intensive industries, including with the participation of transnational companies and foreign investors, and providing the necessary raw materials to the processing industry enterprises.

In order to achieve the goal and tasks successfully 5 directions of industrial and innovative development are expected.

1. Performance of a proactive trade policy which is directed to remove barriers to foreign trade within the EAEU, access to the market of China, Central and South Asia, as well as rational protection of the domestic market.

2. Advanced creation of specialized factors of production at the points of growth. Efforts will be directed to the development of high-quality industrial, digital and certification infrastructure, human capital, competence centers.

3. Creation of new capital-intensive and knowledge-intensive industries, using the possibilities of the state on distribution of raw materials and the provision of attractive conditions for investors.

4. Direct support of effective enterprises in domestic and foreign markets. Efficiency will be measured by the ability to steady competition in domestic and foreign markets.

5. Increasing of the efficiency of the industrial innovation support system through more exact setting-up of the processes of coordination, financing and monitoring of industrialization policy.

The third program of industrialization will be different from previous two five years. Firstly, there will be a shift from field priorities to support effective producers in all spheres of processing industry. Secondly, efforts will be focused on the development of new, widening and "complication" of the existing range of to be produced products, including consumer goods. Thirdly, direct support will be provided in exchange for business counter-obligations in order to achieve specific indications (modernization, export growth, etc.). Fourthly, necessary infrastructure and standards will be created within the framework of preparation of industry for the "digital age".

Support of enterprises based on the model of balanced development will also be continued [8]. Companies will get complex support at all stages of their development - from beginner to successful. Further, attention will be paid to three groups of enterprises.

The first group "Strong back" – the enterprises of processing industry that will increase the volume and range of domestic products including consumer goods and create a pool of future exporters.

The second group "Competitive producers" - existing exporters, their tasks: expansion the range and increasing complexity of the export basket.

The third group "Centers of gravity" – large, capital-intensive projects, including in basic spheres, and also with the participation of TNCs and foreign investors. Development of production of new types of industrial semi-finished products and the provision of the necessary raw materials will be provided due to them.

According to the results of the Third program of industrialization, achievement of the main indicators in the processing industry is planned. Among them real growth of investment in fixed capital in 2 times, real growth of labor productivity in 1.7 times, growth of exports of processed goods in 2.3 times, increase of the Index of economic complexity up to 55 places, increase of the number of operating enterprises per 1,000 people, economically active population in 2.3 times.

This will allow to strengthen the work on further increasing of the value added in the economy, "complication" of the basket of to be produced goods and expansion of its presence in foreign markets.

**Conclusion.** The priority directions in the formation of the structure of the region's economy should be such integrated entities that provide the largest increase in value added. Therefore it is necessary to include an entity whose products are in demand both within the region and beyond into the groups of inter-sectorial integration of material production. It is necessary to group all other enterprises or organizations according to their functional purpose as independent entities on maintenance of programming production facilities or to include them in these entities.

At the present moment, there are possibilities for innovative development in almost all industries of Kazakhstan. Through development institutions the state will take part in the projects that are focused on creating an integrated system of industries which create competitive products, gradually developing the technological chain of added values.

## REFERENCES

- [1] Kantureyev M.T., Sigarev M.I. Public support of small businesses in Kazakhstan // News of the national academy of sciences of the Republic of Kazakhstan. Series of agricultural sciences. 2019. Vol. 1, N 49. P. 16-20. <https://doi.org/10.32014/2019.2224-526X.2>.
- [2] Ushachev I.G. Management system – the basis for the realization of the model of innovative development of the agro-industrial complex of Russia // Economy of agricultural and processing enterprises. 2013. N 2. P. 4-8.
- [3] Abraliev O., Beisenbaeva A., Naimanova Zh. The international experience of agricultural innovations // News of the National academy of sciences of the Republic of Kazakhstan. Series of agricultural sciences. 2019. Vol. 1, N 49. P. 5-15. <https://doi.org/10.32014/2019.2224-526X>.
- [4] Tsaurkubule Zh., Kenshin Zh., Sultanova Z. Scientific approaches to assessing the competitiveness of regions // Bulletin of the Karaganda university. Series of economy. 2018. N 4(92). P. 153-160.
- [5] Davis C. (2014). Planning Assistance Through Technical Evaluation from Relevance Number. Reprint. New York: New York Press.
- [6] Eraydin E. (2016). The role of regional policies along with the external and endogenous factors in the resilience of regions // Cambridge Journal of Regions. Economy and Society. 1 March. Vol. 9, Issue 1. 217-234.
- [7] Shelomentsev A., Taubaev A., Amirova G., Kasymova N. Formation of the integrated innovation infrastructure of the Eurasian economic union as a factor of increasing the knowledge intensity of the economies of the member states // Bulletin of the Karaganda University. N 2(94). P. 9-100.
- [8] Davletbayeva N., Taubayev A., Kuttybai M. (2018). System problems of entrepreneurship development in Kazakhstan regions in conditions of globalization. IDIMT 2018: Strategic Modeling in Management, Economy and Society. 26th Interdisciplinary Information Management Talks (P. 113-119).

Г. К. Нурманбекова<sup>1</sup>, Р. Дүйсенова<sup>2</sup>

<sup>1</sup>Қазақ ұлттық аграрлық университеті, Алматы, Қазақстан,

<sup>2</sup>Қазақ инновациялық гуманитарлық-заң университеті, Семей, Қазақстан

**АЙМАҚТЫҚ ИННОВАЦИЯЛЫҚ САЯСАТТЫ  
ІСКЕ АСЫРУ**

**Аннотация.** Әлемдік экономикада айқындалған орын алатын және өзіндік орынын тапқысы келетін, мемлекет үшін басымдық бағытқа ие болатын инновациялық саясат қарастырылған. Қазақстан аймақтары кадрлық ынталандыруға, өндірістік, ресурстық шикізаттарға айтарлықтай ие болып отыр. Атап айтқанда, соңғы жылдардағы көрсетілген айқын тенденцияларға қарамастан, республиканың аймақтарында шешілмеген мәселелер баршылық екендігін, оның ішінде кәсіпорындардың инновациялық белсенділігінің төмендігін атап айтуға болады, жоғары технологиялық салалар мен жоғары технологиялық өнімдердің төмен үлес салмағы мен тәжірибелік-конструкторлық және ғылыми-зерттеу жұмыстарын қаржыландырудың жеткіліксіздігін көруге болады.

Инновациялық-технологиялық дамудың және аймақтық экономиканың бәсекеге қабілеттілігін жоғарылатудың маңызды этаптары басқарудың механизмі мен инновациялық құрылымның әдістемесі ретінде бөлінген. Аймақтардың бәсекеге қабілеттілігін дамыту инновациялық жүйенің құрылымына сәйкестендірілген, инновациялық ынталандыру механизмдері енгізілген, инновациялық бизнес – құрылымды ұйымдастыруға негізделген.

Аймақтық инновациялық саясатты іске асыру деңгейлері қарастырылған: республикалық және аймақтық (жергіліктіні қоса алғанда). Бәсекеге қабілеттілікті арттыру мақсатында ірі отандық экспортқа бағытталған кәсіпорындар төртінші өндірістік революцияның технологиясын өз өндірістерінде енгізуді қолға алған.

**Түйін сөздер:** аймақ, механизм, инновация, цифрлық экономика, әрекет, технология, ынталандыру, концепция, өзара әрекеттесу, потенциал.

Г. К. Нурманбекова<sup>1</sup>, Р. Ж. Дуйскенова<sup>2</sup>

<sup>1</sup>Казахский национальный аграрный университет, Алматы, Казахстан,

<sup>2</sup>Казахский гуманитарно-юридический инновационный университет, Семей, Казахстан

## РЕАЛИЗАЦИЯ РЕГИОНАЛЬНОЙ ИННОВАЦИОННОЙ ПОЛИТИКИ

**Аннотация.** Рассмотрена инновационная политика, являющейся приоритетом для государств, стремящихся найти собственную нишу и прочно занять определенные позиции в мировой экономике. Регионы Казахстана обладают значительными ресурсно-сырьевым, производственным, кадровым потенциалами. Отмечено, что несмотря на наметившиеся в последние годы позитивные тенденции, в регионах республики имеется ряд нерешенных проблем, в числе которых следует отметить низкую инновационную активность предприятий, малый удельный вес производства наукоемкой и высокотехнологичной продукции, недостаточное финансирование научно-исследовательских и опытно-конструкторских работ. Выделен важный этап инновационно-технологического развития и повышения конкурентоспособности экономики регионов как разработка инновационных структур и механизмов управления. Развитию конкурентоспособности региона будет способствовать формирование инновационной системы; внедрение механизмов стимулирования инноваций; организация инновационных бизнес-структур. Рассмотрены уровни осуществления региональной инновационной политики: республиканском и региональном (включая местный). В целях повышения конкурентоспособности, крупные экспортоориентированные отечественные предприятия приступили к внедрению технологий четвертой промышленной революции на своих производствах.

**Ключевые слова:** регион, механизм, инновации, цифровая экономика, деятельность, технологии, потенциал, концепция, стимулирование, взаимодействие.

### Information about authors:

Nurmanbekova Gulmira, C.E.Sc., Associated Professor, The Kazakh national agrarian university, Almaty, Kazakhstan; Almira 7777; <https://orcid.org/0000-0002-0285-7556>

Duiskenova Raigul, PhD student, Kazakh Humanitarian Juridical Innovative University, Semey, Kazakhstan; raigul19@mail.ru; <https://orcid.org/0000-0002-7011-8229>

## NEWS

OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN

## SERIES OF AGRICULTURAL SCIENCES

ISSN 2224-526X

Volume 5, Number 53 (2019), 45 – 53

<https://doi.org/10.32014/2019.2224-526X.59>

UDC 619: 595.2. 632.9

I. I. Temreshev<sup>1</sup>, A. M. Uspanov<sup>1</sup>, A. B. Yeszhanov<sup>2</sup>,  
A. M. Kenzhegaliev<sup>1</sup>, A. M. Makezhanov<sup>1</sup>, B. B. Bolatbekova<sup>1</sup>

<sup>1</sup>LLP Zh. Zhiembaev Kazakh Research Institute of Plant Protection and Quarantine,  
Ministry of Agriculture of Republic of Kazakhstan, Almaty, Kazakhstan,

<sup>2</sup>M. Aikimbaev Kazakh Scientific Center for Quarantine and Zoonotic Diseases, Almaty, Kazakhstan.  
E-mail: temreshev76@mail.ru, u\_alibek@mail.ru, aidyn.eszhanov@gmail.com, arnur\_1992@mail.ru,  
Makezhanov.arman@bk.ru, bolatbekova\_beikhan@mail.ru

## ABOUT THE RESULTS OF LABORATORY TESTS OF THE BIOLOGICAL DRUG ACTHAROPHYT ON DIFFERENT SPECIES OF ARTHROPOD PESTS

**Abstract.** The article presents data on laboratory testing of the efficacy of the Actarofit, a new biotechnological insectoacaricide of contact action, from a group of avermectins against several species of pest arthropods from different orders - an imagines of a painted bug *Eurydema ornata* (Linnaeus, 1758) (Hemiptera, Heteroptera, Pentatomidae), great green bush-cricket larvae *Tettigoniaviridissima* (Linnaeus, 1758) (Orthoptera, Tettigoniidae), larvae of *Gomphomastax clavata* (Ostroumov, 1881) (Orthoptera, Eumastacidae) and *Chorthippus apricarius* (Linnaeus, 1758) (Orthoptera, Acrididae), imago of healer-beetle *Ulmoides dermestoides* (Fairmaire, 1893) (Coleoptera, Tenebrionidae), wax moth caterpillars *Galleria mellonella* (Linnaeus, 1758) (Lepidoptera, Pyralidae), as well as blood-sucking ixodid tick *Haemaphysalis punctata* Canestrini and Fanzago, 1877 (Acari, Ixodida, Ixodidae). The most resistant to the effects of Actarofit among the tested pest arthropods are the painted bug *Eurydema ornata* (Linnaeus, 1758), the wax moth caterpillars *Galleria mellonella* (Linnaeus, 1758) and the healer-beetle *Ulmoides dermestoides* (Fairmaire, 1893). The larvae of the great green bush-cricket *Tettigoniaviridissima* (Linnaeus, 1758), *Gomphomastax clavata* (Ostroumov, 1881) and *Chorthippus apricarius* (Linnaeus, 1758), as well as the imago of the blood-sucking ixodid tick, *Haemaphysalis punctata* Canestrini and Fanzago, 1877, were the most susceptible to drug effect. Possibly this difference is largely linked with the thickness of the chitinous cover of the studied objects, which to some extent protects them from the effects of Actarofit. Based on the obtained results, it can be said that the biological drug Actarofit may be used for treatment against the wax moth, but with measures to prevent application of the drug on imago and larvae of bees. It can also be used against various pests of agriculture, and some bloodsucking arthropods. But it should always be taken into account that the sensitivity of the pest object to the drug action.

**Key words:** Aktarofit, avermectins, biological drug, pest arthropods, insects, blood-sucking ticks, protective measures, ecologization, agriculture.

**Introduction.** Modern methods of pest control in agriculture are still widely used chemical insecticides. This is mainly due to the fact that the widespread use of chemical insecticides due to economic necessity, and today biological control methods, are less effective comparing to chemical means of protection. High impact speed and efficacy are their advantage. Despite this, pest insects are often able to produce resistance to insecticides, which is expressed in changes in cover permeability, detoxification and changes in sensitivity to insecticides. The undoubted disadvantage of chemical insecticides is also the impact on non-target species of arthropods, as well as accumulation in the soil, plant and animal tissues. As a result of the increasing use of chemicals in plant protection, an enormous amount of various chemical compounds enter the environment. There is evidence that pesticides used in agriculture are able to act as mutagens, causing cytotoxic and negative genetic effects [1-3, 7-9, 22]. Biological drugs, in

particular, neurotoxic compounds such as avermectins, can serve as an alternative means of environmentally friendly plant protection. Avermectins - antibiotics, insecticides, acaricides and nematocides with a 16-membered macrocyclic lactone ring, referring to macrolides, are a product of the vital activity of actinomycetes *Streptomyces avermitilis* (ex Burget al., 1979) Kim and Goodfellow, 2002 (syn. *Streptomyces avermectinius* Takahashi et al., 2002).

In 1984, their synthetic forms were obtained. The principle of action is that they stimulate the release of gamma-aminobutyric acid (GABA) from the nerve endings and increase the connection of GABA with receptor sites on the postsynaptic membrane of muscle cells. This leads to blocking the transmission of nerve impulses, resulting in paralysis and death. The effectiveness of avermectins is very dependent on temperature, for example, when it decreases from 24 to 17°C, toxicity to spider mites decreases by 7.6 times, and when increased to 32°C, it increases by 4.8 times. A big advantage of avermectins is their low toxicity to mammals and humans, non-toxicity to earthworms, as well as to plants, rapid decomposition under the action of sunlight without the formation of toxic residues. Avermectins are not absorbed by the roots of plants from the soil and do not accumulate in them [10-21, 23, 24]. The authors asked about the possibility of using avermectins against various pests of agriculture in the Republic of Kazakhstan. For this purpose, Aktarofit was chosen - a new biotechnological insectoacaricide of contact action for the destruction of pests of agricultural, ornamental, forest and fruit crops (produced by "Enzim", Ukraine). The active basis of the drug is a complex of natural avermectins of groups B1 and B2, at a concentration of 0.2%. The introduction of such drugs is fully consistent with the tasks of transfer and technology adaptation and improving the environmental friendliness and competitiveness of Kazakhstan's agricultural products, set by the President of the Republic of Kazakhstan N.A. Nazarbayev in his annual message to the people in 2018.

**Material and methods.** As a model object, we used various species of pest arthropods from different orders - imago of a painted-bug *Eurydema ornata* (Linnaeus, 1758) (Hemiptera, Heteroptera, Pentatomidae), great green bush-cricket larvae *Tettigoniaviridissima* (Linnaeus, 1758) (Orthoptera, Tettigoniidae), berry grasshopper larvae *Gomphomastax clavata* (Ostroumov, 1881) (Orthoptera, Eumastacidae) and *Chorthippus apricarius* (Linnaeus, 1758) (Orthoptera, Acrididae), healer-beetle imago *Ulomoides dermestoides* (Fairmaire, 1893) (Coleoptera, Tenebrionidae), great wax moth caterpillars *Galleria mellonella* (Linnaeus, 1758) (Lepidoptera, Pyralidae), as well as the bloodsucking ixodid tick *Haemaphysalis punctata* Canestrini and Fanzago, 1877 (Acari, Ixodida, Ixodidae). All insects, except for the last two species, were captured in nature with the help of a butterfly net and manual collection by employees of LLP Zh. Zhiembaev KazRIPPQ. The healer-beetle and the great wax moth were artificially bred under laboratory conditions in the insect of the M. Aykimbaev KSCQZD. Accordingly, experiments on species taken in nature were made in the laboratory of biotechnology of LLP Zh. Zhiembaev KazRIPPQ, while over artificially bred - at the insectary of the M. Aykimbaev KSCQZD, where the drug was transferred according to the oral agreement between the performers. The drug was diluted by us in a concentration of 1%, at a ratio of 400 ml of ordinary running water with the addition of 4 ml of avermectin. After this, the solution was applied to the bottom of Petri dishes or a plastic glass with a volume of 1 liter for the experimental group, while for the control group water was used. Exposure for both experimental and control groups was 1, 2 and 5 minutes. The exposure for the control group was the same time with the addition of water. It should be noted that for each group of tested insects, 3 replications were carried out.

In order to calculate the average time after which the full immobilization of pests occurs upon contact with the drug, time was counted on a stopwatch, immediately after the insect was treated.

The treated insects were placed in a clean Petri dish or plastic cup and checked on the following days after contact with the drug, in case of any surviving individuals could be found.

**Research results.** The pests used for the experiments are shown in figures 1-7. Below (tables 1-6) are the results from which it is clear that 1% solution of the drug Actarofit has 100% effectiveness against all species of pest arthropods used in the laboratory experiment.



Figure 1 –  
The painted bug *Eurydema ornata* (Linnaeus, 1758)



Figure 2 –  
The larva of the great green bush-cricket  
*Tettigoniaviridissima* (Linnaeus, 1758)



Figure 3 –  
The larva of *Gomphomastax clavata* (Ostroumov, 1881)



Figure 4 –  
The larva of *Chorthippus apricarius* (Linnaeus, 1758)



Figure 5 –  
Healer-beetle *Ulomoides dermestoides* (Fairmaire, 1893)



Figure 6 –  
Great wax moth *Galleria mellonella* (Linnaeus, 1758)



Figure 7 –  
Bloodsucking ixodic tick *Haemaphysalis punctata* Canestrini and Fanzago, 1877

As can be seen from the data in Table 1, the painted bug *Eurydema ornata* (Linnaeus, 1758) – a pest of cruciferous crops, died completely 20 minutes after the treatment with Aktarofit.

Table 1 – The results of the test of Acarofit on the painted bug *Eurydema ornata* (Linnaeus, 1758)

| Date       | Experiment |       |        |        |        | Control |       |        |        |        |
|------------|------------|-------|--------|--------|--------|---------|-------|--------|--------|--------|
|            | 3 min      | 7 min | 10 min | 15 min | 20 min | 3 min   | 7 min | 10 min | 15 min | 20 min |
| 16.05.2019 | 8          | 4     | 3      | 2      | 0      | 10      | 10    | 10     | 10     | 10     |
| 17.05.2019 | 0          | 0     | 0      | 0      | 0      | 10      | 10    | 10     | 10     | 10     |

100% of a great green bush-cricket larvae *Tettigoniaviridissima* (Linnaeus, 1758) a multiple eating pest died 15 minutes after treatment.

Table 2 – The results of the test of Aktarofit on the great green bush-cricket larvae *Tettigoniaviridissima* (Linnaeus, 1758)

| Date       | Experiment |       |        |        |        | Control |       |        |        |        |
|------------|------------|-------|--------|--------|--------|---------|-------|--------|--------|--------|
|            | 3 min      | 7 min | 10 min | 15 min | 20 min | 3 min   | 7 min | 10 min | 15 min | 20 min |
| 16.05.2019 | 6          | 4     | 2      | 1      | 0      | 10      | 10    | 10     | 10     | 10     |
| 17.05.2019 | 0          | 0     | 0      | 0      | 0      | 10      | 10    | 10     | 10     | 10     |

Larvae of berry grasshopper *Gomphomastaxclavata* (Ostroumov, 1881) and *Chorthippusapricarius* (Linnaeus, 1758) (Orthoptera, Acrididae) - a pest of fruit crops and medicinal plants, were even less resistant than the previous 2 insect species. Their 100% death occurred 10 minutes after the treatment with Aktarofit (table 3).

Table 3 – Results of the test of Aktarofit on the *Gomphomastaxclavata* larvae (Ostroumov, 1881) and *Chorthippusapricarius* (Linnaeus, 1758) (Orthoptera, Acrididae)

| Date       | Experiment |       |        | Control |       |        |
|------------|------------|-------|--------|---------|-------|--------|
|            | 3 min      | 7 min | 10 min | 3 min   | 7 min | 10 min |
| 16.05.2019 | 4          | 2     | 0      | 10      | 10    | 10     |
| 17.05.2019 | 0          | 0     | 0      | 10      | 10    | 10     |

Data on the efficacy of Acarofit against the wax moth - a pest of beekeeping [4], and the healer-beetle, a pest of stocks, are given in tables 4, 5. We found that the average time before the total immobilization of the wax moth larvae was 228.02 seconds, the maximum 405.82 seconds, and a minimum 104.26 seconds. While the same indicator for the imago of the healer-beetle was 36.86 seconds, 68.18 seconds, and 25.04 seconds respectively. Differences were found in the reactivity of both species for the drug, it was found that the imago beetles had the stage of excitation almost immediately after they were in contact with the drug, while the wax moth larvae reacted much later (about 1 minute). Probably, the differences in sensitivity and time before the total immobilization occurs consisted in the species specific resistance of insects, as well as their body weight. However, this aspect was not studied by us in this study.

Table 4 – Results of the test of Avermectin on the great wax moth caterpillars *Galleria mellonella* (Linnaeus, 1758)

| Date       | Experiment |           |           | Control  |           |           |
|------------|------------|-----------|-----------|----------|-----------|-----------|
|            | 1 minute   | 2 minutes | 5 minutes | 1 minute | 2 minutes | 5 minutes |
| 16.04.2019 | 3          | 3         | 3         | 3        | 3         | 3         |
| 17.04.2019 | 0          | 0         | 0         | 3        | 3         | 3         |
|            | Experiment |           |           | Control  |           |           |
|            | 1 minute   | 2 minutes | 5 minutes | 1 minute | 2 minutes | 5 minutes |
| 17.04.2019 | 3          | 3         | 3         | 3        | 3         | 3         |
| 18.04.2019 | 0          | 0         | 0         | 3        | 3         | 3         |
|            | Experiment |           |           | Control  |           |           |
|            | 1 minute   | 2 minutes | 5 minutes | 1 minute | 2 minutes | 5 minutes |
| 18.04.2019 | 3          | 3         | 3         | 3        | 3         | 3         |
| 19.04.2019 | 0          | 0         | 0         | 3        | 3         | 3         |

Table 5 – The results of the test of Aktarofit on the imago of the healer-beetle *Ulomoidesdermestoides* (Fairmaire, 1893)

| Date       | Experiment |           |           | Control  |           |           |
|------------|------------|-----------|-----------|----------|-----------|-----------|
|            | 1 minute   | 2 minutes | 5 minutes | 1 minute | 2 minutes | 5 minutes |
| 16.04.2019 | 5          | 5         | 5         | 5        | 5         | 5         |
| 17.04.2019 | 0          | 0         | 0         | 5        | 5         | 5         |
|            | Experiment |           |           | Control  |           |           |
|            | 1 minute   | 2 minutes | 5 minutes | 1 minute | 2 minutes | 5 minutes |
| 17.04.2019 | 5          | 5         | 5         | 5        | 5         | 5         |
| 18.04.2019 | 0          | 0         | 0         | 5        | 5         | 5         |
|            | Experiment |           |           | Control  |           |           |
|            | 1 minute   | 2 minutes | 5 minutes | 1 minute | 2 minutes | 5 minutes |
| 18.04.2019 | 5          | 5         | 5         | 5        | 5         | 5         |
| 19.04.2019 | 0          | 0         | 0         | 5        | 5         | 5         |

100% of blood-sucking ixodic tick *Haemaphysalis punctata* Canestrini and Fanzago, 1877 died 10 minutes after treatment with Aktarofit (Table 6).

Table 6 – The results of the test of Aktarofit on the blood-sucking ixodic tick *Haemaphysalis punctata* Canestrini and Fanzago, 1877

| Date       | Experiment |       |        | Control |       |        |
|------------|------------|-------|--------|---------|-------|--------|
|            | 3 min      | 7 min | 10 min | 3 min   | 7 min | 10 min |
| 16.05.2019 | 2          | 1     | 0      | 3       | 3     | 3      |
| 17.05.2019 | 0          | 0     | 0      | 0       | 0     | 0      |

**Discussion of research results.** As can be seen from the obtained results, the painted bug *Euryderma ornata* (Linnaeus, 1758), the great wax moth caterpillar *Galleria mellonella* (Linnaeus, 1758) and the healer beetle *Ulomoidesdermestoides* (Fairmaire, 1893) have the greatest resistance to the effects of Aktarofit from tested pest arthropods. The larvae of the great green bush-cricket *Tettigoniaviridissima* (Linnaeus, 1758), *Gomphomastax clavata* (Ostroumov, 1881) and *Chorthippus apricarius* (Linnaeus, 1758), as well as the imago of the blood-sucking ixodic tick *Haemaphysalis punctata* Canestrini and Fanzago, 1877 proved to be most susceptible to the effects of the drug. It can be assumed that this difference is largely due to the thickness of the chitinous cover of the studied objects, which to some extent protects them from the effects of Aktarofit. Based on the results obtained, it can be said that the biological drug Aktarofit may be used for treatment against the wax moth, but with measures to prevent the ingestion of the drug on the imago and the larvae of bees. Also, it can be used against various pests of agriculture, and some bloodsucking arthropods. But, the sensitivity of the harmful object to the action of the drug should be taken into account.

**Findings.** Thus, the drug from the group of avermectins Aktarofit can be used against various pests, for example, true bugs, which are found quite a lot on food crops [5, 6]. In addition, the high efficacy of this biological drug against the blood-sucking ixodic tick, *Haemaphysalis punctata* Canestrini and Fanzago, 1877, is of great interest. This species is a grazing three host parasite. Imago feed on mammals (several dozen species), larvae and nymphs can also feed on birds and reptiles. The vector of causative agents of Q fever, Crimean hemorrhagic fever, tick-borne encephalitis, tularemia, Lyme disease, etc., which is of great sanitary and epidemiological importance. Therefore, the effect of Aktarofit on this tick is important not only in the field of plant protection, but also to ensure epidemiological well-being.

**Source of research funding.** The work was prepared as part of the implementation of the projects of the Ministry of Agriculture of the Republic of Kazakhstan BR 06249249 "Development of an integrated system to increase productivity and improvement of farm animals breeding qualities, using the example of Bayserke Agro LLP" under subproject 2 "Improving the technology of cultivation and harvesting of forage

crops" and BR 06249206 "Transfer, adaptation and the introduction of advanced technologies for the control of quarantine and especially dangerous pests to ensure the phytosanitary safety of the agro-industrial complex of the Republic of Kazakhstan" for task 3 "Biological control of herd species of pest locusts using GIS technologies".

**И. И. Темрешев<sup>1</sup>, А. М. Успанов<sup>1</sup>, А. Б. Есжанов<sup>2</sup>,  
А. М. Кенжегалиев<sup>1</sup>, А. М. Макежанов<sup>1</sup>, Б. Б. Болатбекова<sup>1</sup>**

<sup>1</sup>ҚР АШМ ТОО Ж. Жиёмбаев атындағы

Қазақ өсімдік қорғау және карантин ғылыми зерттеу институты, Алматы, Қазақстан,

<sup>2</sup>М. Айқымбаев атындағы Қазақ зооноздық және карантиндік инфекциялар ғылыми орталығы,  
Алматы, Қазақстан

### **АКТАРОФИТ БИОЛОГИЯЛЫҚ ПРЕПАРАТЫНЫҢ ӘРТҮРЛІ ЗИЯНДЫ АРТРОПОДТАРҒА АРНАЛҒАН ЗЕРТХАНАЛЫҚ ЗЕРТТЕУЛЕРІНІҢ НӘТИЖЕЛЕРІ ТУРАЛЫ**

**Аннотация.** Мақалада әр түрлі отрядтардан зиянды буынаяқтылардың бірнеше түріне қарсы авермектиндер тобынан контактілі әсер ететін жаңа биотехнологиялық инсектоакарицид - Актарофит тиімділігін зертханалық тестілеу бойынша деректер келтіріледі – қандада *Eurydema ornata* (Linnaeus, 1758) (Hemiptera, Heteroptera, Pentatomidae), *Tettigonia viridissima* (Linnaeus, 1758) (Orthoptera, Tettigoniidae), *Gomphomastax clavata* (Ostroumov, 1881) (Orthoptera, Eumastacidae) және қоңыр саяқ шегіртке *Chorthippus apricarius* (Linnaeus, 1758) (Orthoptera, Acrididae), *Uromoides dermestoides* (Fairmaire, 1893) (Coleoptera, tenebrionidae), *Galleria mellonella* (Linnaeus, 1758) (Lepidoptera, Pyralidae), сондай-ақ қан сорғыш иксод кенесінде *Haemaphysalis punctata* Canestrini and Fanzago, 1877 (Acari, Ixodida, Ixodidae). Сыналған зиянды буынаяқтардан Актарофит әсеріне ең жоғары төзімділікке боялған қандада *Eurydema ornata* (Linnaeus, 1758), *Galleria mellonella* (Linnaeus, 1758) және *Uromoides dermestoides* (Fairmaire, 1893) балауыздары ие. Құрттар жасыл шекшек *Tettigonia viridissima* (Linnaeus, 1758), жидек биелер *Gomphomastax clavata* (Ostroumov, 1881) және қоңыр керек *Chorthippus apricarius* (Linnaeus, 1758), сондай-ақ имаго кровососущего иксодового кене *Haemaphysalis punctata* Canestrini and Fanzago, 1877 қалсаңыз, ең сезімтал әсеріне препарат. Мұндай айырмашылық көбінесе зерттелетін объектілердің хитин жабынының қалыңдығына байланысты болуы мүмкін, ол оларды Актарофиттің әсерінен қорғайды. Алынған нәтижелерді негізге ала отырып, биологиялық Актарофит препаратын балауыз балына қарсы өңдеу үшін пайдалануға болады, бірақ препараттың имаго мен бал араларының личинкаларына түсуінің алдын алу жөніндегі шаралармен бірге. Сондай-ақ оны ауыл шаруашылығының әртүрлі зиянкестеріне және кейбір қан соратын буынаяқтыларға қарсы қолдануға болады. Бірақ бұл ретте зиянды объектінің препараттың әсеріне сезімталдығын міндетті түрде ескеру керек.

**Түйін сөздер:** Актарофит, авермектиндер, биологиялық препарат, зиянды буынаяқтылар, жәндіктер, қан соратын кенелер, қорғау шаралары, экологизация, ауыл шаруашылығы.

**И. И. Темрешев<sup>1</sup>, А. М. Успанов<sup>1</sup>, А. Б. Есжанов<sup>2</sup>,  
А. М. Кенжегалиев<sup>1</sup>, А. М. Макежанов<sup>1</sup>, Б. Б. Болатбекова<sup>1</sup>**

<sup>1</sup>ТОО Казахский научно-исследовательский институт защиты и карантина растений  
им. Ж. Жиёмбаева МСХ РК, Алматы, Казахстан,

<sup>2</sup>Казахский научный центр зоонозных и карантинных инфекций им. М. Айқымбаева, Алматы, Казахстан

### **О РЕЗУЛЬТАТАХ ЛАБОРАТОРНЫХ ИСПЫТАНИЙ БИОЛОГИЧЕСКОГО ПРЕПАРАТА АКТАРОФИТ НА РАЗЛИЧНЫХ ВИДАХ ВРЕДНЫХ ЧЛЕНИСТОНОГИХ**

**Аннотация.** В статье приводятся данные по лабораторному тестированию эффективности Актарофита – нового биотехнологического инсектоакарицида контактного действия из группы авермектинов против нескольких видов вредных членистоногих из разных отрядов – имаго разукрашенного клопа *Eurydema ornata* (Linnaeus, 1758) (Hemiptera, Heteroptera, Pentatomidae), личинок зеленого кузнечика *Tettigonia viridissima* (Linnaeus, 1758) (Orthoptera, Tettigoniidae), личинок ягодной кобылки *Gomphomastax clavata* (Ostroumov, 1881) (Orthoptera, Eumastacidae) и бурого конька *Chorthippus apricarius* (Linnaeus, 1758) (Orthoptera, Acrididae), имаго чернотелки жука-знахаря *Uromoides dermestoides* (Fairmaire, 1893) (Coleoptera, Tenebrionidae),

гусениц большой восковой моли *Galleriamellonella* (Linnaeus, 1758) (Lepidoptera, Pyralidae), а также на кровососущем иксодовом клеще *Haemaphysalis punctata* Canestrini and Fanzago, 1877 (Acari, Ixodida, Ixodidae) наибольшей устойчивостью к воздействию Актарофита из протестированных вредных членистоногих обладают разукрашенный клоп *Eurydema ornata* (Linnaeus, 1758), гусеницы большой восковой моли *Galleria mellonella* (Linnaeus, 1758) и жук-знахарь *Ulomoides dermestoides* (Fairmaire, 1893). Личинки зеленого кузнечика *Tettigoniaviridissima* (Linnaeus, 1758), ягодной кобылки *Gomphomastax clavata* (Ostroumov, 1881) и бурого конька *Chorthippus apricarius* (Linnaeus, 1758), а также имаго кровососущего иксодового клеща *Haemaphysalis punctata* Canestrini and Fanzago, 1877 оказались наиболее восприимчивы к воздействию препарата. Возможно, что подобное различие во многом связано с толщиной хитинового покрова исследуемых объектов, которое в какой-то мере защищает их от воздействия Актарофита. Исходя из полученных результатов, можно говорить о том, что биологический препарат Актарофит возможно использовать для обработки против восковой моли, однако с мерами по предупреждению попадания препарата на имаго и личинок пчел. Также его можно применять против различных вредителей сельского хозяйства, и некоторых кровососущих членистоногих. Но при этом следует обязательно учитывать чувствительность вредного объекта к действию препарата.

**Ключевые слова:** Актарофит, авермектины, биологический препарат, вредные членистоногие, насекомые, кровососущие клещи, защитные мероприятия, экологизация, сельское хозяйство.

#### Information about authors:

Temreshev I. I., LLP Zh. Zhiembaev Kazakh Research Institute of Plant Protection and Quarantine, Ministry of Agriculture of Republic of Kazakhstan, Almaty, Kazakhstan; temreshev76@mail.ru; <https://orcid.org/0000-0003-0004-4399>

Uspanov A. M., LLP Zh. Zhiembaev Kazakh Research Institute of Plant Protection and Quarantine, Ministry of Agriculture of Republic of Kazakhstan, Almaty, Kazakhstan; u\_alibek@mail.ru; <https://orcid.org/0000-0001-7122-8596>

Yeszhanov A. B., M. Aikimbaev Kazakh Scientific Center for Quarantine and Zoonotic Diseases, Almaty, Kazakhstan; aidyn.eszhanov@gmail.com; <https://orcid.org/0000-0001-6572-5668>

Kenzhegaliev A. M., LLP Zh. Zhiembaev Kazakh Research Institute of Plant Protection and Quarantine, Ministry of Agriculture of Republic of Kazakhstan, Almaty, Kazakhstan; arnur\_1992@mail.ru; <https://orcid.org/0000-0002-0308-222X>

Makezhanov A. M., LLP Zh. Zhiembaev Kazakh Research Institute of Plant Protection and Quarantine, Ministry of Agriculture of Republic of Kazakhstan, Almaty, Kazakhstan; Makezhanov.arman@bk.ru; <https://orcid.org/0000-0003-1587-1979>

Bolatbekova B. B., LLP Zh. Zhiembaev Kazakh Research Institute of Plant Protection and Quarantine, Ministry of Agriculture of Republic of Kazakhstan, Almaty, Kazakhstan; bolatbekova\_beikhan@mail.ru; <https://orcid.org/0000-0001-5924-493X>

#### REFERENCES

- [1] Barilyak N.R., Buzhievskaya T.I., Bykorez A.I. (1989). Genetic effects of environmental pollution. Kiev: Naukova Dumka (in Russ.).
- [2] Begimbetova D.A., Kolumbaeva S.Zh., Kalimagambetov A.M. (2009). The genotoxic effect of fipronil on rats of different ages // Experimental Biology. 40. 1: 96-99 (in Russ.).
- [3] Benkovskaya G.V., Leontyeva T.L., Udalov M.B. (2008). Resistance of the Colorado potato beetle to insecticides in the Southern Urals // Agrochemistry. 8: 55-59 (in Russ.).
- [4] Grobov O.F., Smirnov A.M., Popov E.T. (1987). Diseases and pests of honey bees. M.: Agropromizdat (in Russ.).
- [5] Esenbekova P.A., Temreshev I.I., Kenzhegaliev A.M., Tursynkulov A.M., Dosmukhambetov T.M. (2019). Hemiptera (Hemiptera: Heteroptera) – pest and grain (barley, triticale, wheat) Bayserke-Agro LLP // News of the National academy of sciences and the Republic of Kazakhstan. Series of agricultural sciences. 2 (50): 21-30. <https://doi.org/10.32014/2019.2224-526X.12> ISSN 2224-526X
- [6] Esenbekova P.A., Temreshev I.I., Kenzhegaliev A.M., Tursynkulov A.M., Dosmukhambetov T.M. (2019). Bugs (Hemiptera: Heteroptera) – pests of alfalfa "Bayserke-Agro" LLP // News of the National academy of sciences of the Republic of Kazakhstan. Series of agricultural sciences. 2 (50): 55-65. <https://doi.org/10.32014/2019.2224-526X.17> ISSN 2224-526X (in Russ.).
- [7] Korotkova L.I. (2007). Accumulation of organochlorine compounds in the commercial fish of the north-eastern part of the Black Sea. Ichthyological studies in inland waters. Materials of the International Scientific Conference. Saransk: Mordovia State University. P. 91-93 (in Russ.).

- [8] Slivinsky G.G., Temreshev I.I., Isenova G.D., Kozhabayeva G.E. (2016). Aquatic beetles as bioindicators of environmental conditions in the water bodies of South Kazakhstan // *ActaBiologica Sibirica*. 2 (3): 46-53. <http://dx.doi.org/10.14258/abs.v2i3.1454> (in Russ.).
- [9] Smirnov A.A. (2006). Screening of insectoacaricides and their mixtures, creating a compound with a synergistic effect // *Veterinary Pathology*. 1: 118-121 (in Russ.).
- [10] Roslavl'tseva S.A. (1987). New group of insectoacaricides and nematocides // *Agrochemistry*. 7: 130 (in Russ.).
- [11] Roslavl'tseva S.A., Didenko L.N. (2007). New in the problem of insect acaricide resistance of arthropods // *Agrochemistry*. 7: 88-91 (in Russ.).
- [12] Burg R.W., Miller B.M., Baker E.E., Birnbaum J., Currie S.A., Hartman R., Kong Y.-L., Monaghan R.L., Olson G., Putter I., Tunac J.B., Wallick H., Stapley E.O., Oiwa R., Omura S. (1979). Avermectins, New Family of Potent Anthelmintic Agents: Producing Organism and Fermentation // *Antimicrobial Agents and Chemotherapy*. 15(3): 361-7. doi:10.1128/AAC.15.3.361.
- [13] Clark J.K., Scott J.G., Campos F., Bloomquist J.R. (1995). Resistance to Avermectins: Extent, Mechanisms, and Management Implications // *Annual Review of Entomology*. 40: 1-30. doi:10.1146/annurev.en.40.010195.000245.
- [14] Cully Doris F., Vassilatis Demetrios K., Liu Ken K., Paress Philip S., Van Der Ploeg, Lex H. T., Schaeffer James M., Arena Joseph P. (1994). Cloning of an avermectin-sensitive glutamate-gated chloride channel from *Caenorhabditiselegans* // *Nature*. 371 (6499). 707-11. Bibcode:1994Natur.371..707C. doi:10.1038/371707a0.
- [15] Gao Q., Tan G.-Y., Xia X., Zhang L. (2017). Learn from microbial intelligence for avermectinsoverproduction. *Current Opinion in Biotechnology*. 48.: 251-257. doi: 10.1016/j.copbio.2017.08.016.
- [16] Ikeda H., Nonomiya T., Usami M., Ohta T., Omura S. (1999). Organization of the biosynthetic gene cluster for the polyketide anthelmintic macrolide avermectin in *Streptomyces avermitilis* // *Proceedings of the National Academy of Sciences*. 96(17). P. 9509-9514. doi:10.1073/pnas.96.17.9509.
- [17] Jinsong Chen, Jin Miao, Mei Liu, Xueting Liu. (2016). Different fates of avermectin and artemisinin in China // *Science China. Life sciences*. 59 (6).doi: 10.1007/s11427-016-5065-y.
- [18] Ōmura Satoshi, Shiomi Kazuro. (2007). Discovery, chemistry, and chemical biology of microbial products // *Pure and Applied Chemistry*. 79(4). 581-591. doi:10.1351/pac200779040581.
- [19] Pitterna T., Cassayre J., Hüter O.F., Jung Pierre M.J., Maienfisch P., Kessabi F.M., Quaranta L., Tobler H. (2009). New ventures in the chemistry of avermectins // *Bioorganic& Medicinal Chemistry*. 17 (12). 4085-4095. doi:10.1016/j.bmc.2008.12.069.
- [20] Siddique S., Syed Q., Adnan A., Nadeem M., Irfan M., Ashraf Qureshi F. (2013). Production of Avermectin B1b from *Streptomyces avermitilis* 41445 by Batch Submerged Fermentation // *Jundishapur J. Microbiol*. 6 (8): e7198. doi: 10.5812/jjm.7198.
- [21] Takahashi Y. (2002). *Streptomyces avermectinius sp. nov.*, an avermectin-producing strain // *International Journal of Systematic and Evolutionary Microbiology*. 52 (6): 2163-8. doi:10.1099/ijs.0.02237-0.
- [22] Temreshev I.I., Esenbekova P.A., Sagitov A.O., Mukhamadiev N.S., Sarsenbaeva G.B., Ageenko A.V., Homziak J. (2018). Evaluation of the effect of locally produced biological pesticide (AkKobelek™) on biodiversity and abundance of beneficial insects in four forage crops in the Almaty region of Kazakhstan // *International Journal of Environment, Agriculture and Biotechnology (IJEAB)*. 3. 1.: 72-91. <http://dx.doi.org/10.22161/ijeab/3.1.10>. ISSN: 2456-1878. Thomson Reuters Researcher ID: E-2759-2017.
- [23] Yoon Y.J., Kim E.-S., Hwang Y.-S., Choi C.-Y. (2004). Avermectin: Biochemical and molecular basis of its biosynthesis and regulation // *Applied Microbiology and Biotechnology*. 63 (6): 26-34. doi:10.1007/s00253-003-1491-4.
- [24] Zhang Changsheng, Albermann Christoph, Fu Xun, Thorson Jon S. (2006). The in Vitro Characterization of the Iterative Avermectin Glycosyltransferase AveBI Reveals Reaction Reversibility and Sugar Nucleotide Flexibility // *Journal of the American Chemical Society*. 128 (51): 16420-1. doi:10.1021/ja065950.

**NEWS**

OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN

**SERIES OF AGRICULTURAL SCIENCES**

ISSN 2224-526X

Volume 5, Number 53 (2019), 54 – 57

<https://doi.org/10.32014/2019.2224-526X.60>

UDC636.084/.087

**A. S. Kalimoldinova<sup>1</sup>, G. K. Zhaksylykova<sup>1</sup>,  
A. E. Chindaliyev<sup>1</sup>, K. Baigabylov<sup>1</sup>, A. D. Baimukanov<sup>2</sup>**

<sup>1</sup>Educational Scientific and Production Center Bayserke-Agro LLP, Talgar district, Almaty region, Kazakhstan,

<sup>2</sup>Russian State Agrarian University – Moscow Agricultural Academy named after K. A. Timiryazev,  
Moscow, Russia.

E-mail: kalimoldinova\_assel@mail.ru, gulnurzh@ro.ru, achindaliyev@rambler.ru,  
unpcbayerke-agro@mail.ru, aidartaidar98@mail.ru

**GROWTH AND DEVELOPMENT OF CALVES OF HOLSTEIN BREED  
IN THE DAIRY COMPLEX OF THE BAYSERKE-AGRO LLP**

**Abstract.** Advance in genetic potential and nutritional needs of animals has accelerated growth rates. Genetic selection for high dairy productivity implies a higher ability to grow and, therefore, requires an increase in nutrients. Nutrition management from birth is crucial for growth and development, as well as a formation of physiological characteristics of young animals affecting their health.

The article focuses on the influence of feeding and nutrition from birth to 6 months of age on the growth and development of calves of the Holstein breed, as well as monitoring and determining the average daily gain in the preweaning period of young animals of different age groups (n = 96 goals) in the dairy complex of Bayserke-Agro LLP.

**Keywords:** cattle, heifer, growth, development of mammary glands, feeding, diet, calf management, colostrum, milk yield.

**Relevance.** It is known that the growth and development of the body of young animals in the womb and after birth occurs according to certain biological laws. It was found that the formation and growth of bone tissue are more pronounced in the uterine period of fetal development, and growth of muscle tissue - at the age of 9-14 months, adipose tissue begins to be deposited at a later date. Taking into account these patterns of growth and development, in addition to high-grade diets, In dairy cattle breeding rational feeding and keeping regimes of both mothers and offspring are used, which affect the enhanced development of those tissues, individual systems and organs that influence the subsequent dairy productivity of cattle [1-3].

For example, stimulation of the enhanced development of the digestive organs, starting from the early training of calves and eating more plant forage, and development of the mammary gland - from the organization of proper feeding during the period of intensive development, that is, from the time of sexual growth and in the second half of pregnancy [4].

The main conditions for growing young animals for the full replacement of the dairy herd are as follows:

- organization of full and balanced feeding in all age periods of growing of young animals;
- creation of rational methods of technology for keeping with meeting zoohygienic requirements;
- obtaining and selecting for growing calves from the best animals by genotype, as well as from healthy parents;
- disease prevention by organizing and conducting appropriate veterinary actions;
- control over the growth and development of calves [5].

The most important period when growing young animals is the period of milk growing. The body of calves in the first months of life is growing vigorously. There is an intensive formation of skeleton,

muscles, a development of the gastrointestinal tract and other internal organs with the use of vital substances like protein, fat, minerals, carotene from fed colostrum feeds, milk and fodder products. Especially in the first two months after the birth of a calf, if the required conditions of keeping and inadequate feeding are not met, their body is easily susceptible to respiratory and digestive diseases; leading to reduced productivity and even death.

**Aim of the research.** The effect of feeding and nutrition from birth to 6 months of age on the growth and development of calves of the Holstein breed, as well as monitoring and analysis of the average daily gain of young animals of different age groups in the highly power-driven automated dairy farm of Bayserke-Agro LLP in Almaty region.

**The basis for research and the source of funding.** Targeted financing program of the Ministry of Agriculture of the Republic of Kazakhstan for 2018 - 2020 "Transfer and adaptation of technologies for the automation of technological processes for the production of livestock products based on a model farm of the Bayserke-Agro LLP in dairy cattle breeding from 100 cows".

**Research methods.** The object of the research was young stocks available at Bayserke-Agro LLP. Young animals were weighed monthly at the same time every month, in the morning – before watering and feeding the animals, on the basis of which the average daily gain was calculated [6-8].

**Research results.** Growing calves is necessary, first of all, for the successful obtaining of strong, healthy and highly productive animals. Therefore, it is necessary to determine the scheme (feeding rates and rearing with milk) of calf growing.

At Bayserke-Agro LLP, when raising calves during the preweaning period, the following technology for maintenance and feeding was adopted (table 1).

Table 1 – Diagram of the keeping and feeding of calves in the preweaning period

| Daily feeding, kg |                                    |           |               |      |               |           |     |           |
|-------------------|------------------------------------|-----------|---------------|------|---------------|-----------|-----|-----------|
| Age, days         | The method of keeping              | colostrum |               | milk |               | Grain mix | Hay | Mono feed |
|                   |                                    | kg        | rearing rates | kg   | rearing rates |           |     |           |
| 1-5               | Individually in the maternity ward | 5         | 2             | –    | –             | –         | –   | –         |
| 06-30             | Individually in houses             | –         | 2             | 6    | 2             | 0.3       | 0.5 | –         |
| 31-45             | Individually in houses             | –         | –             | 7    | 2             | 0.6       | 0.5 | –         |
| 46-50             | Group of 14 animals                | –         | –             | 7    | 2             | 1         | 1   | –         |
| 51-100            | Group of 18 animals                | –         | –             | 6.0  | 2             | 1.5       | 1.5 | –         |
| 101-120           | Group of 18 animals                | –         | –             | 4.5  | 2             | 2         | 3   | –         |
| 121-135           | Group of 18 animals                | –         | –             | –    | –             | 2         | 3   | 3         |
| 136-150           | Group of 50 animals                | –         | –             | –    | –             | –         | 3   | 8         |
| 151-165           | Group of 80 animals                | –         | –             | –    | –             | –         | 3   | 10        |
| 166-180           | Group of 80 animals                | –         | –             | –    | –             | –         | 3   | 12        |

Calves at birth for 5 days stayed in the maternity ward of a cowshed. Feeding was carried out by two times of colostrum rearing from a mother in the amount of 5 liters per day (2.5 liters each).

From the age of 5 days, calves were transferred to individual houses indoors, where they stayed for 45 days.

Feeding during this period comprised 5 liters of milk (2.5 liters 2 times a day).

From the age of 15 days, they began to accustom to eating crushed grain mixture and high-quality alfalfa hay. Until the end of the period, these feeds were constantly in the feeders. Also, a prerequisite was daily drinking of clean water in an amount of 0.5-1.0 liters.

From 46 to 100 days of age, calves were transferred to group loose keeping on a deep straw litter of 14 animals in each group with water from a drinking bowl, as well as alfalfa hay on self-feeders. The diet consisted of 7 liters of milk (3.5 liters twice a day), a grain mixture of 2.0-2.5 kg and hay of 2.0-2.5 kg.

Calves at the age of 100 to 120 days were kept in groups of 18 goals. With the same method as in the previous group. In this case, feeding was carried out by a gradual supply of milk until the end of the period, and a supply of vegetable feed increased.

From 121 to 135 days of age, calves were kept in groups of 18 animals, and from 136 to 150 days - in a group of 50 animals each. During these periods, the diet consisted of vegetable feed of grain mixture of 3 kg and hay in the amount of 4-4.5 kg.

From 151 to 180 days, calves were kept in groups of 80 animals. During this period, feeding was carried out with a mono-feed intended for cows with middle productivity (with a milk yield of 20-23 kg per day). The structure of the composition of the mono-feed in the dry matter of the diet: corn silage - 40%, alfalfa hay - 14.2%, grain mix - 30% and rape - 16.2%.

For all periods of growing calves, during housing, they were provided with dry and clean straw litter.

The weighing results of dairy calves, as well as the nature of their growth of energy in the pre-weaning period, are presented in table 2.

Table 2 – Nature of the growth energy of calves in the preweaning period

| No | Bull-calves       |           |                 |                       | Heifer-calves     |           |                 |                       |
|----|-------------------|-----------|-----------------|-----------------------|-------------------|-----------|-----------------|-----------------------|
|    | Number of animals | Age, days | Live weight, kg | Average daily gain, g | Number of animals | Age, days | Live weight, kg | Average daily gain, g |
| 1  | 15                | 76.7±2.5  | 89.3±3.1        | 837.2±287             | 19                | 74.3±3.0  | 82.1±2.6        | 771.3±30.0            |
| 2  | 18                | 138.4±5.2 | 156.7±4.8       | 1001±38.3             | 12                | 137±1.7   | 163±4.7         | 1012±42.0             |
| 3  | 16                | 160.8±6.3 | 180.2±7.9       | 962.6±15.8            | 16                | 193.7±5.9 | 194.2±5.9       | 877.1±29.2            |

As can be seen from table 2, under such keeping and feeding conditions, bull-calves reached 180.2 kg of live weight by the age of 161 days with an average daily gain of 933 grams over the entire growth period. Heifers by the age of 195 days reached 194 kg with an average daily gain of 887 grams.

The existing growth standard for young stock of the Holstein breed used in the republic is for bulls at the age of 6 months - 165 kg, of 12 months - 280 kg, of 15 months - 335 kg, of 18 months - 390 kg. For heifers, respectively by age - 150, 260, 305 and 350 kg.

**Conclusions.** The results of monitoring the development of young animals showed high growth energy during the preweaning period. Under the feeding and keeping conditions, the live weight of calves at the age of 161 days was 180.2 kg with an average daily gain of 933 grams, heifers by the age of 195 days reached 194 kg, with an average daily gain of 887 grams. While maintaining this growth energy, the live weight of calves in 12 months will be 340 kg, in 15 months - 424 kg and in 18 months - 508 kg. Heifers will have, respectively - 324, 403 and 483 kg. These data far exceed the growth standards of the young stock of the Holstein breed.

**А. С. Калимолдинова, Г. К. Жаксылыкова,  
А. Е. Чиндалиев, К. Байгабылов, А. Д. Баймұқанов**

<sup>1</sup>«Байсерке-Агро» оқу ғылыми-өндірістік орталығы" ЖШС, Талғар ауданы, Алматы облысы, Қазақстан,

<sup>2</sup>Ресей мемлекеттік аграрлық университеті –

К. А. Тимирязев атындағы Мәскеу ауылшаруашылық академиясы, Мәскеу, Ресей

#### **«БАЙСЕРКЕ-АГРО» ЖШС ГОЛШТИН ТҰҚЫМЫНЫҢ 6 АЙҒА ДЕЙІНГІ БҰЗАУЫНЫҢ ӨСУ ЖАҒДАЙЫ**

**Аннотация.** Жоғары сүтті өнімді ірі қара малды өндіру үшін генетикалық сұрыптау ұсыну бойынша, олардың өнімділігін жоғары деңгейге өсуіне мүмкіндік береді, сондықтан қоректік заттардың ұлғайуын талап етеді. Бұзаулардың дұрыс деңгейде өсіп-жетілу үшін, туғаннан бастап тиімді тамақтандыру бойынша, олардың денсаулығына және физиологиялық ерекшеліктерін қалыптастыру үшін маңызы зор.

Мақалада «Байсерке-Агро» ЖШС-нің сүт кешеніндегі голштин тұқымындағы бұзаулардың өсуіне өсуі мен дамуына туғаннан 6 айлық жасқа дейінгі азықтандыру мен тамақтанудың әсеріне баса назар аударылды (n = 96 бас).

**Түйін сөздер:** ірі қара мал, бұзау, өсу, сүт бездерінің дамуы, азықтандыру, рацион, бұзау өсіру, уыз, сүт сауымы.

А. С. Калимолдинова, Г. К. Жаксылыкова,  
А. Е. Чиндалиев, К. Байгабылов, А. Д. Баймуканов

<sup>1</sup>ТОО «Учебный научно-производственный центр «Байсерке-Агро»,  
Талгарский район, Алматинская область, Казахстан,

<sup>2</sup>Российский государственный аграрный университет –  
Московская сельскохозяйственная академия им. К. А. Тимирязева, Москва, Россия

### РОСТ И РАЗВИТИЕ ТЕЛЯТ ГОЛШТИНСКОЙ ПОРОДЫ В МОЛОЧНОМ КОМПЛЕКСЕ ТОО «БАЙСЕРКЕ-АГРО»

**Аннотация.** Прогресс в генетическом потенциале и пищевых потребностях животных ускорил темпы роста. Генетический отбор для высокой молочной продуктивности предполагает более высокую способность к росту и, следовательно, требует увеличения питательных веществ. Управление питанием с рождения имеет решающее значение для роста и развития, а также формирования физиологических особенностей молодняка влияющих на их здоровье.

В статье основное внимание уделено влиянию кормления и питания от рождения до 6 месячного возраста на рост и развитие у телят голштинской породы, а также проведение мониторинга и определение среднесуточного привеса в молочный период молодняка разных возрастных групп (n = 96 гол.) в молочном комплексе ТОО «Байсерке-Агро».

**Ключевые слова:** крупный рогатый скот, телка, рост, развитие молочных желез, кормление, рацион, выращивание телят, молозиво, надой молока.

#### Information about authors:

Kalimoldinova Asel Sanatkyzy, Researcher, ESPC Bayserke-Agro LLP, Talgar District, Almaty Region, Kazakhstan; kalimoldinova\_assel@mail.ru; <https://orcid.org/0000-0002-6698-3981>

Zhaksylykova Gulnur Kenesbekovna, Senior Researcher, ESPC Bayserke-Agro LLP, Talgar District, Almaty Region, Kazakhstan; gulnurzh@ro.ru; <https://orcid.org/0000-0001-9020-5656>

Chindaliyev Askhat Erbosynovich, Master in Agriculture, Senior Researcher, ESPC Bayserke-Agro LLP, Talgar District, Almaty Region, Kazakhstan; achindaliyev@rambler.ru; <https://orcid.org/0000-0002-2468-3809>

Baigabylov K. O., Senior Researcher, ESPC Bayserke-Agro LLP, Talgar District, Almaty Region, Kazakhstan; unpcbayerke-agro@mail.ru; <https://orcid.org/0000-0002-5267-2031>

Baimukanov Aidar Dastanbekouly, student Master of the Faculty of Zootechnics and Biology of the Russian State Agrarian University – Moscow Agricultural Academy named after K. A. Timiryazev, Moscow, Russia; aidartaidar98@mail.ru; <https://orcid.org/0000-0001-9669-864X>

#### REFERENCES

[1] Bakaeva L.N., Grigoriev V.S. (2012). Growth and biological characteristics of calves with different feeding methods // Bulletin of the Samara State Agricultural Academy. N 1. P. 103-107 (in Russ.).

[2] Levakhin V.I., Babicheva I.A., Poberukhin M.M. (2011). The productivity of young cattle, depending on the technology of cultivation and feeding // Bulletin of the Russian Academy of Agricultural Sciences. N 3. P. 62-63 (in Russ.).

[3] Babicheva I.A. (2014). The use of protein and vitamin supplements to increase the growth and development of animals // News of the Orenburg State Agrarian University. N 3(47). P. 105-107 (in Russ.).

[4] Ombayev A.M., Begaliyeva D.A., Alentayev A.S., Baimukanov D.A. (2017). Intensive technologies for the directional growing of young stock of dairy breeds in the Akmola and Almaty regions. Research, results. Almaty Publishing house of KazNAU. N 4. P. 166-170. (in Russ.).

[5] Baimukanov D.A., Abugaliyev S.K., Seidaliyev N.B., Semenov V.G., Chindaliyev A.E., Dalibayev E.K., Zhamalov B.S., Muka Sh.B. (2019). Productivity and estimated breeding value of the dairy cattle genepool in the Republic of Kazakhstan // Bulletin of the National academy of sciences of the Republic of Kazakhstan. 2019. Vol. 1, N 377. P. 39-53. <https://doi.org/10.32014/2019.2518-1467.5> ISSN 2518-1467 (Online), ISSN 1991-3494 (Print).

[6] Ernst L.K., Kravchenko N.A., Soldatov N.P. et al. (1987). Breeding work in animal husbandry / Ed. N. A. Kravchenko. M.: Agropromizdat. 287 p. (in Russ.).

[7] Isabekov K.I., Malchevsky A.Yu. (2012). On the issue of using breeding value indices in the conditions of modern industry of beef cattle breeding // Bulletin of agricultural science of Kazakhstan. Almaty. N 4. P. 45-49 (in Russ.).

[8] Instructions for bonitation of meat cattle breeds (2000). (coll. of authors). Astana. 22 p. (in Russ.).

**NEWS**

OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN

**SERIES OF AGRICULTURAL SCIENCES**

ISSN 2224-526X

Volume 5, Number 53 (2019), 58 – 65

<https://doi.org/10.32014/2019.2224-526X.61>

UDC 633.2.033.289.1

**Zh. B. Issaeva**

Innovative university of Eurasia, Pavlodar, Kazakhstan.

E-mail: zhanetta.aysha@mail.ru

**RATIONAL USE OF NATURAL PASTURES  
IN TERMS OF KORDAY DISTRICT**

**Abstract.** Complex research was conducted on the rational use of natural pastures, through the seasonal use of foothill pastures in a particular area. On the basis of geobotanical survey, the farm areas were divided into seasons of their use with separation of plant associations. At seasonal use the account of productivity of natural herbage stands on seasons of year is carried out and the gain of live weight of animals for the pasture period is defined. It was found that the use of seasonal pastures provides more weight gain for studied animals compared to animals that graze in one place with an unsystematic manner of grazing. The research was conducted in 2015-2017 on the lands of “Baty” farm in Korday district of Zhambyl region. The pasture lands of the farm consists of 5 independent sites and are located in 3 geographical areas: foothill-steppe, foothill-dry steppe and foothill-semi-desert. The total area of distant pastures is 4.200 hectares.

**Keywords:** pastures, natural herbage, natural areas, soil moisture, yield, animals.

**Introduction.** Pasture is the main feed of renewable vegetable resource. Our country ranks sixth in the world in terms of their area. In our Republic, hayfields and pastures occupy 188.9 million hectares and their share in agricultural land is 7.5 times greater than the area of arable land. Currently, about 48 million hectares in the country are degraded due to the unsystematic use of pastures and animal husbandry due to the limitation of the boundaries of the grazing area. As a result, there is a "failure" of pastures and a sharp decrease in the productivity of grass stands. The main area of degraded land is usually confined to human settlements, as the bulk of farm animals are in private use. At the same time, the concentration of cattle on these lands turns them into barren areas, as they have been grazing for decades without any regime of use [1-4].

Basically, the failure of these lands occurred due to the greater concentration of animals in a limited area, violation of the principle of seasonality and rotation of the used areas, non-compliance with the load of grazing, terms of use of land. In many districts and regions this issue is particularly relevant, because the increase in the number of livestock (animals grazed on pastures) per 1 hectare of feed area used is much faster than the increase in the gross forage stock of pastures. For this reason, the rate of loading of animals on watered pastures is increasing. This imbalance has led, in some cases, to difficulties in environmental and economic regulation in the pasture sector. In addition, at present, the main reason for the degradation of rangelands is the desire of society to obtain the highest possible income, which leads to unreasonably high volumes of extraction of natural resources that exceed the potential of nature itself [5, 6].

The modern state of pastures in the Republic is characterized, at one side, a progressive deterioration of productivity and quality of pasture forage, on the other – the maximum concentration of the livestock used site. For this reason, increased excessive intensive use of irrigated pastures, especially when well and when countryside array, without complying with the load and basic pasture turnover, which gradually broke the ecological balance that has led not only to reduction geed stock, but degrade land, the emergence of wind erosion and overgrowing weeds and not eat ability vegetation.

This study aims to solve problems through the use of science-based approaches of exploitation of pasture resources using distant pasture in a particular area. In this regard, the development of new forms of animal husbandry, wide licet cattle crossing to distant areas according to seasons in order to reduce degradation of pastures, is a promising direction of agricultural research and reflects the needs of the livestock industry in the republic.

**Material and methods.** The research was carried out in 2015-2017 on the lands of the peasant farm “Batyr” located in the rural district of Kenen, Korday district, Zhambyl region. Pasture lands of the farm consists of 5 independent sites and are located on 3 geographical zones: foothill-steppe (950 ha), foothill-dry steppe (1370 ha) and foothill-semi-desert (1880 ha). The total area of distant pastures is 4.200 hectares.

The works performed are as follows:

- determination of soil moisture reserves – 4 points, by drilling up to 0.5 m. Soil samples were taken by soil drill on 4 fixed sites, layer by layer 10 cm by thermostatic-weight method for seasons of the year: spring, summer and autumn in triple repetition;
- selection of soil samples on 4 fixed sites, layer by layer 10 cm to a depth of 50 cm, for agro-chemical analysis; determination of the volume mass of soil on 4 fixed sites, layer by layer 10 cm to a depth of 50 cm in triple repetition [7];
- plant height was determined before taking into account the yield of green mass by measuring 25 plants of each species; accounting of green mass yield of natural pastures was carried out on specific plant outlines for the grazing period in 10 m<sup>2</sup>. The Botanical composition was taken into account by analysis of a trial sheaf weighing 1 kg at natural humidity in 2 - fold repetition [8-10];
- chemical composition of the fodder according to seasons was defined in the Institute’s laboratory (“Kazakh Scientific Research Institute of Animal Breeding and Forage Production”) by common methods;
- live weight gain of animals was carried out by weighing of the selected animals in the control and experimental groups (10 animals in each group) [11].

**Results.** Pasture lands of the project area are located in 3 zones in the conditions of vertical zonality, which distinguishes them by soils and vegetation cover. The pasture lands of “Batyr” farm consists of 5 independent sites:

The site 1 is located in the foothill-semi-desert zone (soil –ordinary grey-brownish) in the coordinate system N 43 27 17.8; E 074 55 46.2. Botanical study of the site has allowed to identify 3 independent plant associations: *Ceratocarpus* –*Artemisia*, *Artemisia*-*ephemerae* and *Ephemerae* -*Artemisia*.

The site 2 and 3 are located in the foothill-dry steppe zone (soil – light brown) with coordinates N 43 28 58.8; E 074 50 43.8. Botanical study of the site allowed to identify 4 independent plant associations: *Festuca*-*variiherbetum*, *Festuca*-*Artemisia*- *variiherbetum*, *Stipa*-*Poa*-*Artemisia* and *Artemisia*-*Festuca*.

The site 4 and 5 are located in the foothill steppe zone (soil – dark chestnut) with coordinates N 43 19 46.4; E 075 01 02.2. Botanical study of vegetation allowed to allocate 6 independent plant associations on the site: *Onobrychis*-*Bromopsis*-*Festuca*, *Festuca*-*Poa*-*Carex*, *Gramineae*-*Erysimum*, *Onobrychis*-*Festuca*-*Poa*-*Bromopsis*, *Bromopsis*-*Alyssum*-*Secale* and *Bromopsis*-*Festuca*-*Onobrychis*.

The site 6 located in the foothill-semi-desert zone in the coordinate system N 42 27 34.5; E 074 53 26.7. As a control variant, the lands of the settlement “Kenen” located in the foothill-semi-desert zone with *Artemisia* forage, with unsystematic and all-year free grazing pasture.

Based on the results of geobotanical studies conducted in 2015, distant pastures were divided according to their lifetime: pastures located in the foothill steppe area used in autumn, the foothill dry steppe pastures are used in summer and foothill semi-desert pastures are used in the spring time. At all of these distant areas were conducted grazing normalized experimental animals where the degree of grazing of the herbaceous layer accounted for 70% of the total weight.

In the course of the work, studies were carried out to determine soil moisture in all geographical areas, on selected plant associations – accounting for the harvest of natural grass stands and at the end of the pasture period – the increase in live weight of animals.

The research we carried out, concerning the determination of the total moisture reserve in the soil, showed that all the types of pastures in the spring time had a sufficient level of humidity suitable for the initial growth of grasses (table 1).

Table 1 – Soil water storage under the plants according to seasons, mm

| Year | Season sampling, cm | Depth of sampling, cm | Pastures according their use                    |                                                                  |                                                |                                                             |
|------|---------------------|-----------------------|-------------------------------------------------|------------------------------------------------------------------|------------------------------------------------|-------------------------------------------------------------|
|      |                     |                       | All year-round grazing                          | Spring grazing                                                   | Summer grazing                                 | Autumn grazing                                              |
|      |                     |                       | Artemisia (foothill semi-desert zone) (control) | Artemisia-Ceratocarpus-Carex-Alyssum (foothill semi-desert zone) | Stipa-Poa-Artemisia (foothill dry steppe zone) | Poa-Onobrychis-Festuca-Carex-Alyssum (foothill steppe zone) |
| 2015 | Spring              | 0-30                  | 20,3                                            | 25,7                                                             | 39,5                                           | 50,4                                                        |
|      |                     | 0-50                  | 42,7                                            | 47,6                                                             | 71,5                                           | 90,1                                                        |
|      | Summer              | 0-30                  | 17,1                                            | 20,7                                                             | 27,4                                           | 21,9                                                        |
|      |                     | 0-50                  | 32,4                                            | 37,3                                                             | 51,8                                           | 40,2                                                        |
|      | Autumn              | 0-30                  | 7,6                                             | 10,6                                                             | 14,5                                           | 19,4                                                        |
|      |                     | 0-50                  | 21,3                                            | 24,2                                                             | 32,1                                           | 35,5                                                        |
| 2016 | Spring              | 0-30                  | 47,3                                            | 50,5                                                             | 75,0                                           | 81,8                                                        |
|      |                     | 0-50                  | 78,2                                            | 86,2                                                             | 122,5                                          | 139,4                                                       |
|      | Summer              | 0-30                  | 15,4                                            | 18,6                                                             | 26,2                                           | 30,1                                                        |
|      |                     | 0-50                  | 30,1                                            | 34,9                                                             | 43,9                                           | 51,0                                                        |
|      | Autumn              | 0-30                  | 11,4                                            | 13,0                                                             | 16,6                                           | 22,4                                                        |
|      |                     | 0-50                  | 22,6                                            | 25,6                                                             | 30,9                                           | 40,8                                                        |
| 2017 | Spring              | 0-30                  | 44,8                                            | 50,8                                                             | 52,1                                           | 75,3                                                        |
|      |                     | 0-50                  | 76,5                                            | 89,1                                                             | 86,9                                           | 123,8                                                       |
|      | Summer              | 0-30                  | 14,2                                            | 17,2                                                             | 19,3                                           | 27,6                                                        |
|      |                     | 0-50                  | 29,2                                            | 33,1                                                             | 37,5                                           | 47,4                                                        |
|      | Autumn              | 0-30                  | 10,6                                            | 12,7                                                             | 15,2                                           | 19,5                                                        |
|      |                     | 0-50                  | 20,5                                            | 24,5                                                             | 28,9                                           | 36,5                                                        |

So, in 2015, in spring, the total soil moisture content in the upper 0-30 cm layer in the control variant with year-round use was 20.3 mm, in the foothill-semi-desert zone - 25.7 mm, in the foothill-steppe zone - 39.5 mm and in the foothill-steppe zone - 50.4 mm. In the half-meter layer of soil, these indicators were respectively: 42.7; 47.6; 71.5 and 90.1 mm. The results obtained in determining the total reserves of moisture in the soil show that the best conditions for the accumulation of moisture in the spring period are created in the foothill-steppe zone. Here, the content of total moisture in the 0-30 cm soil layer is 30.1 mm higher than in the control variant of the experiment. In summer, the amount of soil moisture is somewhat reduced due to its use by plants for its growth and development. In this regard, the total moisture content in the soil in the 0-30 cm layer with unsystematic grazing was 17.1 mm, in the spring use area - 20.7 mm, in the summer use area - 27.4 mm and in the autumn section use - 21.9 mm. In the half-meter layer of soil, these figures were, respectively, 32.4; 37.3; 51.8 and 40.2 mm. By the fall, the soil moisture content throughout the soil profile continues to decrease and in the 0-50 cm soil layer on the control variant is 21.3 mm, the semi-desert zone is 24.2 mm, the foothill-dry steppe zone is 32.1 mm and the foothill-steppe zone - 35.5 mm.

At the end of the research (2017) in spring, the total soil moisture content in the upper layer of 0–30 cm was: in the control variant with unsystematic grazing - 44.8 mm, in the foothill-semi-desert zone - 50.8 mm, in the foothill the dry steppe zone is 52.1 mm and in the foothill steppe zone is 75.3 mm. In the half-meter layer of soil, these indicators were respectively: 76.5; 89.1; 86.9 and 123.8 mm. In the summer, this figure decreases slightly and amounts to 14.2 mm in unsystematic grazing, in the semi-desert it was at the level of 17.2 mm, in the steppe and steppe zones - to 19.3 to 27.6 mm. In the 0-50 cm layer, these

figures were respectively: 29.2; 33.1; 37.5 and 47.4 mm. By the autumn, the soil moisture content in the control variant with unsystematic grazing in the 0-30 cm layer was 10.6 mm, the semi-desert zone - 12.7 mm, the foothill-dry steppe zone - 15.2 mm, in the foothill-steppe zone - 19.5 mm. In the half-meter layer of soil, these figures were respectively: 20.5; 24.5; 28.9 and 36.5 mm.

The observation showed that the all-year pasture had a slightly lower level of the soil moisture during the moisture-accumulating period, than the pastures of spring, summer and autumn use. It should be noted that such minimal content of soil moisture in the treatment is linked with the fact that here the plant cover of the soil surface is very weak, and it is less than 50%, whereas in seasonal areas it is higher and ranges from 70 to 90%. In this context, in the foothill semi-desert zone with ordinary grey-brownish soil (control) the moisture accumulated in winter and early spring periods is used not only for the growth and development of the grass, but most of it is spent on physical evaporation from the soil surface. In addition, the total moisture content in the soil is greater in the foothill-steppe zone with *Poa-Onobrychis-Festuca-Carex-Alyssum* associations, compared with other variants of experience, which is logical. This is due to the fact that in the piedmont-steppe zone more precipitation falls due to the proximity of the mountains, and they are located at an altitude of 1350 meters above sea level, snow comes off the surface of pastures in mid-April. In addition, they are located on a dark chestnut soil; in the spring, the wetting of the soil along the moisture profile is more than 100 cm.

In 2015, on the control version of the experiment, the projective soil cover by the grass stand was between 30-35%. In the distant pastures, that is, in the spring pasture, this indicator was at the level of 50-55%, in the summer - 60-65% and in the autumn - 70-80%. At the end of studies (2017), on the distant sites, the projective soil cover by plants increased by 8-10%, due to the appearance of young shoots of growing plants, while in the control sites this indicator remained almost unchanged, remained at the same level.

In order to identify feed capacity of the used pastures, we have recorded yields of pasture herbage in the selected plant associations according to seasons (table 2).

Table 2 – Yield of pasture grass in the conditions of vertical zoning of the soil (average for the period of 2015-2017)

| Natural area         | Season using                           | Plant associations                      | Seasons of the year, c/ha |        |        |
|----------------------|----------------------------------------|-----------------------------------------|---------------------------|--------|--------|
|                      |                                        |                                         | spring                    | summer | autumn |
| Foothill semi-desert | Control – all-year round use           | <i>Artemisia</i>                        | 7,9                       | 4,1    | 3,9    |
|                      | I area – spring use (spring pasture)   | <i>Ceratocarpus -Artemisia</i>          | 13,7                      | 7,1    | 8,3    |
|                      |                                        | <i>Artemisia-ephemerae</i>              | 13,5                      | 7,2    | 8,1    |
|                      |                                        | <i>Ephemerae -Artemisia</i>             | 15,5                      | 8,4    | 9,4    |
| Foothill dry steppe  | Area II – summer use (summer pasture)  | <i>Festuca-variierbetum</i>             | 17,8                      | 19,6   | 12,1   |
|                      |                                        | <i>Festuca-Artemisia- variierbetum</i>  | 18,8                      | 19,7   | 13,6   |
|                      |                                        | <i>Stipa-Poa-Artemisia</i>              | 16,4                      | 17,6   | 11,7   |
|                      |                                        | <i>Artemisia-Festuca</i>                | 16,0                      | 17,3   | 10,7   |
| Foothill steppe      | Area III – autumn use (autumn pasture) | <i>Onobrychis-Bromopsis-Festuca</i>     | 40,8                      | 38,3   | 25,9   |
|                      |                                        | <i>Festuca-Poa-Carex</i>                | 26,9                      | 27,9   | 21,6   |
|                      |                                        | <i>Gramineae-Erysimum</i>               | 37,1                      | 37,9   | 24,3   |
|                      |                                        | <i>Onobrychis-Festuca-Poa-Bromopsis</i> | 33,5                      | 34,9   | 23,2   |
|                      |                                        | <i>Bromopsis-Alyssum-Secale</i>         | 30,1                      | 31,4   | 20,2   |
|                      |                                        | <i>Bromopsis-Festuca-Onobrychis</i>     | 32,1                      | 33,2   | 21,4   |

Studying the yield of green mass of natural grass stands on average for three years showed that the maximum yield of pasture mass at the site of spring use in the piedmont-semi-desert zone provided the *Ephemerae –Artemisia* type of pastures, where it was 15.5 c/ha in spring, in summer - 8.4 c/ha and in autumn - 9.4 c/ha. In the area of summer use in the foothill-dry steppe zone, the highest yield of pasture mass was noted in the *Festuca-Artemisia- variierbetum* type of pasture, where it was 18.8 c/ha in the

spring, 19.7 c/ha in the summer and 13.6 in the autumn. In the foothill-steppe zone, in the area of autumn use, the yield of pasture mass is higher on the vegetation contour consisting of *Onobrychis-Bromopsis-Festuca* vegetation, where it was 40.8 c/ha in the spring, 38.3 c c/ha in the summer and 25.9 c/ha autumn. At the same time, in the distant pastures the peak of the yield falls on the summer periods. In the control variant of the experiment with year-round use the lowest yield of pasture mass was obtained. Here, with *Artemisia* type of pasture, the yield of grasses was in the spring - 7.9 c/ha, in the summer - 4.1 c/ha and in the autumn - 3.9 c/ha.

Determination of pasture mass yields in the project area according to the seasons of the year showed that the maximum yield of the pasture mass at the site of spring use is provided by the *Ephemerae - Artemisia* type, at the site of summer use - *Festuca-Artemisia- variierbetum* and on the site of autumn use - *Onobrychis-Bromopsis-Festuca* type. At the same time, in the distant pastures the peak of the yield falls on the summer periods.

A study of the chemical composition of herbage in associations for an average of three years showed that in the foothill-semi-desert zone the crude protein content was: 8.1% in spring, in summer - 7.3% and 6.1% in autumn. In the foothill-steppe zone they amounted from - 8.8; 7.9; 6.8%, and in the foothill-steppe zone - 9.1; 8.2; 6.9%, respectively. In the control variant of the experiment the content of crude protein was 7.4% in spring, 6.6% in summer and 5.6% in autumn (figure 1).

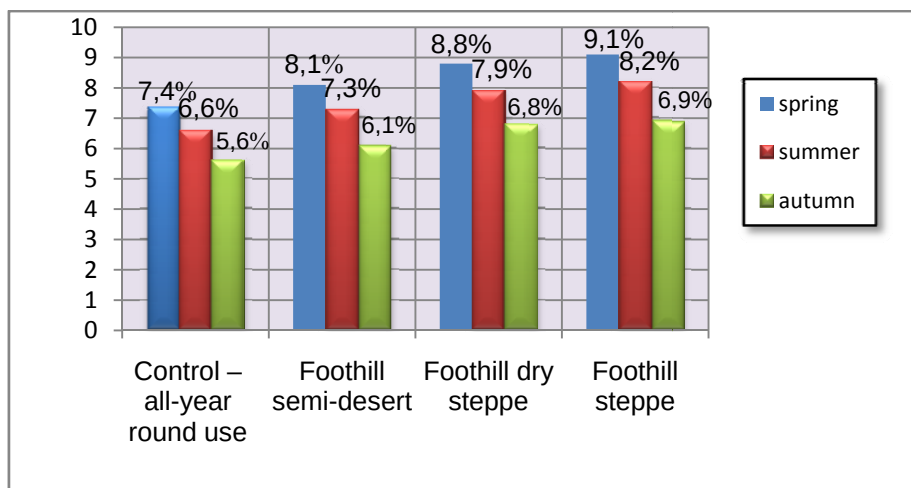


Figure 1 – Dynamics of change in protein content in pasture forage by seasons of the year, % (average for 2015-2017)

The obtained data showed that the content of crude protein in grass stands decreased from spring to autumn in the studied areas, except for the semi-desert zone. Here decrease in crude protein is observed only until august and in september there is an increase due to the rapid development of *Artemisia*.

The opposite tendency was observed for the cellulose content of herbage. In the spring period the content of cellulose in herbage from pastures in foothill semi-desert zone was 26.4%, in herbage from foothill dry steppe zone – 24.7% and in herbage from foothill steppe zone – 23.7%. At the end of investigations these indicators raised and were up to standard. The cellulose content of herbage – 29.1; 27.8 and 28.1% respectively (figure 2). In the control variant of the experiment, the amount of cellulose was 25.8% in spring, 27.3% in summer, and 28.7% in autumn.

The results for protein and cellulose content showed the following tendency: while the protein content decreased from spring to fall the cellulose content increased. The cellulose content reached the maximum value in September when grasses finished their development and became more thicker.

The economic assessment of seasonal use of pastures in the project area was carried out (table 3). To do this, in the spring were selected 2 groups of animals-analogues (experimental and control) three age groups: tuppings rams, ewes of the 3<sup>rd</sup> year of life and lambs of the year of birth. The breed of sheep is – Kazakh fine-wool sheep [12]. In the spring, before the start of sheep grazing (starting indicators), the difference in live weight in the selected analogues on average for three years did not exceed 1.5 kg. The

control group was in the foothill-semi-desert zone on the lands of the settlement “Kenen” and grazed in a free manner, all year round in one place. Experimental group were grazing under the scheme, that is, on seasonal pastures.

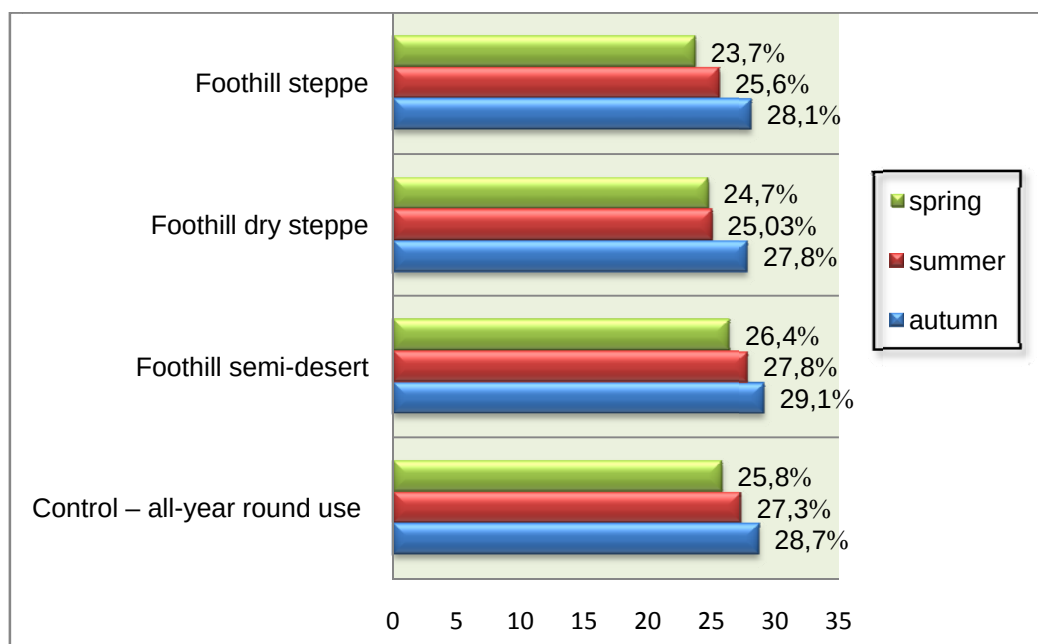


Figure 2 – Dynamics of cellulose content in herbage according to seasons, %  
(average for 2015-2017)

Table 3 – The dynamics of the live weight of animals in the seasonal pastures, kg/head

| Year                     | Season | The live weight of animals, kg/head |                  |                       |                  |                                           |                  |
|--------------------------|--------|-------------------------------------|------------------|-----------------------|------------------|-------------------------------------------|------------------|
|                          |        | Tupping rams<br>(n=10)              |                  | Ewes<br>(n=10)        |                  | The lambs of this tear of birth<br>(n=10) |                  |
|                          |        | experimental<br>group               | control<br>group | experimental<br>group | control<br>group | experimental<br>group                     | control<br>group |
| 2015                     | Spring | 83.520±1.64                         | 81.690±1.53      | 51.120±1.26           | 49.840±1.25      | 17.940±2.21                               | 16.970±2.18      |
|                          | Autumn | 85.300±1.47                         | 82.120±1.46      | 58.450±0.75           | 54.700±0.81      | 36.300±0.58                               | 27.400±2.72      |
| 2016                     | Spring | 81.340±0.67                         | 81.410±0.72      | 48.320±0.83           | 49.100±1.03      | 14.80±2.46                                | 14.600±2.60      |
|                          | Autumn | 86.370±0.60                         | 83.740±0.81      | 59.100±0.67           | 55.000±0.39      | 38.800±0.72                               | 31.950±1.12      |
| 2017                     | Spring | 79.300±0.64                         | 80.100±0.73      | 49.200±2.05           | 49.800±1.44      | 15.800±1.99                               | 15.400±1.93      |
|                          | Autumn | 87.700±1.25                         | 83.400±1.24      | 63.300±1.23           | 56.100±2.02      | 43.000±1.98                               | 32.800±2.01      |
| average for<br>2015-2017 | Spring | 83.380                              | 81.060           | 49.550                | 49.580           | 16.180                                    | 15.650           |
|                          | Autumn | 86.450                              | 83.080           | 60.280                | 52.260           | 39.360                                    | 30.720           |

Thus, from the obtained data it can be seen that a higher gain of live weight was obtained in the experimental group of animals where seasonal grazing was used on the pasture. Seasonal grazing for an average of three years of research at the end of the grazing period provided a gain in live weight of tupping rams at – 3.370 kg/head, in ewes on 8.020 kg/head and lambs of the current year of birth on 8.640 kg more than the control groups of animals that grazed haphazardly on the control pasture.

It should be noted that during the pasture period, the increase in live weight of animals in the experimental group in 2017 is higher than in previous years of the study. So if the increase in live weight in the experimental group in 2015 in tupping rams was 3.180 kg/head, in ewes – 3.750 kg/head and lambs of the current year of birth – 8.900 kg/head, in 2016 – 2.630; 4.100 and 6.850 kg/head, in 2017, these

indicators amounted to 4.30; 7.200 and 10.200 kilograms per head, respectively, compared with the control groups of animals. The increase in live weight gain in experimental groups of animals is due to the fact that in 2017, when grazing animals on seasonal sites, an intra-seasonal pasture turnover was used, in which virtually reduced three times unproductive (idle) movement of animals in search of food in the grazing area, is also sharply reduced trampling vegetation, and in addition completely eliminates the degradation of pasture area.

In addition, the experimental data show that during the pasture period the highest increase in live weight was provided by lambs of the current year of birth. On average, for three years of research during the grazing period, the increase in live weight of lambs of the current year of birth from spring to autumn was in the experimental group – 23.180 kg/head, and in the control group – 15.070 kilograms per head. Such high rates of live weight gain of lambs during the pasture period is mainly due to the increase in muscle mass. It should be noted that during the pasture period, the smallest increase in live weight of animals was noted in sheep-producers, which is natural, since they were additionally fed with concentrated feed in the winter months and they were well-fed in the spring, they also ran out of muscle growth.

**Conclusion.** Thus, the use of seasonal pastures provides more live weight gain of the studied animals compared to the animals that graze in one place with a free grazing.

**Ж. Б. Исаева**

Инновациялық Еуразия университеті, Павлодар, Қазақстан

#### **ҚОРДАЙ АУДАНЫ ЖАҒДАЙЫНДА ТАБИҒИ ЖАЙЫЛЫМДАРДЫ ТИІМДІ ПАЙДАЛАНУ**

**Аннотация.** Нақты аумақта тау бөктеріндегі жайылымдарды маусымдық пайдалану арқылы табиғи жайылымдарды ұтымды пайдалану бойынша зерттеулер кешенді жүргізілді. Геоботаникалық зерттеулер негізінде шаруашылық аумағы өсімдік қауымдастықтарын бөле отырып, оларды пайдалану мерзіміне бөлінген. Маусымдық пайдалану кезінде жыл мезгілдері бойынша табиғи шөптердің шығымдылығын есепке алу жүргізілді және жайылымдық кезеңде жануарлардың тірі салмағының өсуі анықталды. Жайылымдарды маусымдық пайдалануды қолдану жүйесіз тәсілмен бір жерде жайылатын жануарлармен салыстырғанда зерттелетін жануарлардың тірі салмағының артуын қамтамасыз етеді. Зерттеу 2015-2017 жылдары Жамбыл облысы Қордай ауданы "Батыр" шаруа қожалығының жерінде жүргізілді. Шаруа қожалықтың жайылым жерлері 5 дербес телімнен және 3 географиялық аймақта орналасқан: таубөктерлік-шөлейт, таубөктерлік-қуаң дала және таубөктерлік-дала. Шалғайдағы жайылымның жалпы аумағы 4200 гектарды құрайды.

**Түйін сөздер:** жайылымдар, табиғи шөптер, табиғи аймақтар, топырақтың ылғалдылығы, өнімділігі, жануарлар.

**Ж. Б. Исаева**

Инновационный Евразийский университет, Павлодар, Казахстан

#### **РАЦИОНАЛЬНОЕ ИСПОЛЬЗОВАНИЕ ЕСТЕСТВЕННЫХ ПАСТБИЩ В УСЛОВИЯХ КОРДАЙСКОГО РАЙОНА**

**Аннотация.** Комплексно проводились исследования по рациональному использованию естественных пастбищ, путем сезонного использования предгорных пастбищ на конкретной территории. На основании геоботанических исследований, территория хозяйства были разделены на сезоны их использования, с выделением растительных ассоциаций. При сезонном использовании проведены учет урожайности естественных травостоев по сезонам года и определены прироста живой массы животных за пастбищный период. Установлено, что применение сезонного использования пастбищ обеспечивает больше прироста живой массы изучаемых животных по сравнению с животными, которые выпасаются в одном месте с бессистемным способом пастбы. Исследования проводился в 2015-2017 годы на землях крестьянского хозяйства «Батыр» Кордайского района Жамбылской области. Пастбищные земли хозяйства состоит из 5-ти самостоятельных участков и расположены на 3-х географических зонах: предгорно-степной, предгорно-сухостепной и предгорно-полупустынной. Общая площадь отгонных участков составляет 4200 гектаров.

**Ключевые слова:** пастбища, естественный травостой, природные зоны, влажность почвы, урожайность, животные.

**Information about author:**

Issayeva Zhanetta, PhD, associate professor of department the "Agriculture and Bioresources" Innovative Eurasian university, Pavlodar, Kazakhstan; zhanetta.aysha@mail.ru; <https://orcid.org/0000-0002-4182-3041>

**REFERENCES**

- [1] Meshetich V.N., Ayaganov A.B. Haymakings and pastures – recovery time has come // Agro Inform. 2013. N 4. 2 p.
- [2] Kuliev T.M., Zhazylbekov N.A., Alimaev I.I., Kuliev R.T. Development Program of Livestock and Feed Production Industries of the Republic of Kazakhstan in the Context of Regions for the Period of 2012-2016. Almaty: Bastau, 2013. P. 14-19.
- [3] Dyusenbaev Zh. To improve the efficiency pasture land // Kazakhstan truth. 2015. N 25(27901). 8 p.
- [4] Bekturganova A.E., Mykhybayev M., Yermekbayev B. (2019) The rational land use of agricultural purpose in the land law of the republic of Kazakhstan // Bulletin of National academy of sciences of the Republic of Kazakhstan. 2019. Vol. 3, N 51. P. 5-10. <https://doi.org/10.32014/2019.2224-526X.27> ISSN 2224-526X (Online).
- [5] Rassomakhin I.T., Kuchеров V.S., Kozhagaliyeva R.Zh. Ecological direction of assessment of fodder grounds of sukhostepny and semidesertic zones of Cisural area and Zavolzhye // Messenger of agricultural science of Kazakhstan. 2008. N 5. P. 32-35.
- [6] Le Houerou H.H. Ecological management of arid grazing land ecosystem // IUCN. 2005. P. 45-49.
- [7] Guide to field researches and mapping of soils. Soil shooting. Prod.: Academy of Sciences of the USSR. M., 1959. P. 299-303.
- [8] Dospheov B.A. Metodika polevogo opyita. M.: Agropromizdat, 1985. 351 p.
- [9] A methods of experiences on hayfield and pastures. M.: VIK, 1971. Part 1. 229 p.
- [10] A methods of experiences on hayfield and pastures. M.: VIK, 1971. Part 2. 174 p.
- [11] Ovchinnikov V.A. Methods of carrying out experienced works in animal breeding. M., 1976. 261 p.
- [12] Zhumagaliyeva G.M., Kulatayev B.T. (2018) Productive and reproductive qualities of sheep of the Kazakh fine-wool breed // Bulletin of National academy of sciences of the Republic of Kazakhstan. 2018. Vol. 6, N 48. P. 81-86 <https://doi.org/10.32014/2018.2224-526X.23> ISSN 2224-526X (Online).

NEWS

OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN

SERIES OF AGRICULTURAL SCIENCES

ISSN 2224-526X

Volume 5, Number 53 (2019), 66 – 72

<https://doi.org/10.32014/2019.2224-526X.62>

UDC 633.34:578

Sh. Mazkirat, D. I. Babissekova,  
S. V. Didorenko, R. S. Yerzhebayeva

LLP “Kazakh Scientific Research Institute of Agriculture and Plant Growing, Almaty region, Kazakhstan.  
E-mail: shynarbek.mazkirat@gmail.com, janeka\_\_88@mail.ru, svetl\_did@mail.ru, raushan\_2008@mail.ru

## IDENTIFICATION OF PHOTOPERIOD SENSITIVITY GENE *E7* IN SOYBEAN CULTIVARS AND BREEDING LINES USING SSR MARKERS

**Abstract.** Soybean (*Glycine max*) is a short-day plant and its different genotypes start to flower when the day length is less than their critical day length. Southern regions of Kazakhstan are the main sowing area for this crop, and it is crucial to develop soybean cultivars adapted to conditions in North Kazakhstan. In this article, soybean cultivars and their breeding lines were tested to detect *E7* locus determining photosensitivity, SSR markers Satt100 and Satt319 linked to *E7* locus were used in order to distinguish promising cultivars and breeding lines for further breeding plan. 37 soybean cultivars and 34 breeding lines of legume department in KazSRIA&PG were taken as a research object. As a result of SSR genotyping 16 soybean cultivars and 7 hybrids have the recessive alleles corresponds to photoperiodic recessive alleles, these cultivars and breeding lines with *e7* locus are recommended to our breeders as a genetic resource to develop photoinensitive varieties.

**Keywords:** soybean, *E7* gene, SSR markers, photoperiod insensitivity.

**Introduction.** Soybean (*Glycine max* (L.) Merr.) is one of the most economically important oil crops. It is a rich source of vegetable oil and protein feed, macronutrients and minerals, soybean also contains secondary metabolites [1], saponins, phytic acid, oligosaccharides, goitrogens [2], and phytoestrogens [3]. It is not only an important food, feed (protein-oil), technical culture in the world but also in Kazakhstan [4]. Soybean is a more profitable crop. Profitability of production reaches close to 120% in the southeast of Kazakhstan [5]. In 2017, soybean cultivated area in the world was about 123 million hectares [6]. Kazakhstan also pays more attention to increasing soybean production. Sowing area in 2018 reached 126 thousand hectares [7]. In the Republic of Kazakhstan according to the program for diversification of agricultural crops, sowing area of soybean will be reached 400,000 hectares by 2020, this would enable Kazakhstan to produce 1 million tons of soybean seeds in the country [8].

The main region of soybean cultivation is south and south-east of Kazakhstan, however, cultivating soybean in northern part of Kazakhstan is projected where soybean has not previously been a traditional culture (Kostanay, North Kazakhstan and East Kazakhstan regions). Extension of soybean cultivated area in the northern and eastern regions of the republic is a target indicator of the State program for the development of the agro-industrial complex in the Republic of Kazakhstan for 2017-2021. For a large variety of soil and climatic conditions of Kazakhstan, early maturing and resistant to various stresses of soybean cultivars are required. In terms of this, the Kazakh Research Institute of Agriculture and Plant Growing started developing soybean varieties, early maturing, photoperiodic insensitivity and drought resistant, are suitable for sowing in the northern ecotype.

The crop is a short-day plant and its different genotypes start to flower when the day length is less than their critical day length. It is grown worldwide from equator to 50°N and 35°S latitudes [9]. The photoperiod insensitivity is a major criterion that determines the latitudinal adaptation of soybean cultivars [10].

It has adapted to such a wide range of latitudes due to its natural variation of major genes and quantitative trait loci (QTLs) which control flowering time and maturity. Till now, 10 major genes controlling flowering time and maturity have been identified in soybean: *E1* and *E2* [11], *E3* [12], *E4* [13], *E5* [14], *E6* [15], *E7* [16], *E8* [17], *E9* [18] and *J* [19]. Of these 10 genes, *E1*, *E3*, *E4* and *E7* have been reported as quantitative photoperiodic genes [14] with dominant alleles conferring photosensitivity. While dominant alleles at *E1*, *E2*, *E3*, *E4*, *E5*, *E7* and *E8* loci delay time to flowering, recessive alleles at *E6*, *E9* and *J* loci delay flowering time to different extents, interacting with the environment and with genotypes at other loci [9, 18].

The *E7* locus is associated with the response to light quality and it may be related to phytochrome. The study of mapping *E7* locus with the microsatellite markers Satt100, Satt319 and Satt460 on LG C2 (chromosome 6) Satt442 (H), and Satt497 (L) revealed that Satt 100 and Satt 319 are the most effective markers to detect *E7* locus [20].

The effectiveness of detecting *E* alleles for the early diagnosis of the reaction of soybean plants to the photoperiod has been shown in numerous publications [21–24], but these markers have not yet been used in the practical soybean breeding in Kazakhstan. Domestic breeders, developing varieties for various climatic zones of Kazakhstan, deal with a mosaic of forms, groups of maturity and varieties with varying degrees of photosensitivity. Breeders need information on the genetic variability that determines this diversity, as well as a real tool to diagnose the adaptive potential of a plant to a certain longitude of the day in the early stages of the selection process.

The aim of this study is to identify the allelic composition of parental forms and their breeding lines of soybean by the *E7* photoperiod sensitivity gene and select photoinensitivity forms.

**Materials and methods.** 37 soybean cultivars and 34 breeding lines of legume department in KazSRIA&PG were taken as research objects. Early maturing and ultra-early maturing accessions were used to develop early maturing soybean varieties for the eastern and northern regions of Kazakhstan. [Table 2, Table 3].

Simple sequence repeat (SSR) markers Satt 100 and Satt 319 were selected from those designed and mapped by Molnar *et al.* [20] (table 1).

Table 1 – SSR markers used for detecting polymorphism at *E7* locus.

| SSR name | Primer sequences (5'→3')    |
|----------|-----------------------------|
| Satt 100 | F: ACCTCATTTTGGCATAAA       |
|          | R: TTGGAAAACAAGTAATAATAACA  |
| Satt 319 | F: CAACTCAGTAGGGGTCAATAACAA |
|          | R: TGAAATAGGGAAAATAAGGGAACA |

DNA was isolated using the CTAB method [25] from the first true leaves of individual seedlings grown in greenhouse conditions. Fresh leaf samples, about 100 mg each, were transferred to 2-ml test tubes with 600 µl of CTAB extraction buffer containing 1.0% polyvinylpyrrolidone (PVP40) and homogenized using a stainless steel pestle. After that the mix was incubated in water bath for 1-1.5 hours, then added chloroform/octanol (24:1), 96% ethanol added to the supernatant to precipitate and washed several times with 70% ethanol. Isolated DNA was then dissolved in 100 µl of sterile water. The concentration and quality of DNA samples was determined at 260 and 280 nm using a spectrophotometer Jenway 6715 (Jenway, Staffordshire, UK). DNA samples were diluted with sterile water to a concentration of 100 ng/µl for use in further experiments.

Polymerase chain reaction was carried in Eppendorf Mastercycler (Germany). The PCR conditions for both primers were as follows: 1×PCR buffer, 2.5 mM MgCl<sub>2</sub>, 150 µM each of dNTPs, 0.35 µM 1 of each forward and reverse primers, 1 µl BSA (2 mg/ml) and 1 U of Taq DNA polymerase (Biosan, Novosibirsk, Russia) and 100 ng of template DNA in 15 µl. Thermo-cycling conditions were initial denaturation at 95 °C for 5 min, followed by 35 cycles of 20 s at 95 °C, 1 min at 53 °C, 80 s at 72 °C, and with a final extension of 10 min at 72 °C. The amplification products were separated in polyacrylamide gel

(8% acrylamide, 1×TBE buffer), and gels were stained with ethidium bromide for digital imaging by the QuantumST4 Gel documenting system (Vilber, Collégien, France), as indicated above. The dimensional characteristics of PCR products were determined using the computer software 'QuantumCapt' (Vilber, Collégien, France) to determine the length and intensity of DNA fragments.

**Results and discussion.** In our experiment, three alleles of microsatellite were identified using both of Satt100 and Satt319 markers, the amplified fragments were named as A, B and C. According to Rosenzweig et al. [26] A and B corresponds to *E7* and *e7* genes respectively, an unknown allele also was revealed with a fragment of 154 bp corresponds to C at the locus satt100. The study carried on 37 soybean cultivars showed that 18 cultivars have *E7* locus and 16 varieties have recessive *e7* locus which are associated to photoperiodic insensitivity (table 2). 3 cultivars, 346-271-92, Annushka and Brianskaia, have unknown locus that needs to conduct further investigation to detect the locus.

Table 2 – Results of SSR genotyping used for detecting polymorphism at *E7* locus in 37 soybean cultivars

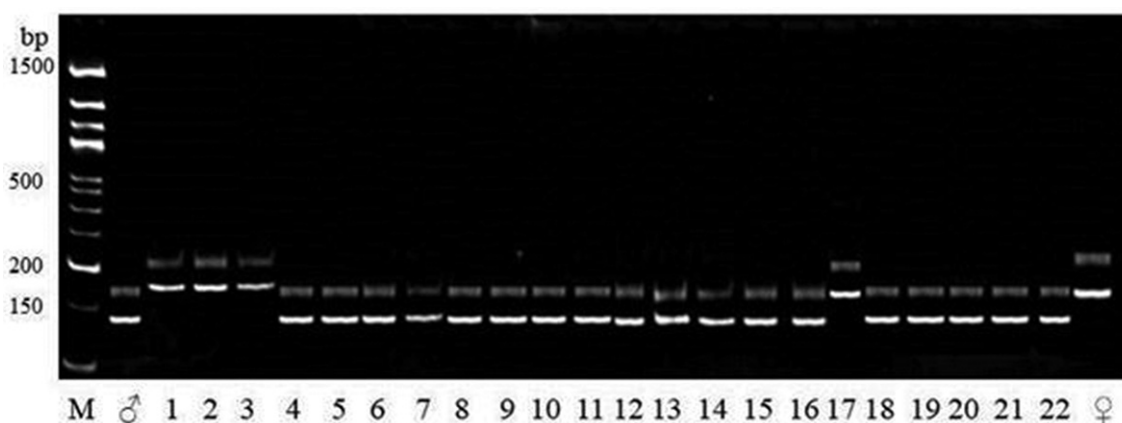
| №  | Accession/cultivar name | Origin/source  | Alleles of loci/genes |          |                |
|----|-------------------------|----------------|-----------------------|----------|----------------|
|    |                         |                | Satt 100              | Satt 319 | <i>E7</i> Gene |
| 1  | HP -203                 | USA            | A                     | A        | <i>E7</i>      |
| 2  | GilChin                 | China          | A                     | A        | <i>E7</i>      |
| 3  | K3972                   | –              | B                     | B        | <i>e7</i>      |
| 4  | K6932                   | –              | B                     | B        | <i>e7</i>      |
| 5  | Rokujuunichi mame       | Japan          | B                     | B        | <i>e7</i>      |
| 6  | 234                     | Russian        | B                     | B        | <i>e7</i>      |
| 7  | 347                     | –              | A                     | A        | <i>E7</i>      |
| 8  | 346-271-92              | Russian        | C                     | C        | -              |
| 9  | 317-236-11              | Russian        | A                     | A        | <i>E7</i>      |
| 10 | 211-124-206             | Russian        | B                     | B        | <i>e7</i>      |
| 11 | 2 CH                    | –              | B                     | B        | <i>e7</i>      |
| 12 | 583583                  | –              | B                     | B        | <i>e7</i>      |
| 13 | Fiskeby 111             | Sweden         | B                     | B        | <i>e7</i>      |
| 14 | LMF                     | Poland         | B                     | B        | <i>e7</i>      |
| 15 | AC Brant                | Canada         | A                     | A        | <i>E7</i>      |
| 16 | Amour                   | France         | B                     | B        | <i>e7</i>      |
| 17 | Sepia                   | France         | B                     | B        | <i>e7</i>      |
| 18 | Amurskaia 401           | Russian        | B                     | B        | <i>e7</i>      |
| 19 | Annushka                | Ukraine        | C                     | C        | -              |
| 20 | Brianskaia              | Russian        | C                     | C        | -              |
| 21 | Birlik KV               | Kazakhstan     | B                     | B        | <i>e7</i>      |
| 22 | Vega                    | Russian        | A                     | A        | <i>E7</i>      |
| 23 | VNIIS 1                 | Russian        | A                     | A        | <i>E7</i>      |
| 24 | Zara                    | Kazakhstan     | A                     | A        | <i>E7</i>      |
| 25 | Zakat                   | Russian        | A                     | A        | <i>E7</i>      |
| 26 | Luchezarnaia            | Russian        | A                     | A        | <i>E7</i>      |
| 27 | Mriia                   | Ukraine        | A                     | A        | <i>E7</i>      |
| 28 | Podiaka                 | Ukraine        | A                     | A        | <i>E7</i>      |
| 29 | Rassvet                 | Russian        | A                     | A        | <i>E7</i>      |
| 30 | Soer 3                  | Russian        | A                     | A        | <i>E7</i>      |
| 31 | Soer 4                  | Russian        | A                     | A        | <i>E7</i>      |
| 32 | Soer 5                  | Russian        | A                     | A        | <i>E7</i>      |
| 33 | Ustia                   | Ukrain         | B                     | B        | <i>e7</i>      |
| 34 | Khorol                  | Canada-Ukraine | B                     | B        | <i>e7</i>      |
| 35 | Jaselda                 | Belarus        | B                     | B        | <i>e7</i>      |
| 36 | Lastochka               | Kazakhstan     | A                     | A        | <i>E7</i>      |
| 37 | Pamiat UGK              | Kazakhstan     | A                     | A        | <i>E7</i>      |

Table 3 – Results of SSR genotyping used for detecting polymorphism at *E7* locus in 36 hybrids and their parent cultivars

| №  | Name of hybrids and parent cultivars | Allele of Satt 100 locus | Allele of Satt 319 locus | <i>E7</i> gene |
|----|--------------------------------------|--------------------------|--------------------------|----------------|
| 1  | Lastochka                            | A ♀                      | A                        | <i>E7</i>      |
| 2  | 234                                  | B ♂                      | B                        | <i>e7</i>      |
| 3  | LT44/11                              | B                        | B                        | <i>e7</i>      |
| 4  | LT44/12                              | B                        | B                        | <i>e7</i>      |
| 5  | LT44/2                               | A                        | A                        | <i>E7</i>      |
| 6  | Zara                                 | A ♀                      | A                        | <i>E7</i>      |
| 7  | Jaselda                              | B ♂                      | B                        | <i>e7</i>      |
| 8  | N 8                                  | A                        | A                        | <i>E7</i>      |
| 9  | Zara                                 | A ♀                      | A                        | <i>E7</i>      |
| 10 | Khorol                               | B ♂                      | B                        | <i>e7</i>      |
| 11 | N 10/1                               | A/B                      | A/B                      | <i>E7/e7</i>   |
| 12 | N 10/2                               | A/B                      | A/B                      | <i>E7e7</i>    |
| 13 | Zara                                 | A ♀                      | A                        | <i>E7</i>      |
| 14 | 234                                  | B ♂                      | B                        | <i>e7</i>      |
| 15 | L 8/31                               | A                        | A                        | <i>E7</i>      |
| 16 | L 8/32                               | A                        | A                        | <i>E7</i>      |
| 17 | Pamiat UGK                           | A ♂                      | A                        | <i>E7</i>      |
| 18 | Birlik KV                            | B ♀                      | B                        | <i>e7</i>      |
| 19 | M 15/1                               | A                        | A                        | <i>E7</i>      |
| 20 | M 15/2                               | B                        | B                        | <i>e7</i>      |
| 21 | M 15/3                               | B                        | B                        | <i>e7</i>      |
| 22 | M 15/4                               | B                        | B                        | <i>e7</i>      |
| 23 | M 15/5                               | A/B                      | A/B                      | <i>E7/e7</i>   |
| 24 | M 20                                 | B                        | B                        | <i>e7</i>      |
| 25 | Zara                                 | A ♀                      | A                        | <i>E7</i>      |
| 26 | 583583                               | B ♂                      | B                        | <i>e7</i>      |
| 27 | L1/1                                 | A                        | A                        | <i>E7</i>      |
| 28 | L1/21                                | A                        | A                        | <i>E7</i>      |
| 29 | L1/22                                | A                        | A                        | <i>E7</i>      |
| 30 | L1/23                                | A                        | A                        | <i>E7</i>      |
| 31 | Zara                                 | A ♀                      | A                        | <i>E7</i>      |
| 32 | Ustia                                | B ♂                      | B                        | <i>e7</i>      |
| 33 | L4/1                                 | A                        | A                        | <i>E7</i>      |
| 34 | L4/31                                | A                        | A                        | <i>E7</i>      |
| 35 | L4/32                                | A                        | A                        | <i>E7</i>      |
| 36 | L4/33                                | A                        | A                        | <i>E7</i>      |
| 37 | L4/34                                | A/B                      | A/B                      | <i>E7/e7</i>   |
| 38 | Zara                                 | A ♀                      | A                        | <i>E7</i>      |
| 39 | 2 CH                                 | B ♂                      | B                        | <i>e7</i>      |
| 40 | L11/21                               | A                        | A                        | <i>E7</i>      |
| 41 | L11/22                               | A                        | A                        | <i>E7</i>      |
| 42 | L11/23                               | A                        | A                        | <i>E7</i>      |
| 43 | L11/24                               | A                        | A                        | <i>E7</i>      |
| 44 | L11/25                               | A                        | A                        | <i>E7</i>      |
| 45 | L11/26                               | A                        | A                        | <i>E7</i>      |
| 46 | L11/27                               | A                        | A                        | <i>E7</i>      |
| 47 | L11/28                               | A                        | A                        | <i>E7</i>      |
| 48 | L11/4                                | B                        | B                        | <i>e7</i>      |
| 49 | LT44/2                               | A                        | A                        | <i>E7</i>      |
| 50 | LT44/3                               | A                        | A                        | <i>E7</i>      |

PCR analysis related to detecting *E7* locus in hybrids is shown in table 3. All hybrids developed from Zara x Jaselda, Zara x 234, Zara x 583583 and Zara x Ustia possess *E7* locus, hybrids N10/1 and N10/2 from Zara x Khorol have both *E7* and *e7* loci. 11 derivative lines were developed by crossing Zara x 2 CH, among them only line L11/4 has a recessive allele linked to photoperiod insensitivity.

Hybrids LT44/11 and LT44/12 derived from the cross Lastochka x 234 have the fragment with a size of 145 bp at Satt100 locus that corresponds to *e7* gene. 4 out of 6 lines (M15/2, M15/3, M15/4 and M20) derived from Pamiat UGK x Birlik KV (figure) also contain recessive *e7* gene while others have photo-sensitivity gene.



M-marker; ♂ - Birlik KV; ♀ - Pamiat UGK;  
M15/1 (1-3); M15/2 (4-7); M15/3 (8-11); M15/4 (12-15); M15/5 (15-19); M20 (20-22)  
PCR products of parental forms and hybrid population of Birlik KV and Pamiat UGK

The variety of domestic breeding Zara was highly preferred by plant architectonics and a high percentage of hybrid pod abscission in designing the hybridization scheme. Zara variety was developed on the basis of KazSRIA&PG and recommended for adapting in the East Kazakhstan region

However, DNA identification showed that Zara and all hybrid combinations with its participation had photoperiod sensitivity gene *E7*, while sowing these accessions in eastern and northern Kazakhstan their vegetation period extended.

The use of the soybean variety as a maternal form developed in the conditions of eastern Kazakhstan and approved for production there - Birlik KV proved to be more productive. A high percentage of segregation with photoin sensitivity was recorded in hybrid populations with the use of Birlik KV as the maternal form.

Thus, the data of genetic analysis on the targeted interest are needed in designing hybridization schemes for the effective and fruitful work of the breeder

In conclusion, SSR analysis carried on 37 soybean cultivars and 34 breeding lines, developed from the 8 crosses to get new promising lines with the *e7* locus, showed that 16 cultivars and 7 hybrids out of 34 possess photoperiodic recessive alleles, these cultivars and breeding lines will be used in further breeding programs to develop new varieties adaptable to the conditions of Northern Kazakhstan.

It was established that in the 24 cross combinations of the Zara variety with *E7* allele showed dominance to the paternal forms with the *e7* allele in the hybrid populations. This variety is not desirable for crossing when developing soybean varieties that are insensitive to photoperiod.

It is recommended to use varieties of Khorol, 234 and Birlik KV for developing photoin sensitive lines possessing *e7* gene.

**Funding:** This research was funded by the Ministry of Agriculture (Kazakhstan), Scientific Technical Program, BR06249214-OT-18 "Development and introduction of new highly productive soybean varieties with high-quality for various regions of the country that resistant to environmental stress factors using world biodiversity".

Ш. Мазкират, Д. И. Бабисекова, С. В. Дидоренко, Р. С. Ержебаева

«Қазақ егiшiлiк және өсiмдiк шаруашылығы ғылыми зерттеу институты» ЖШС,  
Алмалыбак ауылы, Алматы обылысы, Қазақстан

### SSR МАРКЕРЛЕРІН ПАЙДАЛАНА ОТЫРЫП, ҚЫТАЙ БҰРШАҚ СОРТТАРЫ МЕН СЕЛЕКЦИЯЛЫҚ ЛИНИЯЛАРЫН ФОТОПЕРИОДҚА СЕЗІМТАЛ E7 ГЕНІ БОЙЫНША ИДЕНТИФИКАЦИЯЛАУ

**Аннотация.** Қытай бұршақ (*Glycine max*) – қысқа күндік өсімдік, қытай бұршақ генотиптері, күннің ұзақтығы олардың критикалық ұзақтығынан аз болған жағдайда гүлдену басқышына өтеді. Қазақстанның оңтүстік аймақтары қытай бұршақ өсірілетін негізгі өңір болып табылады, Қазақстанның солтүстік аймақтарына өсіруге бейімделген Қытай бұршақ сорттарын шығару - еліміз үшін маңыздылығы өте жоғары. Бұл мақалада фотопериодқа сезімталдығын бақылайтын E7 локусын анықтау үшін, қытай бұшағының ата-аналық формалары мен селекциялық линияларға талдау жасалынды. Перспективті сорттар мен линияларды идентификациялау үшін, E7 локусынмен тығыз байланысқан Satt100 және Satt319 SSR-маркерлері пайдаланылды. Зерттеу объектісі ретінде Қазақ егіншілік және өсімдік шаруашылығы ғылыми зерттеу институтының дөңдібұршақ бөлімінен қытайбұршақ өсімдігінің 37 сорт үлгілері мен 34 селекциялық линиялары алынды. SSR генотиптеу нәтижесі бойынша, фотопериодқа сезімтал емес E7 генінің рецессивті аллельдері бар қытай бұршағының 16 сорты және 7 селекциялық буданы анықталды, осы алынған сорттар мен линиялар фотопериодқа сезімтал емес сорттарды шығару үшін генетикалық ресурс ретінде селекциянерлерге пайдалануға ұсынылды.

**Түйін сөздер:** қытай бұршағы, E7 гені, SSR-маркерлер, фотопериодқа сезімтал емес.

Ш. Мазкират, Д. И. Бабисекова, С. В. Дидоренко, Р. С. Ержебаева

ТОО «Казахский научно-исследовательский институт земледелия и растениеводства»,  
Алматинская область, п. Алмалыбак, Казахстан

### ИДЕНТИФИКАЦИЯ ГЕНА ЧУВСТВИТЕЛЬНОСТИ К ФОТОПЕРИОДУ E7 У СОРТОВ И СЕЛЕКЦИОННЫХ ЛИНИИ СОИ С ИСПОЛЬЗОВАНИЕМ SSR-МАРКЕРОВ

**Аннотация.** Соя (*Glycine max*) – растение короткого дня, и его различные генотипы переходят к цветению, когда долгота дня меньше их критической длины. Южные регионы Казахстана являются основным регионом возделывания для этой культуры, и для страны крайне важно создать сорта сои, адаптированные к условиям Северного Казахстана. В статье родительские формы сои и их селекционные линии были протестированы по выявлению локуса E7, контролирующего фоточувствительность. Для идентификации перспективных сортов и линий были использованы SSR-маркеры Satt100 и Satt319, тесно сцепленные с локусом E7. В качестве объекта исследования были использованы 37 сортов и 34 селекционные линии сои отдела зернобобовых культур Казахского НИИ земледелия и растениеводства. По результатам SSR-генотипирования выявлены 16 сортов сои и 7 гибридов, имеющих рецессивные аллели гена фотопериодической нейтральности локуса E7 и эти сорта и селекционные линии рекомендуются селекционерам в качестве генетического ресурса для создания нечувствительность к фотопериоду сортов.

**Ключевые слова:** соя, ген E7, SSR-маркеры, нечувствительность к фотопериоду.

#### Information about authors:

Mazkirat Sh., LLP “Kazakh Scientific Research Institute of Agriculture and Plant Growing, Almalybak vil.,  
Almaty region, Kazakhstan; shynarbek.mazkirat@gmail.com; <http://orcid.org/0000-0003-1768-3779>

Babissekova D. I., LLP “Kazakh Scientific Research Institute of Agriculture and Plant Growing, Almalybak  
vil., Almaty region, Kazakhstan; janeka\_\_88@mail.ru; <https://orcid.org/0000-0003-2289-7296>

Didorenko S. V., LLP “Kazakh Scientific Research Institute of Agriculture and Plant Growing, Almalybak vil.,  
Almaty region, Kazakhstan; svetl\_\_did@mail.ru; <https://orcid.org/0000-0002-2223-0718>

Yerzhebayeva R. S., LLP “Kazakh Scientific Research Institute of Agriculture and Plant Growing, Almalybak  
vil., Almaty region, Kazakhstan; raushan\_2008@mail.ru; <https://orcid.org/0000-0003-4585-8505>

REFERENCES

- [1] Sakai T., Kogiso M. (2008) Soy isoflavones and immunity // J. Med. Invest. 55: 167-173. DOI: <https://doi.org/10.2152/jmi.55.167> (in Eng.).
- [2] Liener I.E. (1994) Implications of antinutritional components in soybean foods // Crit. Rev. Food Sci. Nutr. 34: 31-67. DOI: 10.1080/10408399409527649 (in Eng.).
- [3] Ososki A.L., Kennelly E.J. (2003) Phytoestrogens: a review of the present state of research // Phytother. Res. 17: 84-86. DOI: 10.1002/ptr.1364 (in Eng.).
- [4] Boiko A.T., Karyagin Y.G. (2004) Soybean – high protein culture. Almaty: JSC Vita. 18 p. (in Russ.).
- [5] Erzhanova K., Atakulov T., Ospanbaiev Zh., Romanecas K., Smanov A. (2018) Phytomelioration of secondary saline irrigated lands of the Southeast of Kazakhstan // Bulletin of National academy of sciences of the Republic of Kazakhstan. 5(375): 70-75. DOI: <https://doi.org/10.32014/2018.2518-1467.9> ISSN 2518-1467 (Online), ISSN 1991-3494 (Print) (in Eng.).
- [6] FAO data <http://www.fao.org/faostat>
- [7] <http://www.stat.gov.kz>
- [8] Didorenko S.V. (2014) Achievements of soybean breeding in Kazakhstan // Vestnik of NAS RK. Agrarian series. 1: 22-27 (in Russ.).
- [9] Watanabe S., Harada K., Abe J. (2012) Genetic and molecular bases of photoperiod responses of flowering in soybean // Breed. Sci. 61: 531-543. DOI: 10.1270/jsbbs.61.531 (in Eng.).
- [10] Hartwig E.E., Kihl RAS (1979) Identification and utilization of a delayed flowering character in soybeans for short day conditions // Field Crop Res. 2:145-151. DOI: [https://doi.org/10.1016/0378-4290\(79\)90017-0](https://doi.org/10.1016/0378-4290(79)90017-0) (in Eng.).
- [11] Bernard R.L. (1971) Two major genes for time of flowering and maturity in soybeans // Crop Sci. 11:242-244: 10.2135/cropsci1971.0011183X001100020022x (in Eng.).
- [12] Buzzell R.I. (1971) Inheritance of a soybean flowering response to fluorescent day length conditions // Can. J. Genet. Cytol. 13: 703-707. DOI: <https://doi.org/10.1139/g71-100> (in Eng.).
- [13] Buzzell R.I., Voldeng H.D. (1980) Inheritance of insensitivity to long day length // Soybean Genet. Newsl. 7:26-29. DOI: <https://lib.dr.iastate.edu/soybeangenetics/vol7/iss1/13> (in Eng.).
- [14] McBlain B.A., Bernard R.L. (1987) A new gene affecting the time of flowering and maturity in soybeans // J. Hered. 78: 160-162. DOI: 10.1093/oxfordjournals.jhered.a110349 (in Eng.).
- [15] Bonato E.R., Vello N.A. (1999) E6 a dominant gene conditioning early flowering and maturity in soybeans // Genet. Mol. Biol. 22: 229-232. DOI: <http://dx.doi.org/10.1590/S1415-47571999000200016> (in Eng.).
- [16] Cober E.R., Voldeng H.D. (2001) A new soybean maturity and photoperiod-sensitivity locus linked to E1 and T // Crop Sci. 41: 698-701. DOI:10.2135/cropsci2001.413698x (in Eng.).
- [17] Cober E.R., Molnar S.J., Charette M., Voldeng H.D. (2010) A new locus for early maturity in soybean // Crop Sci. 50: 524-527. DOI:10.2135/cropsci2009.04.0174 (in Eng.).
- [18] Kong F., Nan H., Cao D., Li Y., Wu F., Wang J. (2014) A new dominant gene E9 conditions early flowering and maturity in soybean // Crop Sci. 54: 2529-2535. DOI:10.2135/cropsci2014.03.0228 (in Eng.).
- [19] Ray J.D., Hinson K., Mankono E.B., Malo F.M. (1995) Genetic control of a long-juvenile trait in soybean // Crop Sci. 35: 1001-1006. DOI:10.2135/cropsci1995.0011183X003500040012x (in Eng.).
- [20] Molnar S.J., Rai S., Charette M., Cober E.R. (2003) Simple sequence repeat (SSR) markers linked to E1, E3, E4, and E7 maturity genes in soybean // Genome. 46:1024-1036. DOI: 10.1139/g03-079 (in Eng.).
- [21] Murray M.G., Thompson W.F. (1980) Rapid isolation of high molecular weight plant DNA // Nucleic Acids Res. 8: 4321-4325. DOI: 10.1093/nar/8.19.4321 (in Eng.).
- [22] Kumawat G., Yadav A., Satpute G.K. (2019) Genetic relationship, population structure analysis and allelic characterization of flowering and maturity genes *E1*, *E2*, *E3* and *E4* among 90 Indian soybean landraces // Physiol Mol Biol Plants 25: 387. DOI: <https://doi.org/10.1007/s12298-018-0615-3> (in Eng.).
- [23] Gupta S., Bhatia V.S., Kumawat G. (2017) Genetic analyses for deciphering the status and role of photoperiodic and maturity genes in major Indian soybean cultivars // J. Genet. 96:147. DOI: <https://doi.org/10.1007/s12041-016-0730-2> (in Eng.).
- [24] Shin J.H., Lee S.H. (2012) Molecular markers for the *E2* and *E3* genes controlling flowering and maturity in soybean // Mol Breeding. 30: 1793. DOI: <https://doi.org/10.1007/s11032-012-9743-6> (in Eng.).
- [25] Anuarbek S.N., Volkova L.A., Turuspekov E.K., Abugalieva S.I. (2015) Screening of soybean world collection using DNA markers // KazNU Bulletin. Biology series. N 3 (65): 111-117 (in Russ.).
- [26] Rosenzweig V.E., Aksyonova E.A., Milash S.B., Goloenko D.V., Davydenko O.G. (2008) Prospects of exploiting of photoperiod sensitivity gene *E7* in early soybean breeding and revealing of its sources with SSR-markers // Soybean Genetics Newsletter. Vol. 35. <http://www.soygenetics.org/articleFiles/> (in Eng.).

## NEWS

OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN

## SERIES OF AGRICULTURAL SCIENCES

ISSN 2224-526X

Volume 5, Number 53 (2019), 73 – 82

<https://doi.org/10.32014/2019.2224-526X.63>

UDC 556.54

**Zh.S. Mustafayev<sup>1</sup>, A.T. Kozykeyeva<sup>1</sup>, A.A. Sagaev<sup>2</sup>, E.N. Alimbaev<sup>2</sup>**<sup>1</sup>Kazakh national agrarian university, Almaty, Kazakhstan,<sup>2</sup>Korkyt-Ata Kyzylorda State University, Kyzylorda, Kazakhstan.

E-mail: z-mustafa@rambler.ru, aliya.kt@yandex.ru, sagaev\_51@mail.ru; hagrid25@mail.ru

**ANTHROPOGENIC CHANGES IN DRAIN  
IN LOWERS OF THE SYRDARYA RIVER**

**Abstract.** Based on the analysis of information and analytical materials of the Main Administration of the USSR Hydrometeorological Service, RSE «Kazgidromet» and the «Aral-Syrdarya Basin Inspectorate for Regulation of Use and Protection of Water Resources» at the Committee on Water Resources of the Ministry of Agriculture of the Republic of Kazakhstan has estimated the anthropogenic flow change in the lower reaches of the Syrdarya River on hydrological posts, with the determination of the coefficient of desiccation, characterized by a decrease in the carrying capacity of the river under the influence of not only changes in the hydrological regime of the river in the upper reaches, but also economic activities carried out in the catchments of the river basin.

**Keywords:** river, basin, hydrology, regime, natural, anthropogenic, modern, analysis, assessment, equation.

**Introduction.** Currently, there is a catastrophic water-ecological situation in the Syrdarya river basin, which is explained, first of all, by its transboundary position, as well as by the confinement of the lower part of the basin to arid inland areas where the river receives almost no tributaries. The situation is aggravated by the fact that it is in these areas within Kazakhstan that the Syrdarya river is the main waterway and the source of water supply for the population and various sectors of the economy, the main areas of population as well as industrial and agricultural development to its valley. Irrational economic activity in the catchment area, including the use of water resources, also has a great influence on the ecological status of the basin-river system in the lower reaches of the Syrdarya river [1-8].

**Purpose of the study** based on the analysis of information and analytical materials of the Main Directorate of the Hydrometeorological Service of the USSR, RSE «Kazgidromet» and the «Aral-Syrdarya Basin Inspectorate for Regulation of Use and Protection of Water Resources» at the Committee on Water Resources of the Ministry of Agriculture of the Republic of Kazakhstan in the lower reaches of the Syrdarya river under the influence of economic activity.

**The object of research.** Syrdarya is the second in terms of water content and the first in length along the river of Central Asia. From the sources of Naryn, its length is 3019 km, and the basin area is 219 thousand km<sup>2</sup>. The sources of the Syrdarya lie in the Central (Inner) Tien Shan. After the confluence of Naryn and Karadarya, the river is called Syrdarya. The power of the river is glacial and snowy, with the latter predominating. For the water regime is characterized by spring-summer flood. The largest stock falls in June. The main flow of the Syrdarya is formed on the territory of the Kyrgyz Republic. Then Syrdarya crosses Uzbekistan and Tajikistan and flows into the Aral Sea on the territory of Kazakhstan. The total length of the channel in the catchment area of the Syrdarya River is 22,212 km and the basin area is 219,000 km<sup>2</sup> [4-9].

The reservoir of the Syrdarya river basin has several reservoirs: Toktoguls (19.5 km<sup>3</sup>, Kyrgyzstan), Kairakkum (4.2 km<sup>3</sup>, Tajikistan), Lake Aydarkul (41 km<sup>3</sup>, Uzbekistan) and Shardarins (5.7 km<sup>3</sup>, Kazakhstan). In order to regulate spring floods and water discharges from the Toktogul hydropower plant, Kazakhstan built the Koksaray reservoir (45 km dam length) in the South Kazakhstan region with a volume of three billion cubic meters, which was first filled in spring 2010 [10].

Syrdarya previously flowed into the Aral Sea, now, due to the catastrophic decline in its level and the collapse of the sea into two parts in 1989, the river flows into the northern part of the sea, (the so-called “Small Sea”). The waters of the Syrdarya are largely dismantled for economic needs; therefore, the current volume of flow in the estuary has decreased by more than 10 times (from 400 to 30 m<sup>3</sup>/s) as compared with the conditionally natural period (until 1960) [9].

**Materials and research methods.** The study of long-term hydrological data on the hydrological posts of the Syrdarya River, located below the Shardara reservoir, was based on the materials of the Main Directorate of the Hydrometeorological Service of the USSR, RSE «Kazgidromet» and the «Aral-Syrdarya Basin Inspectorate for Regulation of Use and Protection of Water Resources, the Committee on Water Resources of the Ministry of Agriculture» of the Republic of Kazakhstan[10-14].

The hydrological study of the Syrdarya river in the lower reaches is comparatively satisfactory, since the hydrological posts Shardara, Tomenaryk, Kyzylorda and Kazalinsk and the upper reaches of the Naryn river and the Naryn hydrological post from 1911 to 2015 have the longest observations. . At the same time, the hydrological posts «Naryn» and «Shardara» have constant observations from 1911 to the present, which can serve as analogs when restoring the average annual discharge of the river along the hydrological posts «Tomenaryk», «Kyzylorda» and «Kazalinsk», i.e. the hydrological post «Naryn» is located on the zones of formation of the flow of the Syrdarya river, and the hydrological post «Kazalinsk» is located as a closing target in the area of flow drainage (figure 1-6).

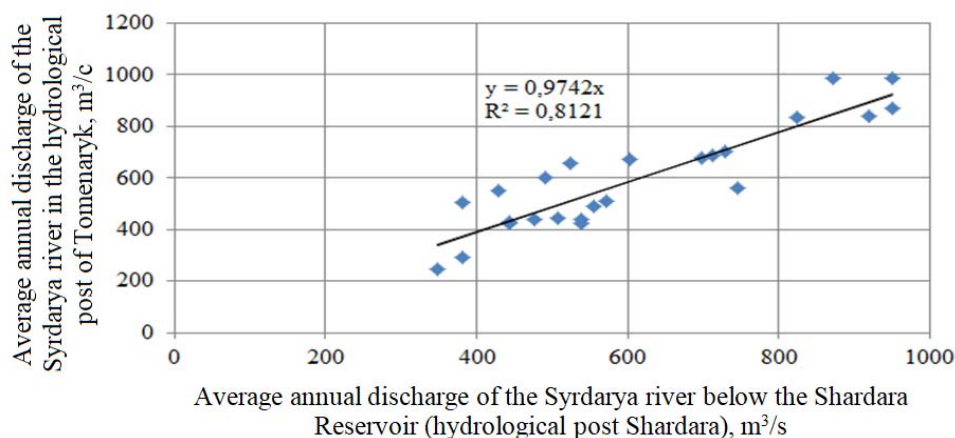


Figure 1 – Dependence of the average annual discharge of the Syrdarya river water in the Tomenaryk hydrological station on the average annual discharge of the Syrdarya river below the Shardara reservoir (hydrological post Shardara) during the natural regime

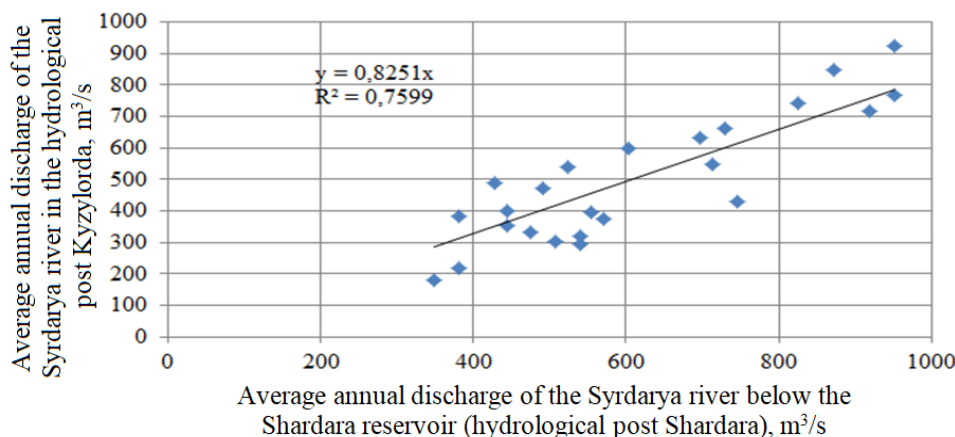


Figure 2 – Dependence of the average annual discharge of the Syrdarya river in the hydrological station Kyzylorda on the average annual discharge of the Syrdarya river below the Shardara reservoir (the hydrological post Shardara) during the natural regime

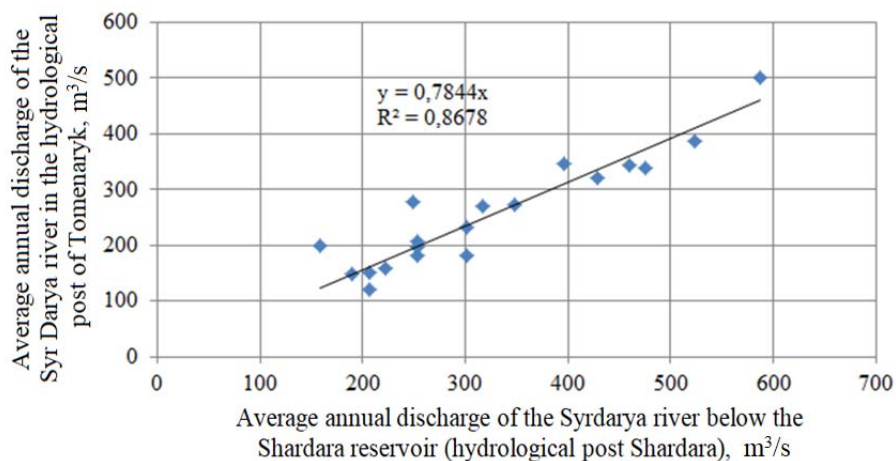


Figure 3 – Dependence of the average annual discharge of the Syrdarya river water in the Tomenaryk hydrological station on the average annual discharge of the Syrdarya river below the Shardara reservoir (hydrological post Shardara) during the anthropogenic regime

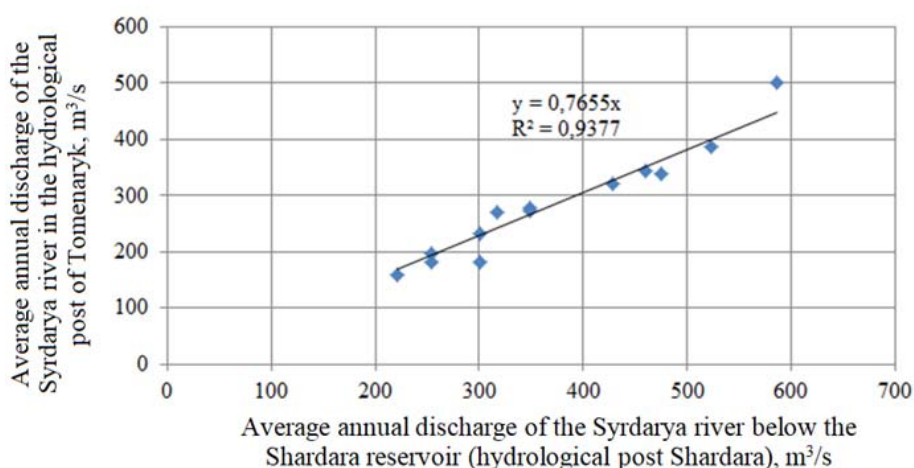


Figure 4 – Dependence of the average annual discharge of the Syrdarya river water in the Tomenaryk hydrological station on the average annual discharge of the Syrdarya river below the Shardara reservoir (the Hydrological post Shardar) during the modern regime

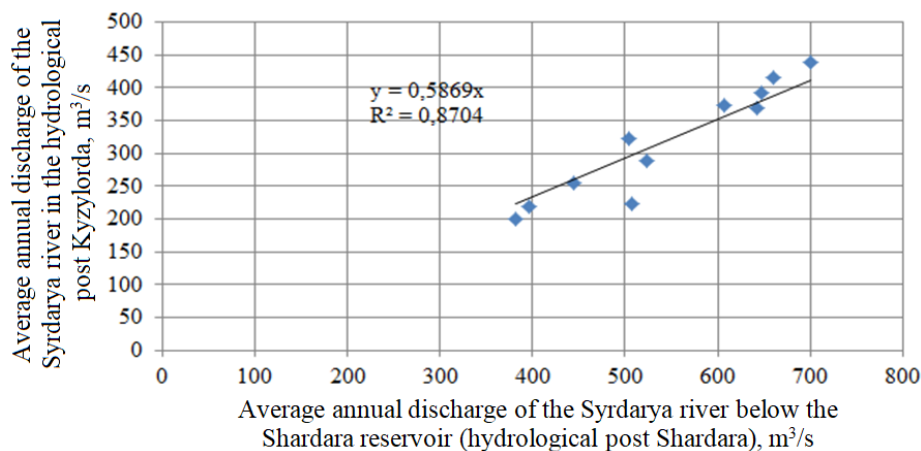


Figure 5 – Dependence of the average annual discharge of the Syrdarya river in the hydrological post Kyzylorda on the average annual discharge of the Syrdarya river below the Shardara reservoir (the hydrological post Shardara) in the period of the modern regime

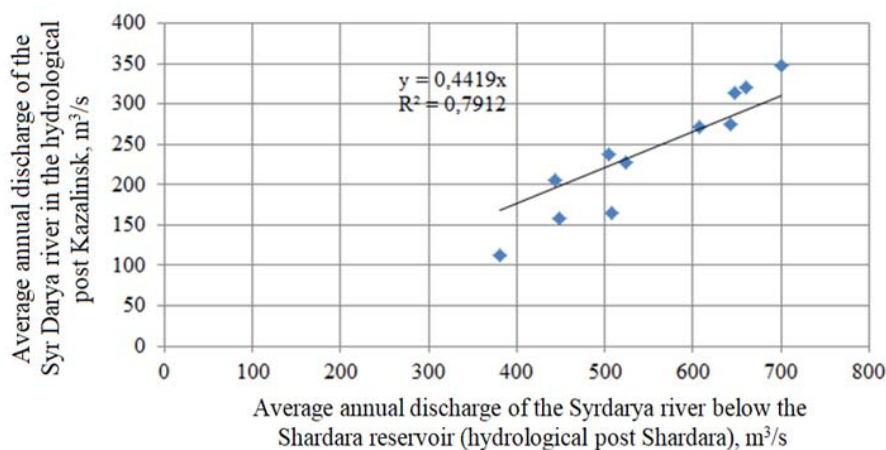


Figure 6 – Dependence of the average annual discharge of the Syrdarya river water in the Kazalinsk hydrological station on the average annual discharge of the Syrdarya river below the Shardara reservoir (the hydrological post Shardara) during the modern regime

Thus, as a result of statistical analysis of information and analytical materials of the Main Directorate of the Hydrometeorological Service of the USSR, RSE «Kazgidromet» and the «Aral-Syrdarya Basin Inspectorate for the regulation of the use and protection of water resources» at the Committee on Water Resources of the Ministry of Agriculture of the Republic of Kazakhstan hydrological posts by the method of hydrological analogy obtained regression equation with a high correlation coefficient (table 1).

Table 1 – Information on the reconstruction of the rows of the average annual discharge of the water of the Syrdarya River

| River                | River analogues, hydrological post | Regression equation  | Correlation coefficient |
|----------------------|------------------------------------|----------------------|-------------------------|
| Natural regime       |                                    |                      |                         |
| Tomenaryk            | Shardara                           | $Y = 0,9742 \cdot X$ | $R = 0,90$              |
| Kyzylorda            | Shardara                           | $Y = 0,8251 \cdot X$ | $R = 0,87$              |
| Anthropogenic regime |                                    |                      |                         |
| Tomenaryk            | Shardara                           | $Y = 0,7844 \cdot X$ | $R = 0,93$              |
| Modern regime        |                                    |                      |                         |
| Tomenaryk            | Shardara                           | $Y = 0,7655 \cdot X$ | $R = 0,97$              |
| Kyzylorda            | Shardara                           | $Y = 0,5869 \cdot X$ | $R = 0,93$              |
| Kazalinsk            | Shardara                           | $Y = 0,4419 \cdot X$ | $R = 0,89$              |

Assessing the impact of economic activity on the formation of runoff watersheds in the Recmi basin presents great difficulties, since their complexity lies in the fact that the influence of anthropogenic factors has to be estimated against the background of natural fluctuations in runoff and natural flow-forming factors.

**Research results.** Based on the use of the regression equation obtained by the method of hydrological analogs, the average annual discharge of the Syrdarya river water by the «Tomenaryk», «Kyzylorda» and «Kazalinsk» hydro posts in the absence of observation, which allowed us to imagine the long-term average annual discharge in the Syrdarya river sections, that is, the hydrological posts «Naryn», «Shardara», «Tomenaryk», «Kyzylorda» and «Kazalinsk» (figure 7–11).

As can be seen from figure 1–5, the long-term and modern period tends to increase in the hydrological posts of Naryn and Shardara, and the hydrological posts of Tomenaryk, Kyzylorda and Kazalinsk located below the Shardara reservoir, on the contrary, there is a constant decrease in the average annual discharge of the Syrdarya river. It should be noted that in the long-term fluctuations in the average annual water discharge of the hydrological posts of Naryn located above the Toktogul reservoir and the hydrological posts of Shardara located below the Shardara reservoir, there is a weak positive trend during

the observation period, which did not particularly affect the general direction of change in the average annual discharge for many years.

Thus, the analysis of observational data on the average annual discharge of water in the lower reaches of the Syrdarya River showed that, beginning in the 1970s, the average annual discharge began to change significantly under the influence of anthropogenic factors and economic activity.

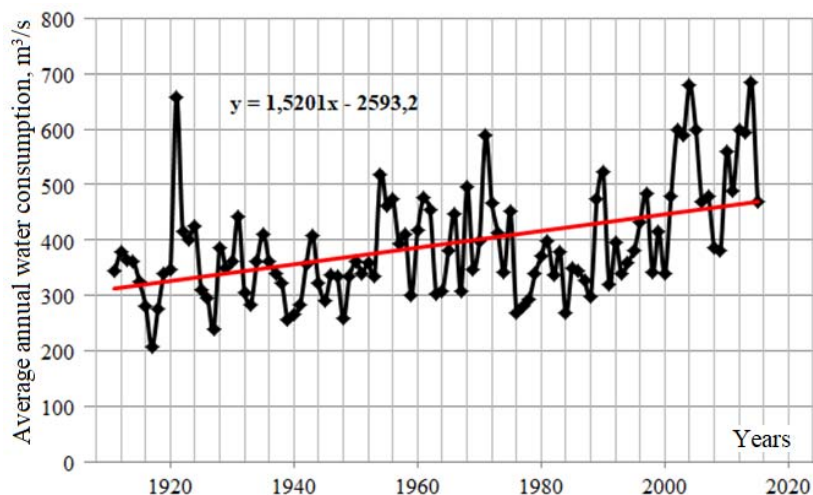


Figure 7 – The long-term course of the average annual water discharge at the hydrological posts of the Naryn River of the Syrdarya

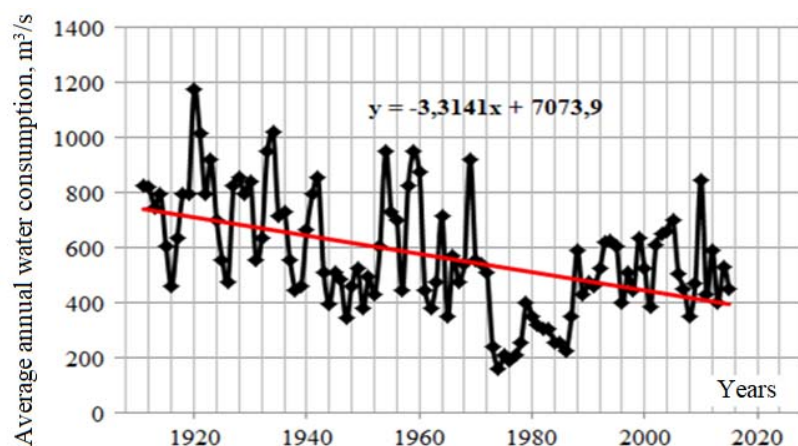


Figure 8 – The long-term course of the average annual discharge of the hydrological posts of Shardara (below the Shardara reservoir) of the Syrdarya river

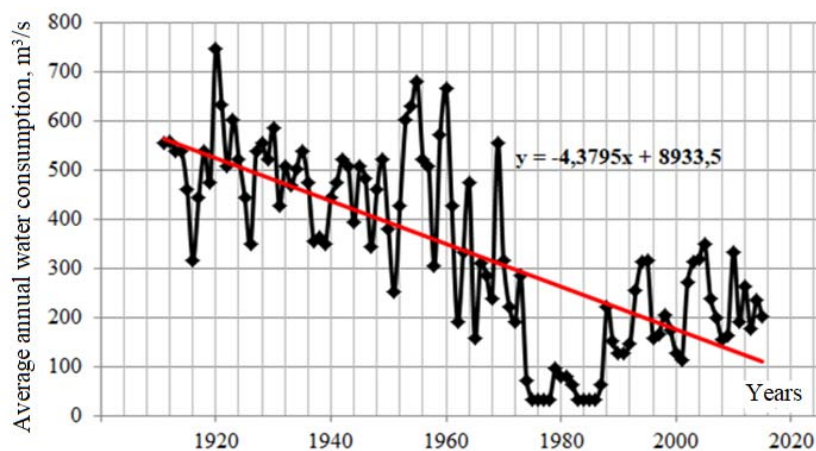


Figure 9 – The long-term course of the average annual water discharge of the hydrological posts of the Tomenaryk of the Syrdarya River

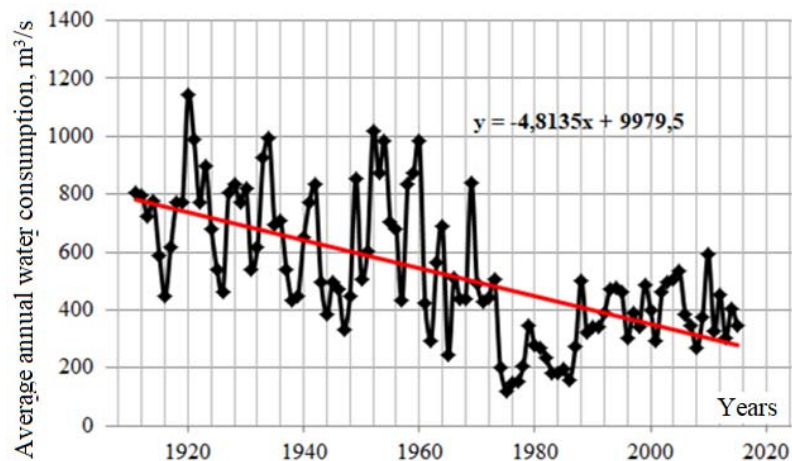


Figure 10 – The long-term course of the average annual water discharge at the Kyzylorda hydrological posts of the Syrdarya River

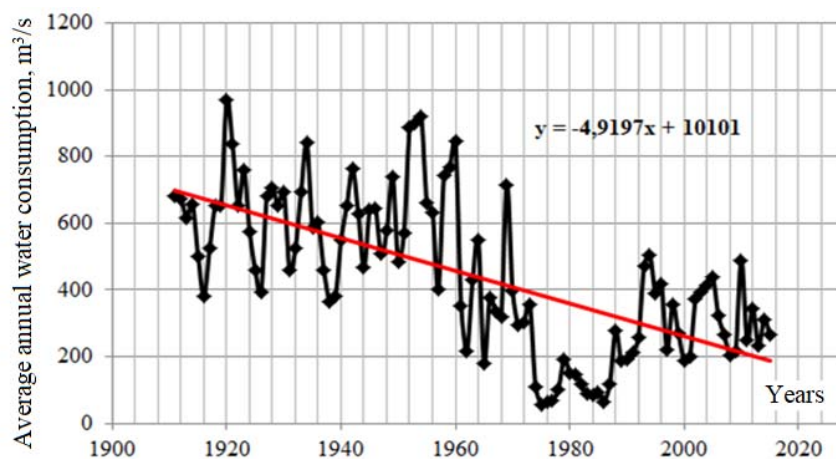


Figure 11 – The long-term course of the average annual water discharge of the hydrological posts of the Kazalinsk, Syrdarya River

Figure 12 shows the difference integral curve for the hydrological posts Naryn, Shardara, Tomenaryk, Kyzylorda and Kazalinsk, as well as the trend line in the area of maximum slope of curve 6 (1970-2015).

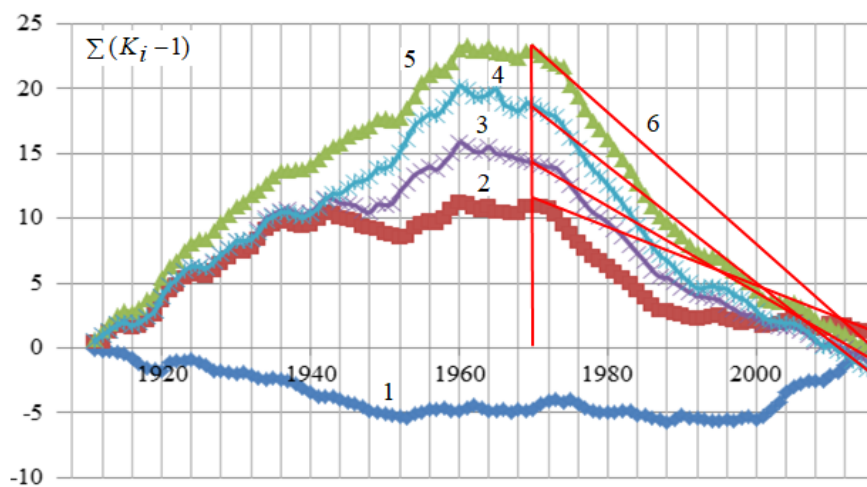


Figure 12 – Integral difference curve in the lower reaches of the Syrdarya river by hydrological posts (1 - Naryn; 2 - below the Shardara reservoir (Shardara); 3 - Tomenaryk; 4 - Kyzylorda; 5 - Kazalinsk)

At the same time, the integral difference curve shows that in the zone of their increase a growth in the average annual water flow is observed, and in the zone of maximum inclination of the trend line there is a decrease in the average annual water flow in the below Shardara reservoir [15].

Based on the maximum slope of the trend line, which characterize the decrease in the average annual discharge of the lower reaches of the Syrdarya River, then below the Shardara reservoir, the trend line equation on curve 6 (Figure 6) has the following form:

- for the hydrological station Shardar (below Shardara reservoirs):  $V = -0,4796 \cdot X + 955,43$ ;
- for the hydrological station Tomenaryk:  $V = -0,5000 \cdot X + 1010,46$ ;
- for the hydrological station Kyzylorda:  $V = -0,3359 \cdot X + 675,73$ ;
- for the hydrological station Kazalinsk:  $V = -0,4463 \cdot X + 897,62$ .

Thus, the representative period was determined by difference integral curves of the average annual water discharge at the hydrological posts located in the catchment area of the Syrdarya river basin, namely in the flow formation zone at the hydrological posts of Naryn and in the store area at the hydrological posts of Shardar, Tomenaryk, Kyzylorda and Kazalinsk located below Shardara reservoir. A multi-year period from 1911 to 2015, which was chosen as the calculation, includes three periods [9]:

- conditionally natural (1911-1970);
- sustainable water consumption - irrigation regime of the Toktogul hydroelectric station (1976-1992);
- sustainable water consumption - energy mode of operation of the Toktogul hydroelectric station (1993-2015).

The division of the period of sustainable water consumption into two is due to the fact that since 1993 the Toktogul reservoir regime has changed, that is, it previously worked in the irrigation mode, where discharges from it were carried out mainly in the autumn-summer period and made up about 75% of the total flow. In the middle of the 90s of the last century, the Toktogul reservoir operation mode changed dramatically, that is, to generate the necessary electricity for Kyrgyzstan, the main water releases were carried out in the winter months, during which about 60% of the total flow volume was triggered, which led to some increase in the lower reaches of the Syrdarya River [9; 15-17].

The current hydrological situation in the lower reaches of the Syrdarya River urgently requires a balanced use of water resources, necessitates an assessment of the impact of anthropogenic factors on the flow and hydrological regime. The issues of assessing the direction and magnitude of changes in river flow under the influence of climate change and human economic activities are of paramount practical and scientific and methodological importance, since their solution allows to take into account the nature and extent of changes in both water resources and the complex environmental conditions of the river basin watershed [9; 18; 19].

Thus, the cited dynamics of changes in expenditures of the lower reaches of the Syrdarya River in the hydrological posts Shardara, Tomenaryk, Kyzylorda and Kazalinsk during the period of observations from 1911 to 2015 showed that as the flow in the upper reaches was regulated by reservoirs from 1955 to 1980, that is, Kairakkum's (1956), Shardara's (1965), Sharvak's (1970), Toktogul's (1975) and Andijan's (1978) with a total usable capacity of 33.1 km<sup>3</sup>, which was commensurate with the annual flow of the Syrdarya River. Consequently, the felting of such hard anthropogenic activities in the lower reaches of the Syrdarya river began the process of drying out, which radically changed the weight of the hydraulic and geomorphological conditions of water flow, flow and channel indicators.

The dynamics of river drying is expressed by a coefficient that takes into account the ratio of costs left in the river bed to maintain its hydro-ecological balance between adjacent gauging stations [10]:

$$\eta = Q_{noc} / Q_{np},$$

where  $\eta$  – river drying coefficient;  $Q_{np}$  – consumption of upper gauging station;  $Q_{noc}$  – consumption of lower gauging station.

The change in the coefficient of river desiccation between adjacent hydrological posts below the Shardara reservoir and relative to the hydrological post Shardar is shown in table 2.

Table 2 – Changes in the coefficient of drying in different periods of anthropogenic impacts in the lower Shardara reservoir

| Hydrological post | Indicators       | Periods of anthropogenic impacts in the lower Shardara reservoir |           |           |           |           |            |
|-------------------|------------------|------------------------------------------------------------------|-----------|-----------|-----------|-----------|------------|
|                   |                  | 1911-1920                                                        | 1921-1930 | 1931-1940 | 1941-1950 | 1951-1960 | 1961-19700 |
| 1                 | 2                | 3                                                                | 4         | 5         | 6         | 7         | 8          |
| Shardara          | $Q_{np}, m^3/s$  | 764,2                                                            | 776,9     | 672,8     | 524,5     | 699,3     | 542,2      |
| Tomenaryk         | $Q_{noc}, m^3/s$ | 744,4                                                            | 756,8     | 655,4     | 559,0     | 798,4     | 493,1      |
|                   | $\eta$           | 0,97                                                             | 0,97      | 0,97      | 1,07      | 1,14      | 0,91       |
| Kyzylorda         | $Q_{noc}, m^3/s$ | 630,5                                                            | 737,8     | 545,9     | 611,2     | 733,2     | 387,0      |
|                   | $\eta$           | 0,82                                                             | 0,95      | 0,81      | 1,16      | 1,05      | 0,71       |
| Kazalinsk         | $Q_{noc}, m^3/s$ | 517,2                                                            | 526,4     | 443,5     | 459,4     | 516,7     | 329,1      |
|                   | $\eta$           | 0,68                                                             | 0,68      | 0,66      | 0,88      | 0,74      | 0,61       |
| Tomenaryk         | $Q_{np}, m^3/s$  | 744,4                                                            | 756,8     | 655,4     | 559,0     | 798,4     | 493,1      |
| Kyzylorda         | $Q_{noc}, m^3/s$ | 630,5                                                            | 737,8     | 545,9     | 611,2     | 733,2     | 387,0      |
|                   | $\eta$           | 0,85                                                             | 0,97      | 0,83      | 1,09      | 0,92      | 0,78       |
| Kazalinsk         | $Q_{noc}, m^3/s$ | 517,2                                                            | 526,4     | 443,5     | 459,4     | 516,7     | 329,1      |
|                   | $\eta$           | 0,69                                                             | 0,70      | 0,68      | 0,82      | 0,65      | 0,67       |
| Kyzylorda         | $Q_{noc}, m^3/s$ | 630,5                                                            | 737,8     | 545,9     | 611,2     | 733,2     | 387,0      |
| Kazalinsk         | $Q_{noc}, m^3/s$ | 517,2                                                            | 526,4     | 443,5     | 459,4     | 516,7     | 329,1      |
|                   | $\eta$           | 0,82                                                             | 0,71      | 0,81      | 0,75      | 0,70      | 0,85       |

Continuation of table 2

| 1                 | 2                | 9                                                                | 10        | 11        | 12        | 13        |
|-------------------|------------------|------------------------------------------------------------------|-----------|-----------|-----------|-----------|
| Hydrological post | Indicators       | Periods of anthropogenic impacts in the lower Shardara reservoir |           |           |           |           |
|                   |                  | 1971-1980                                                        | 1981-1990 | 1991-2000 | 2001-2010 | 2011-2015 |
| Shardara          | $Q_{np}, m^3/s$  | 304,4                                                            | 348,8     | 533,4     | 561,7     | 478,8     |
| Tomenaryk         | $Q_{noc}, m^3/s$ | 282,4                                                            | 265,6     | 406,2     | 436,0     | 366,5     |
|                   | $\eta$           | 0,93                                                             | 0,76      | 0,76      | 0,82      | 0,76      |
| Kyzylorda         | $Q_{noc}, m^3/s$ | 170,1                                                            | 136,6     | 329,2     | 331,7     | 281,0     |
|                   | $\eta$           | 0,56                                                             | 0,39      | 0,62      | 0,59      | 0,59      |
| Kazalinsk         | $Q_{noc}, m^3/s$ | 107,1                                                            | 83,4      | 198,7     | 245,8     | 213,1     |
|                   | $\eta$           | 0,35                                                             | 0,24      | 0,37      | 0,44      | 0,44      |
| Tomenaryk         | $Q_{np}, m^3/s$  | 282,4                                                            | 265,6     | 406,2     | 436,0     | 366,5     |
| Kyzylorda         | $Q_{noc}, m^3/s$ | 170,1                                                            | 136,6     | 329,2     | 331,7     | 281,0     |
|                   | $\eta$           | 0,60                                                             | 0,51      | 0,81      | 0,76      | 0,77      |
| Kazalinsk         | $Q_{noc}, m^3/s$ | 107,1                                                            | 83,4      | 198,7     | 245,8     | 213,1     |
|                   | $\eta$           | 0,38                                                             | 0,31      | 0,49      | 0,56      | 0,58      |
| Kyzylorda         | $Q_{noc}, m^3/s$ | 170,1                                                            | 136,6     | 329,2     | 331,7     | 281,0     |
| Kazalinsk         | $Q_{noc}, m^3/s$ | 107,1                                                            | 83,4      | 198,7     | 245,8     | 213,1     |
|                   | $\eta$           | 0,63                                                             | 0,60      | 0,60      | 0,74      | 0,76      |

Analysis of the coefficient of desiccation of the lower reaches of the Sydarya River below the Shardara's reservoir for the period under review, that is, from 1911 to 2015 at intervals of 10 years showed that between the hydrological posts of Tomenaryk, Kyzylorda and Kazalinsk in unfavourable conditions there were areas below the Kyzylorda hydroelectric complex, where the coefficient of desiccation in the period of anthropogenic activities, that is, sustainable water consumption – the irrigation regime of the Toktogul hydroelectric station (1976-1992) was below 0.56.

Therefore, the long-term analysis of the average annual water discharge and the integral difference curve along the hydrological posts located in the lower Shardara reservoir and based on their obtained trend line equation show that an intensive process occurs in the lower reaches of the Syrdarya River, that is, an intensive process of drying up of the river takes place from the Shardara reservoir to the Small Aral Sea.

**Conclusions.** In order to make an appropriate decision when using the water resources of the Syrdarya river basin, there is a need to change the modern principles in the field of environmental management, and the fundamental change of traditional methods and methodology of natural science to a new one, based on the properties of the natural environment, considered independently of our activities, and on the basis of laws of nature.

Ж. С. Мустафаев<sup>1</sup>, А. Т. Козыкеева<sup>1</sup>, А. А. Сагаев<sup>2</sup>, Е. Н. Алимбаев<sup>2</sup>

<sup>1</sup>Казахский национальный аграрный университет, Алматы, Казахстан,

<sup>2</sup>Кызылординский государственный университет им. Коркыт-Ата, Кызылорда, Казахстан

#### АНТРОПОГЕННЫЕ ИЗМЕНЕНИЯ СТОКА В НИЗОВЬЯХ РЕКИ СЫРДАРЬИ

**Аннотация.** На основе анализа информационно-аналитических материалов Главного управления гидрометеорологической службы СССР, РГП «Казгидромет» и «Арал-Сырдарьинской бассейновой инспекции по регулированию использования и охране водных ресурсов» Комитета по водным ресурсам Министерствасельского хозяйства Республики Казахстан произведена оценка антропогенного изменения стока в низовьях реки Сырдарьи по гидрологическим постам, с определением коэффициента усыхания, характеризующегося уменьшение пропускной способности реки под влиянием не только изменения гидрологического режима реки в верховьях, но и хозяйственной деятельности, проведенной в водосборах бассейна реки.

**Ключевые слова:** река, бассейн, гидрология, режим, естественный, антропогенный, современный, анализ, оценка, уравнение.

Ж. С. Мұстафаев<sup>1</sup>, Ә. Т. Қозыкеева<sup>1</sup>, Ә. А. Сағаев<sup>2</sup>, Е. Н. Әлімбаев<sup>2</sup>

<sup>1</sup>Қазақ ұлттық аграрлық университеті, Алматы, Қазақстан,

<sup>2</sup>Қорқыт-Ата атындағы Қызылорда мемлекеттік университеті, Қызылорда, Қазақстан

#### СЫРДАРЬЯ ӨЗЕНІНІҢ ТӨМЕНГІ АЛАБЫНДАҒЫ СУ АҒЫНЫНЫҢ ТЕХНОГЕНДІК ӨЗГЕРУІ

**Аннотация.** ССРО-ның гидрометеорологиялық қысметінің бас басқармасының, «Казгидромет» РММ-нің және Қазақстан Республикасының Ауылшаруашылық министрлігіне қарасты Су ресурстар комитетінің «Арал-Сырдарья алабының су ресурстарын пайдалануды реттеу және қорғау инспекциясының» ақпараттық-талдау мәліметтерін жүйлеудің негізінде Сырдарья өзенінің төменгі алқабында орналасқан гидрологиялық бекеттер бойынша құрғау көрстеткішін анықтау арқылы су ағынының өтімінің техногендік өзгеруіне баға берілген, ал ол тек қана өзеннің гидрологиялық режимінің өзгеруінің әсерінен өзеннің су өткізу қабілетінің төмендегенін ғана сипаттап қоймайды және ол өзеннің сужинау алабындағы жүргізілген шаруашылық қызметтерге байланысты екендігін көрсетеді.

**Түйін сөздер:** өзен, сужинау алабы, гидрология, режимі, табиғи, техногендік, сқазіргі, талдау, бағалау, теңдеу.

#### Information about authors:

Mustafaev Zh. S., Doctor of Technical Sciences, Professor, Kazakh national agrarian university, Almaty, Kazakhstan; z-mustafa@rambler.ru; <https://orcid.org/0000-0003-2425-8148>

Kozykееva A. T., Doctor of Technical Sciences, Professor, Kazakh national agrarian university, Kazakh national agrarian university, Almaty, Kazakhstan; aliya.kt@yandex.ru; <https://orcid.org/0000-0003-0581-0881>

Sagaev A. A., Candidate of Technical Sciences, Professor Kyzylorda State University named after Korkyt-Ata, Kyzylorda, Kazakhstan; sagaev\_51@mail.ru; <https://orcid.org/0000-0003-2544-2596>

Alimbaev E. N., Master, senior lecturer Kyzylorda State University named after Korkyt-Ata, Kyzylorda, Kazakhstan; hagrid25@mail.ru; <https://orcid.org/0000-0002-5596-7791>

## REFERENCES

- [1] Ibatullin S.R. Water resources of Central Asia: current state, problems and prospects of use. Almaty, 2013. 144 p.
- [2] The water and energy resources of Central Asia: problems of use and development (industry review). 2008. 44 p.
- [3] The relationship of water and energy resources in Central Asia. Improving regional cooperation in the Syrdarya basin. 2004. 62 p.
- [4] Mustafayeva L.Zh., Seidualiev M.A. Ecological and economic efficiency of water and land resources use (on the example of the Syrdarya river) (Analytical review). Taraz, 2003. 80 p.
- [5] Mustafayev Z.S., Pulatov K., Kozykeeva A.T., Mustafayeva L.Zh. Environmental assessment of natural systems in the Aral Sea Basin zones (Analytical review). Taraz, 1997. 80 p.
- [6] Mustafayev Z.S., Pulatov K., Kozykeeva A.T., Mustafayeva L.Zh. Ways to improve the natural-ecological situation in the Aral Sea Basin (Analytical review). Taraz, 1997. 70 p.
- [7] Mustafayev Z.S., Kozykeeva A.T. The Aral Sea Basin: Past, Present and Future. Taraz, 2012. 318 p.
- [8] Burlibaev M.Zh., Get it J.D., Tursunov A.A. Aral-Syrdarya basin: hydrological problems, water allocation issues. Almaty: Dauir, 2001. 180 p.
- [9] Water resources of Kazakhstan: assessment, forecast, management. Vol. IX. Inland and marginal reservoirs of Kazakhstan (Aral, Balkash, Kspiy). Book 1. Almaty, 2012. 456 p.
- [10] Development of a complex of urgent and promising measures to increase the carrying capacity of the Syrdarya river below the Sharda reservoir to the Malaya Aral depression, taking into account the deterioration of the hydrological regime and increased anthropogenic pressures: R & D report (final). Taraz, 2005. 148 p.
- [11] Surface water resources of the USSR. Middle Asia. The Syrdarya River Basin. L.: Gidromemoizdat, 1965. Vol. 14, release 1. 256 p.
- [12] Surface water resources. Basic hydrological characteristics. Middle Asia. The basin of the river Syrdarya. L.: Gidromemoizdat, 1967. Vol. 14, release 1. 320 p.
- [13] State Water Cadastre. Long-term data on the regime and resources of surface land waters. Kazakh SSR. L.: Gidromemoizdat, 1967. Vol. 14, issue 1. 268 p.
- [14] Assessment of water resources and channel balance of the Syrdarya River within Kazakhstan. Tashkent-Almaty, 2011. 52 p.
- [15] Burlibaev M.Zh., Fashevsky B.V., Opp K., Burlibaeva D.M., Kaydarova R.K., Vagapova A.R. Scientific basis for rationing the ecological flow of rivers of Kazakhstan. Almaty, Kanagat Publishing House, 2014. 408 p.
- [16] The relationship of water and energy resources in Central Asia: Improving regional cooperation in the Syr Darya basin. Washington, DC, 2004. 65 p.
- [17] Water resources and adaptation interventions in Central and West Asia. 2012. 12 p.
- [18] Mustafayev Zh.S., Kozykeyeva A.T., Zhanymkhan Kurmanbek. (2019) Normalization of the ultimate allowable load in the drainage basin of the Karatal river basin // News of the National academy of sciences of the Republic of Kazakhstan. Series of agricultural sciences. 2019. Vol. 3, N 51. P. 37-44. ISSN 2224-526X. <https://doi.org/10.32014/2019.2224-526X.33>
- [19] Mustafayev Zh.S., Kozykeeva A.T., Zhanymkhan K., Aldiyarova A.E., Mosiej Józef. The methods of assessment of maximum allowable impacts ecologically on small rivers // News of the National academy of sciences of the Republic of Kazakhstan. Series of geology and technical sciences, 2019. Vol. 2, N 434. P. 30-38. ISSN 2518-170X (Online), ISSN 2224-5278 (Print). <https://doi.org/10.32014/2019.2518-170X.35>

## NEWS

OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN

SERIES OF AGRICULTURAL SCIENCES

ISSN 2224-526X

Volume 5, Number 53 (2019), 83 – 87

<https://doi.org/10.32014/2019.2224-526X.64>

UDC 636.1.612.64.089.67

**D. M. Bekenov<sup>1</sup>, A. A. Spanov<sup>1</sup>, N. S. Kenchinbayev<sup>1</sup>, A. D. Baimukanov<sup>2</sup>**<sup>1</sup>Educational Scientific and Production Center Bayserke-Agro LLP, Talgar district, Almaty region, Kazakhstan,<sup>2</sup>Russian State Agrarian University – Moscow Agricultural Academy named after K. A. Timiryazev, Moscow, Russia.

E-mail: unpcbayerke-agro@mail.ru, abzal16@mail.ru, nazymnazym13@gmail.com, aidartaidar98@mail.ru

**UPDATING THE TREATMENT METHOD OF THE FOLLICULAR OVARIAN CYSTS IN COWS OF THE DAIRY PRODUCTIVITY DIRECTION IN THE EAST-KAZAKHSTAN REGION**

**Abstract.** The article gives data on the use of releasing hormone for the treatment of follicular ovarian cysts of milk cows. Herewith, a comparison of two treatment options for follicular cysts using releasing hormone was carried out.

Treatment regimens consisted of injecting the gonadotropin-releasing hormone and prostaglandin F2 $\alpha$  drugs in various variants. For therapy of the sexual function of cows with follicular ovarian cysts, the drug Surfagon was used. As for the first regimen, from the day of finding a cyst formation in the ovary, the preparation was injected intravenously once for 3 days at a dose of 50  $\mu$ g with an ultrasound scan of the ovaries on the 4th day for the detecting a follicular cyst. According to the second regimen, the classical scheme of follicular cyst treatment was used based on a single intramuscular injection of releasing hormone (Surfagon) in the diagnosis of a follicular ovarian cyst at a dose of 50  $\mu$ g and prostaglandin F2 $\alpha$  injections on the 10-12 day and artificial insemination in the presence of estrus.

At the mean, of all the experimental groups during the first treatment regimen, recovery of ovulation and estrous cycle rhythm was recorded in 75.1% of animals, in the second treatment option - in 38.7% of animals. Cured animals on coming to the estrus were artificially inseminated with the sperm of bulls, tested on the quality of the offspring. 35 days after artificial insemination, the experimental animals underwent a rectal examination and ultrasound scan to determine pregnancy. In all groups of animals, fruitful insemination was on average 66.9% with the first treatment regimen and 53.5% with the second treatment regimen.

These results indicate a fairly high therapeutic efficacy of releasing hormone in the form of the Surfagon drug or its analogues when it is applied to cows with a follicular ovarian cyst during the period of manifestation of estrus or the formation of a new cyst. In terms of the share of cows that had recovered, the efficiency of the first regimen is 75.1%, of the fertilized animals - 66.9%.

**Keywords:** monitoring, releasing hormone, follicular cyst, treatment, cow.

**Introduction.** The decrease in fertility of cattle is associated with functional disorders of the reproductive organs that are often detected in animals, including ovarian dysfunction, manifested in the form of their hypofunction or cyst and inflammation of the uterine lining (endometritis). The problems associated with the reproduction of highly productive dairy cattle, especially the long period of the reproductive cycle, lactation dominant and the risk of infertility are among the acutest problems in dairy cattle breeding [1-3].

The onset of (follicular) cysts is caused by out-of-time or insufficient secretion of luteinizing hormone during the estrus due to the inability of the hypothalamic-pituitary system to respond adequately to estrogenic stimulation through positive feedback mechanisms. The consequences leading to excessive secretion of fluid in the follicles is a fairly common dys hormonal pathology, resulting in temporary infertility in most cases in dairy cows. Herewith, most cows recover without treatment in the period from

13 to 28 days, but in 35-40% of cases anovulatory cycles and cystic formations reappear. According to the results of our own research, functional disorder of the ovaries in the form of follicular cysts in high-milk herds is registered in up to 20% of the cows of the production department [4, 5].

At cyst formations in the ovaries, an active treatment policy is rational than waiting for self-healing, leading to a lengthening of the calving interval. At the same time, during rectal examination and detection of cyst signs, it is noted that 8-12 days after the establishment of the primary diagnosis, treatment is required only for 50% of previously diagnosed animals. In the opinion of some researchers, active identification and treatment of cows with cyst ovarian formations is recommended based on repeated confirmation of the diagnosis [6].

In view of these circumstances, a comprehensive study of this pathology is necessary, as well as the improvement of diagnostics and methods of treating cows with the ovarian cyst [7].

**Materials and methods of research.** The research work was carried out within the framework of the budget program upon the project "Development of effective breeding methods in the dairy cattle breeding industry", for the event "Increasing the reproductive ability of dairy cows in the eastern region", where the task was to study and improve restoration methods of the reproductive functions of dairy cows. The research work was conducted using the Simmental cows on the base farms of Kamyshinskoe and Zeitenov LLP of the East Kazakhstan region.

The state of the reproductive organs of cows was checked by rectal palpation and ultrasound diagnostics in order to determine the prevalence and risk factors for the development of cyst formations in the ovaries of experimental animals.

Treatment regimens consisted of injecting gonadotropin-releasing hormone and prostaglandin F2 $\alpha$  drugs in various variants. For correction of estrus of cows with follicular ovarian cysts, the Surfagon was used. At the first regimen, from the day of the finding a cyst formation in the ovary, the preparation was injected intravenously once for 3 days at a dose of 50  $\mu$ g with an ultrasound scanning of the ovaries on the 4th day for the presence of a follicular cyst. In cases of detection of cysts, mechanical extrusion was performed by rectal palpation. When mechanical extrusion was not possible due to the compacted wall and small volume, they were re-processed by the releasing hormone. If the cyst formation was successfully ruptured after 10-12 days, re-rectal palpation or ultrasound diagnostics of the ovary for the presence of cyst formation or corpus luteum was conducted. Cows with the corpus luteum in the ovary were injected with prostaglandin F2 $\alpha$  at a dose of 0.3 mg and in the presence of signs of estrus (48-72 hours), they were artificially inseminated. Animals come to the estrus within 10-12 days were immediately artificially inseminated.

According to the second regimen, the classical scheme of treatment of follicular cysts was used based on a single intramuscular injection of releasing hormone (Surfagon) at a dose of 50  $\mu$ g and injections of prostaglandin F2 $\alpha$  group drugs on the 10-12 day and artificial insemination in the presence of estrus [8].

In both cases, the effectiveness of insemination was taken into account, i.e. sperm dose consumption for 1 fruitful insemination, duration of treatment time and service period.

**Research results.** In the basic farms of Kamyshinskoe and Zeitenov LLP of the East-Kazakhstan region, animals with cystic pathology were selected and divided into 2 groups according to treatment regimens.

As can be seen from table 1, investigations on the use of releasing hormone in the treatment of follicular cysts were conducted on 53 cows of the Simmental breed in Zeitenov LLP, which was 10.6% of the 500 diagnosed cows, 34 Simmental cows in the Kamyshinskoe farm, which accounted for 13.6% of the 250 diagnosed cows. In each farm, cows with ovarian cysts were divided into two experimental groups for the treatment of follicular cysts using the releasing hormone in two different variants. The conditions for feeding and keeping animals in the experimental groups were similar.

Table 2 shows that in Zeitenov LLP in the first regimen, 23 animals were treated, 17 of which had an ovarian cyst, it amounted to 73.9%. As for the second treatment regimen, of 22 cows 8 animals had a cyst, which amounted to 36.3%. On the Kamyshinskoe farm, according to the first regimen, 17 animals were treated, 13 of which had a cystic formation, which accounted for 76.4%. According to the second treatment option, of 17 cows, a cyst was detected in 7 animals, which amounted to 41.1%. On average, of all the experimental groups in the first treatment regimen, recovery of ovulation and estrus rhythm was recorded in 75.1% of animals, in the second treatment option - in 38.7%.

Table 1 – Diagnosed cows with cystic pathology in the context of farms

| No | Name of farm                              | Breed     | Cows with cystic pathology |      |
|----|-------------------------------------------|-----------|----------------------------|------|
|    |                                           |           | n                          | %    |
| 1  | Zeitenov LLP, East-Kazakhstan region      | Simmental | 53                         | 10.6 |
| 2  | Kamyshinskoe farm, East-Kazakhstan region | Simmental | 34                         | 13.6 |

Table 2 – Results of the treatment of animals according to two regimens

| No | Name of farm, Cow breed            | Treatment regimen | Number of cows | The number of cured and artificially inseminated cows |      |
|----|------------------------------------|-------------------|----------------|-------------------------------------------------------|------|
|    |                                    |                   |                | n                                                     | %    |
| 1  | Zeitenov LLP, Simmental breed      | 1                 | 23             | 17                                                    | 73.9 |
|    |                                    | 2                 | 22             | 8                                                     | 36.3 |
| 2  | Kamyshinskoe farm, Simmental breed | 1                 | 17             | 13                                                    | 76.4 |
|    |                                    | 2                 | 17             | 7                                                     | 41.1 |

Cured animals on coming to estrus were artificially inseminated with sperm of bulls, tested on the quality of the offspring. 35 days after artificial insemination, the experimental animals underwent a rectal examination and ultrasound scanning to determine pregnancy.

As can be seen from table 3, in the Zeitenov LLP, the pregnancy was detected in the first treatment regimen in 11 cows of total of 17 artificially inseminated animals, fruitful insemination amounted to 64.7%. According to the second option, of 8 cows 4 animals got pregnant, which amounted to 50% of fruitful insemination. On the Kamyshinskoe farm, according to the first treatment regimen, of 13 artificially inseminated cow 9 animals were pregnant, which accounted for 69.2% of fruitful insemination. According to the second regimen, of 7 cows 4 animals got pregnant, the fruitful insemination was 57.1%. In all groups of animals, fruitful insemination was on average 66.9% according to the first treatment regimen, and 53.5% according to the second treatment regimen.

The application of the first treatment option for cows with a follicular ovarian cyst ensured restoration of the estrus rhythm and fertility in most experimental animals. These results indicate a fairly high therapeutic efficacy of releasing hormone in the form of the drug Surfagon or its analogues when it is applied to cows with a follicular ovarian cyst during the period of manifestation of estrus signs or the formation of a new cyst. In terms of the shares of cows recovered, the efficiency of the first option is 75.1%, the share of the fertilized - 66.9%.

Highly synthetic GN-RH analogue of domestic production - Surfagon, administered to cows with follicular ovarian cysts intravenously at a dose of 50 µg, normalizes the functional activity of the gonads with the restoration of ovulation. With its differentiated three-time use (in the absence of the effect of previously conducted hormone therapy), under ultrasound control, recovery was observed in 75.1% of animals with a fertility rate of 66.9% compared to the classical treatment regimen based on a single injection of releasing hormone, where recovery was observed in 38.7% of cows with a fertility rate of 53.5%.

Table 3 – Results of artificial insemination of cows by two treatment regimens

| No | Name of farm      | Treatment regimen | The number of artificially inseminated cows | The number of pregnant cows |      |
|----|-------------------|-------------------|---------------------------------------------|-----------------------------|------|
|    |                   |                   |                                             | n                           | %    |
| 1  | Zeitenov LLP      | 1                 | 17                                          | 11                          | 64.7 |
|    |                   | 2                 | 8                                           | 4                           | 50   |
| 2  | Kamyshinskoe farm | 1                 | 13                                          | 9                           | 69.2 |
|    |                   | 2                 | 7                                           | 4                           | 57.1 |

**Conclusion.** The solution of the tasks allowed to improve some technological aspects used in the reproduction of cattle. During the testing and development of estrus stimulation schemes for cows, new data were obtained, which expanded the possibility of reproduction management. Despite the achieved results, there is a need to improve and develop effective treatment regimens for follicular cysts.

**The ground for doing research.** Scientific and technical program of the Ministry of Agriculture of the Republic of Kazakhstan for 2018-2020. "Improving the efficiency of breeding methods in cattle breeding", project 3. "Development of effective breeding methods in the dairy cattle breeding industry", the event "Improving the reproductive ability of dairy cows in the eastern region"

Д. М. Бекенов<sup>1</sup>, А. А. Спанов<sup>1</sup>, Н. С. Кенчинбаева<sup>1</sup>, А. Д. Баймуканов<sup>2</sup>

<sup>1</sup> "Байсерке-Агро" оқу ғылыми-өндірістік орталығы" ЖШС, Талғар ауданы, Алматы облысы, Қазақстан,

<sup>2</sup> Ресей мемлекеттік аграрлық университеті –

К. А. Тимирязева атындағы Мәскеу ауылшаруашылық академиясы, Мәскеу, Ресей

### ШЫҒЫС ҚАЗАҚСТАН ОБЛЫСЫ ЖАҒДАЙЫНДА СҮТТІ БАҒЫТТАҒЫ СИЫРЛАРДА АНАЛЫҚ БЕЗ ФУНКЦИЯСЫНЫҢ Фолликулярлық киста түрінде БҰЗЫЛУЫМЕН КҮРЕСУ ӘДІСІН ЖЕТІЛДІРУ

**Аннотация.** Мақалада сүт өнімділігі бағытындағы сиырлардың аналық бездерінің фолликулярлы кисталарын емдеуге арналған релизинг-гормонды пайдалану туралы деректер келтіріледі. Бұл ретте фолликулярлы кисталарды емдеудің екі нұсқасын релизинг-гормонды пайдалану арқылы салыстыру жүргізілді.

Емдеу схемалары гонадотропин релизинг-гормон және простагландин F2α тобының препараттары әртүрлі нұсқаларда инъекцияда болды. Аналық бездің фолликулярлық қылқаламымен сиырлардың жыныстық қызметін түзету үшін сурфагон препаратын қолданған. Бірінші нұсқа бойынша, аналық безде кистозды пайда болған күннен бастап препарат көктамыр ішіне бір рет 50 мкг дозада 3 күн бойы инъекцияланды, төртінші күні аналық бездерді фолликулярлы кистаның болуына ультрадыбыстық сканерлеу арқылы тексерді. Екінші нұсқа бойынша фолликулярлы кистаны емдеудің классикалық сызбасы қолданылды, бұл ретте, бұлшықет ішіне бір реттік инъекцияға негізделген релизинг-гормон (сурфагон) 50 мкг дозада аналық бездегі фолликулярлық кистаны диагностикалау және 10-12 күнге простагландин F2α тобының препараттарын инъекциялау және жыныстық даму болған жағдайда жасанды ұрықтандыру кезінде.

Орташа алғанда барлық тәжірибелі топтардың ішінен емдеудің бірінші нұсқасы бойынша, овуляция мен жыныстық циклдің ырғағын қалпына келтіру жануарлардың 75,1%-да, емдеудің екінші нұсқасы бойынша 38,7%-да тіркелді. Жыныстық аң аулауға келген жануарлар ұрпағының сапасы бойынша тексерілген бұқалардың ұрығымен қолдан ұрықтандырылды. Қолдан ұрықтандырғаннан кейін 35 күн өткеннен кейін тұяқты жануарларға ұлттықты анықтау мақсатында ректалдық зерттеу және УДЗ жүргізілді. Жануарлардың барлық топтары бойынша нәтижелі ұрықтандыру орташа есеппен емдеудің бірінші нұсқасы бойынша 66,9 %, ал емдеудің екінші нұсқасы бойынша 53,5% болды.

Келтірілген нәтижелер "сурфагон" препараты немесе оның аналогтары түріндегі релизинг-гормонның жеткілікті жоғары терапиялық тиімділігі жыныстық аң аулау белгілерін манифестациялау немесе жаңа киста қалыптастыру кезеңінде аналық бездің фолликулярлы қылқаламымен сиырларды қолданғанда немесе оның аналогтары туралы куәландырады. Сауықтырылған сиыр үлесі бойынша бірінші нұсқаның тиімділігі 75,1 %, ұрықтандырылған 66,9% құрайды.

**Түйін сөздер:** мониторинг, релизинг-гормон, фолликулярлы киста, емдеу, сиыр.

Д. М. Бекенов<sup>1</sup>, А. А. Спанов<sup>1</sup>, Н. С. Кенчинбаева<sup>1</sup>, А. Д. Баймуканов<sup>2</sup>

<sup>1</sup>ТОО «Учебный научно-производственный центр «Байсерке-Агро»,  
Талгарский район, Алматинская область, Казахстан,

<sup>2</sup>Российский государственный аграрный университет –

Московская сельскохозяйственная академия им. К. А. Тимирязева, Москва, Россия

### УСОВЕРШЕНСТВОВАНИЕ МЕТОДА БОРЬБЫ С РАССТРОЙСТВОМ ФУНКЦИЙ ЯИЧНИКОВ В ФОРМЕ ФОЛЛИКУЛЯРНОЙ КИСТЫ У КОРОВ МОЛОЧНОГО НАПРАВЛЕНИЯ ПРОДУКТИВНОСТИ В УСЛОВИЯХ ВОСТОЧНО-КАЗАХСТАНСКОЙ ОБЛАСТИ

**Аннотация.** В статье приводятся данные по использованию релизинг-гормона для лечения фолликулярных кист яичников коров молочного направления продуктивности. При этом было проведено сравнение двух вариантов лечения фолликулярных кист с использованием релизинг-гормона.

Схемы лечения заключались в инъекции гонадотропин релизинг-гормона и препаратов группы простагландин F2 $\alpha$  в различных вариантах. Для коррекции половой функции коровам с фолликулярными кистами яичников применяли препарат сурфагон. По первому варианту со дня обнаружения кистозного образования в яичнике препарат инъецировали внутривенно однократно в течение 3-х дней в дозе по 50 мкг. с ультразвуковым сканированием яичников на четвертый день на наличие фолликулярной кисты. По второму варианту использовали классическую схему лечения фолликулярных кист основанная на однократной внутримышечной инъекции релизинг-гормона (сурфагон) при диагностировании фолликулярной кисты в яичнике в дозе 50 мкг и инъекции препаратов группы простагландин F2 $\alpha$  на 10-12 день и искусственного осеменения при наличии половой охоты.

В среднем из всех опытных групп по первому варианту лечения, восстановление овуляции и ритма полового цикла зафиксировали у 75,1 % животных, по второму варианту лечения 38,7 %. Вылеченные животные по приходу в половую охоту были искусственно осеменены спермой быков, проверенных по качеству потомства. По истечению 35 дней после искусственного осеменения подопытным животным было проведено ректальное исследование и УЗИ с целью определения стельности. По всем группам животных плодотворное осеменение было в среднем по первому варианту лечения 66,9 %, а по второму варианту лечения 53,5 %.

Приведенные результаты свидетельствуют о достаточно высокой терапевтической эффективности релизинг-гормона в виде препарата «сурфагон» или же его аналогов при его применении коровам с фолликулярной кистой яичников в период манифестации признаков половой охоты или же формирования новой кисты. По доле выздоровевших коров эффективность первого варианта составляет 75,1 %, оплодотворившихся 66,9 %.

**Ключевые слова:** мониторинг, релизинг-гормон, фолликулярная киста, лечение, корова.

#### Information about authors:

Bekenov Dauren Maratovich, Master of Natural Sciences and Biotechnology, Director of ESPC Bayserke-Agro LLP, Talgar District, Almaty Region, Kazakhstan; unpcebayerke-agro@mail.ru; <https://orcid.org/0000-0003-2244-0878>

Spanov Abzal Abushakipovich, Senior Researcher, ESPC Bayserke-Agro LLP, Talgar District, Almaty Region, Kazakhstan; abzal16@mail.ru; <https://orcid.org/0000-0001-9303-3722>

Kenchindayeva Nazym Serzhanovna, Scientific Secretary, ESPC Bayserke-Agro LLP, Talgar District, Almaty Region, Kazakhstan; nazymnazym13@gmail.com; <https://orcid.org/0000-0002-6624-0125>

Baimukanov Aidar Dastanbekouly, Master student of the Faculty of Zootechnics and Biology of the Russian State Agrarian University – Moscow Agricultural Academy named after K. A. Timiryazev, Moscow, Russia; aidartaidar98@mail.ru; <https://orcid.org/0000-0001-9669-864X>

#### REFERENCES

- [1] Dulger G.P. (2006). Modern concepts of ovarian cysts in cows. Reports TAA. Issue 278. Moscow. RSAU – Moscow Agricultural Academy n/a K. A. Timiryazev. P. 746-752 (in Russ.).
- [2] Porfiryev I.A. (1990). Prevention and treatment of obstetric and gynecological pathologies of farm animals. M. P. 84-88 (in Russ.).
- [3] Baimukanov D.A., Seidaliyev N.B., Alentayev A.S., Abugaliyev S.K., Semenov V.G., Dalibayev E.K., Zhamalov B.S., Muka Sh.B. (2019) Improving the reproductive ability of the dairy cattle // Reports of the National academy of sciences of the Republic of Kazakhstan. 2019. Vol. 2, N 324. P. 20-31. <https://doi.org/10.32014/2019.2518-1483.33> ISSN 2518-1483 (Online), ISSN 2224-5227 (Print).
- [4] Baimukanov D.A., Abugaliyev S.K., Seidaliyev N.B., Chindaliyev A.E., Dalibayev E.K., Zhamalov B.S., Muka Sh.B. Productivity and estimated breeding value of the dairy cattle gene pool in the Republic of Kazakhstan // Bulletin of the National academy of sciences of the Republic of Kazakhstan. 2019. Vol. 2, N 378. P. 14-28. <https://doi.org/10.32014/2019.2518-1467.36> ISSN 2518-1467 (Online), ISSN 1991-3494 (Print).
- [5] Ribadu A.Y., Dobson H., Ward W.R. (1994). Ultrasound and progesterone monitoring of ovarian follicular cysts in cows treated with GnRH // Br. Vet. J. 150 (5). P. 489-497.
- [6] Elchaninov V.V., Belonozhkin V.P., Nasibov Sh.N. (1997). Physiological and pathological issues of the reproductive function of cows. Part I. Bykovo, Podolsky district, Moscow. Region: Scherbinskaya print. 291 p. (in Russ.).
- [7] Valyushkin K.D., Medvedev G.F. (1997). Obstetrics, gynecology and biotechnology of animal reproduction. Minsk: Urjay. 718 p. (in Russ.).
- [8] Dyulger G.P., Nezhdanov A.G., Lobodin K.A. (2008). Hormonal control over the reproduction of cattle // Veterinary. N 1. P. 3-7 (in Russ.).

**NEWS**

OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN

**SERIES OF AGRICULTURAL SCIENCES**

ISSN 2224-526X

Volume 5, Number 53 (2019), 88 – 92

<https://doi.org/10.32014/2019.2224-526X.65>

UDC 636.1.082

**K. Zh. Iskhan**

Educational Scientific and Production Center Bayserke-Agro LLP, Almaty region, Kazakhstan.

E-mail: Kayrat\_Ishan@mail.ru

**PRODUCTIVE PROFILE OF HERD HORSES  
OF DOMESTIC BREEDS**

**Abstract.** It has been established that, at pasture breeding, the fertility of meat-type mares was not more than 75%, at hand breeding - 90%. In mares of the dairy productivity direction, the fertility was 75-87%, at hand breeding - 90-96%.

The optimal parameters for dairy productivity of the Kazakh Jabe mares and Kushum breed are the average daily milk yield of at least 3.5 kg, regardless of the technological parameters of the udder (cupped, round), thickness and length of nipples.

Mare's udder consists of two separate halves - right and left. Its girth at the base was 54 cm for Jabe mares, 72 cm for Kushum mares, 10 and 15 cm of depth, respectively, 26-30 cm of length along the sideline, 23 and 28 cm of length along the midline. Nipples in Jabe mares had the following measurements: length - 3 cm, nipple girth at the base - 9 cm, the distance between nipples - 4 cm, and in Kushum mares, these indicators were 5; 12; 7.5 cm respectively.

Mares with a cup-shaped udder had higher dairy productivity of 13.75 and 15.12 liters, while mares with a rounded udder had a milking capacity of 13.39 and 14.50 l.

It has been established that in mares with a cup-shaped udder, due to their higher milking capacity, foals develop better and have a higher average daily gain in live weight. The average daily gain of Kazakh Jabe foals of 2 months of age was 1000 and 950 g, and the Kushum foals - 1190 and 1100 g.

**Keywords:** milking capacity, udder shape, early maturity, foals, profile.

**Relevance of the topic.** In the structure of the breed horse population of the Almaty region, the Kushum horses take the third place after the Kazakh horses and the Mugalzhar horse.

The Kushum horses of the Almaty region on average by centner surpass the local Kazakh horses in live weight, while in their fertility and adaptability to year-round pasture winter-grazing conditions and survival do not differ from the parameters of the Kazakh horses of Jabe type [1].

The genetic capacity in live weight of Kushum mares reaches 577 kg, and in stallions - 711 kg and more. These data show the potential for further improvement of the Kushum breed horses in such an economically useful trait as live weight.

In the qualitative transformation of herd horse breeding in Kazakhstan, the role of the Kushum breed, as the main improving breed, with high meat and dairy productivity, good adaptability to year-round pasture and winter grazing management is extremely great. But in order to meet the growing requirements, the Kushum horse must be constantly upgraded in the direction of increasing the measurements and massiveness, improving the exterior, enhancing the breeding and productive qualities that ensure high performance and adaptation to the severe herd management conditions when crossing with local Kazakh horses. In this regard, the development of breeding methods to further enhance the breeding and productive qualities of domestic horse breeds in the conditions of year-round pasture and winter-grazing management is crucial [2, 3].

In the Republic of Kazakhstan, sustained growth in the horse population is observed, from 1,235,600 animals in 2007 to 1,608,000 animals in 2013. In 2018, the number of horses already reached 2.3 million heads, that is the growth is 372,400 heads [4].

Of the total population of horses, 80% are bred in a herd way and are oriented on the horse products manufacturing - the brood contingent, horse meat, and koumiss. The main trends in the development of productive horse breeding are the increase in the population of animals, mainly on account of domestic horse breeds of meat and dairy type as the Kushum, Mugalzhar and Kazakh horses of Jabe type. The stallions of these breeds are used as improvers of local populations of herd horses, and mares used for purebred breeding. In the future, the number of horses in all regions of Kazakhstan will grow.

Horse breeding is a profitable branch of productive livestock breeding, which successfully develops in the desert and semi-desert zones of the south-east of the Republic of Kazakhstan. Horse breeding in the Almaty region is successfully combined with herd horse breeding and meat - greasy sheep breeding. In the conditions of the Almaty region, the Kushum horse breed, which is an improver of local milk-producing animals, is of particular interest.

The studies were carried out according to the program of the Ministry of Agriculture of the Republic of Kazakhstan for 2018 - 2020. URN: BR06249249-OT-18 Development of a complex system of enhancing productivity and improving the breeding qualities of farm animals, by the example of Bayserke-Agro LLP.

**The aim of the research.** To determine the productive profile of herd horses of domestic breeds according to fertility and dairy productivity of mares.

**Methods of research.** The research work was carried out on the horse-breeding farm of the Kerbulak branch of Bayserke-Agro LLP in the Talgar district of the Almaty region.

The objects of the study were the purebred Kushum and Kazakh Jabe horses.

Experiments on the study of milking capacity of mares were conducted in four groups of mares-analogs.

Under the experience were 25 milk mares, all mares were full age, from 5 to 11 years old.

To characterize the development and body build type, milk mares were measured and weighed [5]. To study the constitutional peculiarity of mares, indices of format, chest girth, massiveness, and bone were calculated. [6].

The definition of the udder shape of mares was made visually, the measurement of length and thickness of the nipples was carried out with a measuring tape (figure).

There was a hand milking of mares on the farm, 5 times a day, with intervals between milkings at 2–2.5 hours. This frequency of milking is associated with the anatomical and physiological features of the udder structure and the excretion of milk in mares.



Figure 1 – Measurement of length and thickness of the nipples

Mares were milked only in the daytime, at night they were kept together with foals on pasture. Milk mares were served by two milkmaids and a herdsman.

The commercial milkiness of mares was determined monthly during lactation using the method of control milk yields, twice a month on two adjacent days [3].

Dairy productivity was calculated taking into account milk sucked at night by a foal, according to the formula of professor I.A. Saigin [7].

$$Y_c = \frac{V\phi \cdot 24}{m}$$

where  $Y_c$  - daily (gross) milk yield of mares;  $V\phi$  – actual (marketable) milk yield in l;  $T$  - time spent for milking (hours).

Biometric processing of digital materials was carried out according to the standard technique. [8].

**Research results.** In determining the productive profile of horses, the reproductive qualities of Kazakh Jabe horses and the Kushum breed were studied depending on the class (elite + I, II, non-class) and the direction of productivity (meat and dairy).

In the flocks of mares of the meat direction of productivity in the population of 20-30 heads, one stud horse was assigned.

In mare flocks of the dairy productivity in the number of 15-20 heads, one stallion was assigned. The re-mating was carried out after two days, which allowed providing pregnancy more than 75% of mares. 10 days after the re-mating stray from flock mares were returned to service. With the manifestation of the estrus, the mare was mated in the same manner as during the first estrus. For prophylaxis of altering of the mated horses, they were checked for the presence of pregnancy according to physiological data throughout the entire breeding season.

It was established that, at pasture breeding, the fertility of mares of the meat direction of productivity was not more than 75%, with a hand breeding - 90%. In mares of dairy productivity, the fertility was 75-87%, at hand mating - 90-96%.

From the mated contingent, there were excluded mares born in 2017. 3 years old and older female horses were allowed to be mated. Of the three-year-old mares, the underdeveloped and weak ones were not allowed for mating, and of the full-aged mares - those who were unable to bear and feed the foal.

It was found that the main causes of low fertility are: stallions have frequent mounting; poor fatness of mares; incomplete feeding (lack of nutrients, minerals, and vitamins in the diet); genital diseases in mares. A similar problem exists in dairy breeding [9, 10].

The optimal parameters for dairy productivity of the Kazakh Jabe mares and the Kushum breed are the average daily milk yield of at least 3.5 kg, regardless of the technological parameters of the udder (cupped, round), thickness and length of nipples.

Mare's udder consists of two separate halves - right and left. Its girth at the base was 54 cm for Jabe mares, 72 cm for Kushum mares, 10 and 15 cm of depth, respectively, 26-30 cm of length along the sideline, 23 and 28 cm of length along the midline. Nipples in Jabe mares had the following measurements: length - 3 cm, nipple girth at the base - 9 cm, the distance between nipples - 4 cm, and in Kushum mares, these indicators were 5; 12; 7.5 cm respectively.

Most often mares have a cup-shaped and round shape of the udder. Rarely with a goat udder shape, but such mares were picked out from herds.

Dairy productivity of mares was studied, depending on the udder shape on the second month of lactation (from April 25 to May 25, 2019).

In the Bayserke Agro farm, mares foal in mid-March and early April. The milking of experimental mares began on April 25th.

Horses of both groups due to various udder shape did not have the same milking capacity (table 1). Mares with a cup-shaped udder had higher dairy productivity of 13.75 and 15.12 liters, while mares with a rounded udder had a capacity of 13.39 and 14.50 liters of milk.

From there, when creating farms for koumiss production, mares with a cup-shaped udder should be selected.

An important measure in the selective and breeding work is the elaboration of a control scale for the development of young stock. To this end, we conducted a study of the growth and development of young animals of both breeds (table 2).

Table 1 – Milking capacity of mares depending on the udder shape

| Indicators                   | Breed                     |             |              |         |
|------------------------------|---------------------------|-------------|--------------|---------|
|                              | Kazakh breed of Jabe type |             | Kushum breed |         |
|                              | Udder shape               |             |              |         |
|                              | Cup-shaped                | Rounded     | Cup-shaped   | Rounded |
| Number of animals            | 4                         | 3           | 3            | 2       |
| Actual milk yield per day, l | 5.73±0.3                  | 5.58±0.5    | 6.30±0.4     | 6.04    |
| Milking capacity:            |                           |             |              |         |
| Per day, l                   | 13.75±0.5                 | 13.39±0.8   | 15.12±0.5    | 14.50   |
| Per month, l                 | 412.50±26.1               | 401.70±14.7 | 453.60±23.4  | 435.0   |

Table 2 – Growth and development of foals.

| Indicators                            | Breed                     |         |              |         |
|---------------------------------------|---------------------------|---------|--------------|---------|
|                                       | Kazakh breed of Jabe type |         | Kushum breed |         |
|                                       | Udder shape               |         |              |         |
|                                       | Cup-shaped                | Rounded | Cup-shaped   | Rounded |
| Number of animals                     | 4                         | 3       | 3            | 2       |
| Live weight: at the age of 3 days, kg | 41                        | 39      | 48           | 47      |
| At the age of 1 month, kg             | 82±3.1                    | 79±4.5  | 93±5.9       | 90      |
| At the age of 2 months, kg            | 112±5.4                   | 107±7.7 | 129±9.2      | 123     |

At the age of one month, the average daily gain in live weight of foals of the Kazakh and Kushum mares with a cup-shaped udder was 1518 and 1667 g, and with the rounded shape of the udder - 1481 and 1592 g respectively. The average daily live weight gain in the Kazakh Jabe foals of 2-month-old age was 1000 and 950 g, while in Kushum foals - 1190 and 1100g.

Considering that in mares with a cupped udder shape due to their higher milking capacity foals develop better and have a higher average daily gain.

**Conclusion.** In the conditions of Bayserke-Agro LLP, when breeding Kazakh breed of Jabe type and Kushum breed of dairy productivity, it is necessary to strictly select and breed mares according to the technological parameters of the udder.

It was established that mares with a cup-shaped udder had higher dairy productivity of 13.75 and 15.12 liters, while mares with a rounded udder shape had a milking capacity of 13.39 and 14.50 liters.

From there, when creating farms for koumiss production, mares with a cup-shaped udder should be selected.

**К. Ж. Исхан**

ЖШС "Байсерке-Агро" Оқу ғылыми-өндірістік орталығы, Алматы облысы, Қазақстан

### ОТАНДЫҚ ТАБЫН ЖЫЛҚЫ ТҰҚЫМДАРЫНЫҢ ӨНІМДІ ПРОФИЛІ

**Аннотация.** Үйірде шағылыстыру кезінде етті бағыттағы биелердің ұрықтануы 75%-дан артық емес, қолмен шағылыстыру кезінде 90%-ды құрағаны анықталды. Сүтті бағыттағы биелердің ұрықтануы 75-87%, қолмен шағылыстыру 90-96% құрады. Жабе және Көшім тұқымындағы қазақ жылқылары биелерінің сүт өнімділігінің оңтайлы параметрлері желіннің технологиялық параметрлеріне (кесе тәрізді, дөңгелек), емшегінің қалыңдығы мен ұзындығына қарамастан, кемінде 3,5 кг сүттің орташа тәуліктік сауымы болып табылады. Биелердің желін екі бөлек жартыдан тұрады – оң және сол. Оның орамының жабы тұқымында 54 см, Көшім биелері – 72 см, тереңдігі тиісінше 10 және 15 см, бүйір сызығы бойынша ұзындығы 26-30 см, орта сызығы бойынша ұзындығы 23 және 28 см. Жабе үлгісіндегі қазақ биелерінің желіні мынадай өлшемдерге ие болды: ұзындығы 3 см, желін орамы 9 см, желіні арасындағы қашықтық 4 см, Көшім биелері тиісінше 5; 12; 7,5 см. Жоғары сүт өнімділігімен 13,75 және 15,12 л тостаған желін формасы түріндегі биелер бар, ал желіннің дөңгелек түріндегі биелер 13,39 және 14,50 л сүттілігі болған. Тостаған пішіні бар желін биелерде

жоғары сүттілігіне байланысты құлындары неғұрлым жақсы дамиды және орташа тәуліктік өсуі жоғары. 2 айлық жастағы жабы құлындардың орташа тәуліктік өсімі 1000 және 950 г, ал Көшім 1190 және 1100 г құрады.

**Түйін сөздер:** сүттілік, желіннің пішіні, тез даму, құлындар, профиль.

**К. Ж. Исхан**

ТОО «Учебный научно-производственный центр Байсерке-Агро», Алматинская область, Казахстан

## ПРОДУКТИВНЫЙ ПРОФИЛЬ ТАБУННЫХ ЛОШАДЕЙ ОТЕЧЕСТВЕННЫХ ПОРОД

**Аннотация.** Установлено, что при косячной случке оплодотворяемость кобыл мясного направления продуктивности составила не более 75%, при ручной случке 90%. У кобыл молочного направления продуктивности оплодотворяемость составила 75-87%, при ручной случке 90-96%. Оптимальными параметрами молочной продуктивности кобыл казахских лошадей жабе и кушумской породы является средний суточный удой молока не менее 3,5 кг, независимо от технологических параметров вымени (чашевидная, округлая), толщины и длины сосков. Вымя кобыл состоит из двух обособленных половин – правой и левой. Его обхват у основания равнялся у казахских кобыл типа жабе 54 см, у кушумских – 72 см, глубина соответственно 10 и 15 см, длина по боковой линии 26-30 см, длина по средней линии 23 и 28 см. Соски у казахских кобыл типа жабе имели следующие промеры: длина 3 см, обхват соска у основания 9 см, расстояние между сосками 4 см, а у кушумских кобыл соответственно 5; 12; 7,5 см. Более высокой молочной продуктивностью обладали кобылы с чашевидной формой вымени 13,75 и 15,12 л, тогда как кобылы с округлой формой вымени имели молочность 13,39 и 14,50 л. Установлено, что у кобыл с чашевидной формой вымени в силу более высокой молочности жеребята развиваются лучше и имеют более высокий среднесуточный прирост. Среднесуточный прирост жеребят казахского типа жабе 2-х месячного возраста составлял 1000 и 950 г, а кушумских 1190 и 1100 г.

**Ключевые слова:** молочность, форма вымени, скороспелость, жеребята, профиль.

### About the author:

Iskhan Kairat Zhaleluly, Candidate of agricultural sciences, associate professor, chief researcher of the Educational Scientific and Production Center Bayserke-Agro LLP, Talgar district, Almaty region, Kazakhstan; Kayrat\_Ishan@mail.ru; <https://orcid.org/0000-0001-8430-034X>

## REFERENCES

- [1] Satayev E.T., Iskhan K.Zh., Baimukanov D.A., Akimbekov A.R. Dairy productivity of Kushum horse breed // Izdenister, natizheler – Research, results. 2018. N 2(78). Almaty: KazNAU. P. 128-135 (in Russ.).
- [2] Aubakirov Kh.A., Baimukanov D.A., Rakhmanov S.S. Peculiarities of the distribution of colors in the horse population grown in the farm "Bapysh-Seisenbay" of Zhambyl region // Reports of the National academy of sciences of the Republic of Kazakhstan. 2016. Vol. 5, N 309. P. 268-274 (in Kaz.).
- [3] Akimbekov A.R., Baimukanov D.A., Iskhan K.Zh., Omarov M.M., Aubakirov Kh.A. Dairy productivity and milk composition in mares of different genotypes // Reports of the National academy of sciences of the Republic of Kazakhstan. 2018. N 2. P. 172-180 (in Russ.).
- [4] Baimukanov D.A. Industrialization of the agro-industrial complex erodes genetic diversity // Internet portal "ABCTV.kz inbusiness.kz. November 15, 2018. [https://abctv.kz/ru/author\\_news/industrializaciya-apk-razmyvaet-geneticheskoe-raznoobrazie](https://abctv.kz/ru/author_news/industrializaciya-apk-razmyvaet-geneticheskoe-raznoobrazie)
- [5] Instructions for bonitation of local breeds of Kazakhstan – Astana, 2014. 22 p. (in Russ.).
- [6] Akimbekov A.R., Baimukanov D.A., Yuldashbaev Yu.A., Demin V.A., Iskhan K.Zh. Horse breeding (ISBN 978-5-906923-27-1). M.: COURSE: INFRA-M, 2018. 400 p. (in Russ.).
- [7] Saygin I.A. Meat and dairy horse breeding // Agricultural production of the Urals. 1963. N 5. P. 12-14 (in Russ.).
- [8] Plokhinsky N.A. Guidelines for biometrics for livestock specialists. M.: Kolos Publishing House, 1969. 256 p. (in Russ.).
- [9] Abugaliyev S.K., Seidaliyev N.B., Dalibayev E.K., Zhamalov B.S., Muka Sh.B. Procedure of custom mating and genomic analysis of bull-calves in dairy cattle breeding // Reports of the National academy of sciences of the Republic of Kazakhstan. ISSN 2224-5227. 2018. Vol. 5, N 321. P. 41-47. <https://doi.org/10.32014/2018.2518-1483.5>
- [10] Seidaliyev N.B., Dalibayev E.K., Zhamalov B.S., Muka Sh.B. Monitoring data of the existing system of organization of the selective process in the dairy cattle breeding of the Republic of Kazakhstan // News of the National academy of sciences of the Republic of Kazakhstan: Series of Agricultural Sciences. ISSN 2224-526X. 2018. Vol. 5, N 47. P. 81-86. <https://doi.org/10.32014/2018.2224-526X.11>

## NEWS

OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN

## SERIES OF AGRICULTURAL SCIENCES

ISSN 2224-526X

Volume 5, Number 53 (2019), 93 – 99

<https://doi.org/10.32014/2019.2224-526X.66>

UDK 631.5:633.4

**B. M. Koshen, A. S. Shayakhmetova, M. Toktar, B. M. Koshenov**

M. Kozybaev North Kazakhstan University, Petropavl, Kazakhstan.

E-mail: gul\_94@bk.ru, adelina\_renata@bk.ru, murat-toktar@mail.ru, kerei\_kyzy@mail.ru

**FORAGE PRODUCTION  
IN THE NORTHERN PART OF KAZAKHSTAN**

**Abstract.** The natural grassland in the northern part of Kazakhstan is in the degraded and heavy grazed state, particularly near the ails and villages.

Forage production as a grain branch takes a leading place in plant production of the Northern Kazakhstan.

The alkaline soils take about 30 million hectares in the Northern Kazakhstan, 80% of which are used as feed lands for silage production and pastures. The proper usage of these lands will promote to improve the soil fertility and forage crops yield. But only the proper melioration of these lands will give the efficient response.

One of the main forage crops in the Northern Kazakhstan is a corn for silage. By its nutritive and energetic values, the corn makes up to more than 40% in the structure of ruminant animals ration. The yield and prod

Activity of early-ripening hybrids of corn is affected by the agricultural practice of its cropping. Time of planting, seeding rates and time of harvesting corn hybrids are of special importance.

**Keywords:** maize, crop production, fodder production, Productivity, agricultural engineering.

**Introduction.** The steppe zone occupies about 40% of the territory of Northern Kazakhstan. The annual amount of precipitation ranges from 250 to 350 mm, and the sum of temperatures during the growing season reaches 2200-24000. This zone is one of the largest regions of the Republic. However, the further development of animal husbandry and increase of its productivity is constrained by insufficient provision of livestock feed and its low quality.

Currently, a lot of work is being done to restore the livestock and improve its quality, which requires not only the development of new technology for its maintenance, but also a new approach to the management and organization of the forage base. First of all, it refers to its stability over the years, with a high quality of feed [1-3].

In the North of Kazakhstan, the area under forage crops is being restored, which employs about 3.6 million hectares or about 14% of the total arable land. Huge spaces are occupied by natural forage lands. Only natural pastures more than 30 million hectares and about 1.5 million hectares of natural hayfields [4].

As a rule, these lands are marginal lands – saline soils, underdeveloped, poor in nutrients. Most of them are located in the area of steppes and semi-deserts. Hay harvest on these lands does not exceed an average of 3-5 C, pasture weight 15-20 C ha. In sharply dry years, the harvest is reduced by 1.5-2.0 times [5, 6].

Of great importance is the improvement of the quality of corn silage, which occupies a greater proportion in the structure of ruminant diets. Therefore, it is necessary to improve the quality of this valuable juicy food on the basis of widespread introduction of advanced technologies of their cultivation, harvesting and storage.

Achieving these priorities is possible only on the basis of progressive energy-resource-saving technologies of cultivation of forage crops, harvesting and storage of feed, improving the structure of diets and feed quality, which ultimately contributes to an increase in meat and milk production in the country by 25-30%.

**Materials and methods.** Studies on the development and reclamation of saline were carried out on meadow-steppe saline complexes in LLP "Novokubanka" Akmola region, located in the subzone of southern carbonate chernozems.

The tab of experiments was preceded by a detailed soil scheme of experimental plots on a scale of 1: 500.

All records and observations were carried out in accordance with the "Guidelines for soil-reclaimed research and development of projects of reclamation of saline lands in the Kazakh SSR" Alma-Ata, 1980.

During the laying of field and production experiments with corn conducted in SKYISH was guided by the "Methodological recommendations for the formulation of field experiments with corn". Dnepropetrovsk 1980 and "guidelines on the assessment of bioenergy, crop rotations and technology of cultivation of fodder crops", M., 1989.

**Results and discussion.** Given the wide variety of solonchets in Kishish (VNIIESH) was developed by reclamation in their group (3). All the soils of solonch complex of reclamation is divided into 9 groups. The basis for the division of Solonch into groups, in addition to their differences in soil-reclamation properties, is the uniformity of the reclamation techniques used. The productivity of the development of saline depends on the system and use in the reclamation period and the types of crops grown.

The results of a comparative study of salt resistance of crops using field (agronomic salt resistance) and vegetation (biological salt resistance) experiments have shown that the salt resistance of perennial grasses is generally higher than annual crops. Among the first the highest agronomic and biological tolerance different Wheatgrass beskorpusnye. Agronomic salt tolerance of sweet clover, especially the 2nd year of life, is also quite high, although its biological salt resistance is much lower than other crops. Wheatgrass, alfalfa, folonari significantly behind in terms of resistance to salinity in the wheat-grass and clover 2-year, differ little among themselves in agronomic salt tolerance. Markedly inferior to them in the rump.

Of annual crops is allocated to the biological and agronomic salt mustard crop which is reduced with increasing soil salinity very slowly. It is followed by barley. Millet, wheat, oats, mogar are characterized by a relatively average salt resistance. Sorghum and Sudanese grass greatly reduce the yield with increasing salinity and die at the lowest level of soil salinity compared to other crops, which is largely due to the unfavorable temperature regime for these crops in these conditions. Table 1 presents average years of data, shows the extent of yield reduction of crops by 25%, 50% and 75% compared to crop them into non-saline soil.

Table 1 – Scale of salt tolerance of agricultural crops under conditions of chloride-sulphate salinity

| The content of toxic salts in % to the soil (layer 0-40 cm), corresponding to the degree of decrease in yield on |      |      |      |               |      |      |      |
|------------------------------------------------------------------------------------------------------------------|------|------|------|---------------|------|------|------|
| Perennial crop                                                                                                   | 25%  | 50%  | 75%  | Annual crop   | 25%  | 50%  | 75%  |
| Wheatgrass                                                                                                       | 0,38 | 0,72 | 1,06 | Mustard       | 0,35 | 0,74 | 0,91 |
|                                                                                                                  |      |      |      | Barley        | 0,30 | 0,56 | 0,75 |
| Melilot                                                                                                          | 0,35 | 0,64 | 0,93 | Millet grain. | 0,31 | 0,45 | 0,66 |
| Elymus junceus                                                                                                   | 0,40 | 0,60 | 0,89 | Wheat         | 0,27 | 0,44 | 0,67 |
|                                                                                                                  |      |      |      | Mogar.        | 0,26 | 0,44 | 0,67 |
| Elymus sibiricus                                                                                                 | 0,37 | 0,65 | 0,90 | Sudanese      | 0,23 | 0,44 | 0,71 |
|                                                                                                                  |      |      |      | Oat           | 0,25 | 0,39 | 0,60 |
| Lucerne                                                                                                          | 0,34 | 0,60 | 0,92 | Agro          | 0,20 | 0,36 | 0,57 |
| Zhitnyak                                                                                                         | 0,32 | 0,55 | 0,92 | Millet feed   | 0,20 | 0,34 | 0,47 |
| Rump                                                                                                             | 0,32 | 0,37 | 0,66 |               |      |      |      |

On the basis of the data obtained, the grouping of crops by salt tolerance was developed (table 2).

Comparison of this group with the one developed by Kiryushin V. I. and Moiseenko N. D. (5) the group of cultures on salt tolerance testifies to the different relation of cultures to salinity and salinity.

Sweet clover and mustard, the salt lick is extremely stable, but the resistance to severe salinization of the sweet clover below. Unselfish Wheatgrass on the contrary, showing high quality in both respects,

Table 2 – Grouping of crops by salt and salt tolerance for the conditions of the arid steppe of Northern Kazakhstan

| Degree of stability | Salt tolerance                                                                                        | Salt Resistance<br>(V. I. Kiryushin, N. D. Moiseenko, 1971)   |
|---------------------|-------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|
| Very strong         | Wheatgrass unselfish                                                                                  | Sweet clover (yellow and white)                               |
| Strong              | Sweet clover (yellow and white)                                                                       | A. Siberian, Wheatgrass SIZ                                   |
| Average             | Wheatgrass PPE. Sitnikova, a. Siberian, alfalfa: Petrohemija, seneviratna, selegilina, zhytnyak, rump | Alfalfa: Petrohemija, seneviratna, selegilina, zhytnyak, rump |
| Weak                | Sainfoin                                                                                              | Sainfoin                                                      |
| Annual crop         |                                                                                                       |                                                               |
| Very strong         | Mustard                                                                                               | Mustard                                                       |
| Strong              | Barley                                                                                                | Barley                                                        |
| Average             | Millet fodder, wheat, mogar, millet grain, oats                                                       | Oats, millet, mogar, Sudanese grass                           |
| Weak                | Sorghum, Sudanese grass                                                                               | Wheat, sorghum                                                |

more resistant to strong salinization. Even greater differences in relation to salt the salt lick sustainability exhibit a. and wheat. Siberian salt lick has a strong resistance to medium salt tolerance, and the wheat – average salt tolerance and weak solonetz resistance.

Equally strong resistance to salinity and salinity shows barley, and weak – sainfoin. Given that the prospect of using saline soils is mainly associated with the tinning of their perennial grasses, it is advisable to establish the degree of salinization of soils – weak, medium, strong and very strong - focusing on the nature of reducing the yield of medium-resistant perennial grasses (alfalfa, corn, hair), respectively, 25%, 50% and 75%. Based on these considerations, the classification of saline soils according to the degree of salinity can be presented in the following form:

- Slightly salted 0.2-0.4%;
- Average saline 0.4-0.6%;
- Strongly saline 0.6-0.9%;
- Very strongly saline >0.9%.

Economic analysis showed the feasibility of using the meadow solonetz complexes in grassland crop rotations with sowing of such crops as wheat grass beskorpusnye, clover, a. Sitnikova, Wheatgrass. Moreover, Wheatgrass and melon pay for the costs in the first two years. At the same time, the use of these lands as natural hayfields on the verge of profitability. On the complexes of these soils, already involved in the arable land, it is more expedient to place salt and salt-resistant field crops, of which barley, oats, mustard are the most preferred.

**Place and role of corn in crop rotation.** In the conditions of Northern Kazakhstan, where moisture is the main factor of plant productivity, the main action of its predecessors is determined by its influence on the water regime of the soil. According to the obtained data, the reserves of productive moisture in the root layer of the soil after harvesting corn are 1.5-2.5 times higher than after barley, wheat, sunflower, which dry the soil to a greater depth. Especially large differences in the content of moisture productivity were observed in the soil layer of 100-150 cm (35.1 against 16.8-17.1 mm).

The productivity of crop rotation links depends not only on the saturation of their corn, but also its saturation by its predecessors. The results of our studies show that the productivity is higher when placing corn after spring barley and legumes in a mixture with cereals. On average, for 10 years its productivity after barley amounted to 47.5 C/ha of fodder units after corn 39.7 C/ha, after spring wheat – 42.3, after corn for corn – 49.7 C/ha.

Thus, in the conditions of the steppe zone of Northern Kazakhstan, it is advisable to sow corn in the following links: 1) maize – maize – barley; 2) maize – oats; 3) maize – spring wheat – oats, barley, annual grasses.

The saturation of crop rotations with corn is determined by the specialization of farms taking into account soil and climatic conditions. The maximum productivity of grain crop rotations was observed at 33.3% saturation of their corn. So, at 66% of grain on average for 5 years it was received from 1 hectare of crop rotation area: grain – 28,7 C/ha, exchange energy – 31,8 GJ. Therefore, for farms in the region

specializing in the production of milk and beef, the most productive is the crop rotation, in which corn occupies 40%, spring wheat 20%, grain and annual herbs 20%. The productivity of corn in specialized crop rotations largely depends on its predecessors. The highest yield was obtained by placing it after spring wheat (53.5 C/ha DM) and peas (56.7 C/ha), and the lowest (40.6 C/ha) – in permanent crops. The greatest collection of exchange energy from 1 hectare is provided by crop rotations with a specific weight of corn in the structure of sowing 66.7%.

Corn crops for silage (grain-bearing mass) are placed in fields with different soil nutrient and moisture content. Therefore, it is very important to know the reaction of maize plants to mineral fertilizers in connection with their predecessors. We have found that when sowing after spring wheat and barley, corn reacts to phosphorus fertilizers better than after corn. Nitrogen-potash and phosphorus-potash fertilizers most contributed to the increase in its yield after the pea mixture (table 3).

Table 3 – Efficiency of application of mineral fertilizers for corn for different predecessors

| Predecessor       | Dry matter, C/ha    |                                 |                                                 |
|-------------------|---------------------|---------------------------------|-------------------------------------------------|
|                   | without fertilizers | N <sub>60</sub> P <sub>60</sub> | N <sub>60</sub> P <sub>60</sub> K <sub>60</sub> |
| Spring wheat      | 32,3                | 43,6                            | 45,0                                            |
| Barley            | 38,1                | 46,9                            | 47,3                                            |
| Corn              | 32,8                | 36,8                            | 43,8                                            |
| Pea-oat mixture   | 40,5                | 49,8                            | 56,7                                            |
| HCP <sub>05</sub> |                     | 2,7                             | 3,0                                             |

**Types, doses and methods of application of complex fertilizers.** In order to provide plants with nutrients in the earliest period of their vegetation, a sharp reduction in nutrient losses from fertilizers, stimulation of the growth of the corn root system, the most effective is the row application of complex mineral fertilizers simultaneously with the sowing of corn.

However, one of the factors constraining the widespread introduction of row-by-row application of complex mineral fertilizers together with sowing is the opinion that the germination of corn is reduced when using increased doses of fertilizers that adversely affect seeds and seedlings.

In our research, undertaken in 2009-2011, a complex mineral fertilizer with seed introduction has had a depressing effect on seedlings and maize seedlings. On average, nitrophos at a dose (NP)20 had the least negative effect on seedlings and young plants in 3 years with rowed introduction of tuks. From the dose is double the number of plants decreased by 9%. The dose of nitrophoska (NPK)40 reduced thickness of 7-8% in comparison with the dose (NPK)20. The use of elevated norms of superphosphate and ammophos did not adversely affect the density of corn. Compared to the control (without fertilizers), row-by-row placement of the tuks reduced the density by a maximum of 8.4%(nitrofoska (NPK)240). Further processes of biomass accumulation proceeded more intensively in variants with row application of fertilizers. So, in phase 5-8 leaf weight per plant at scattered making fertilizers increased relative to control at 16-20% (ammophos and nitrophos), and the localization of similar doses from 0 to 34.5(P20) to 76.4-80.0% of (nitrophos and map). Thus, row placement of complex types of fertilizers is more effective than their application at random for cultivation.

The evaluation of the final result showed that the total yield of green mass in the experiment averaged 276.0-334.0 t/ha or 37.0-47.7 t/ha (table 4).

Row application of fertilizers sharply increased their efficiency. Thus, the increase in the yield of fodder units from the row application of the same doses of fertilizers compared with the introduction of randomly increased within the following limits: nitrophos – 3,4.

The best results in comparison with the control provided the use of nitrophos. The increase was 8,2-10,7 kg K. u/ha. a Smaller effect is obtained by applying nitrophoska (6,7-7,5 t/ha), ammonium phosphate (7,1-7,6 t/ha) and superphosphate (up to 5.4 t/ha). The same pattern was observed in the yield of dry matter.

Table 4 – Efficiency of various types and doses of complex mineral fertilizers when applied together with sowing

| Option                                                                                                                   | Yield, t/ha           |            |           |      |      |                     |
|--------------------------------------------------------------------------------------------------------------------------|-----------------------|------------|-----------|------|------|---------------------|
|                                                                                                                          | Average for 2009-2011 |            | Feed unit |      |      | Average for 3 years |
|                                                                                                                          | Green mass            | Dry matter | 2009      | 2010 | 2011 |                     |
| 1. Control (without fertilizers)                                                                                         | 276,0                 | 40,8       | 32,4      | 32,4 | 46,3 | –                   |
| Spread under cultivation                                                                                                 |                       |            |           |      |      |                     |
| 2. N <sub>60</sub> P <sub>60</sub> K <sub>60</sub>                                                                       | 310,1                 | 43,2       | 37,0      | 38,5 | 48,2 | 41,4                |
| 3. P <sub>20</sub>                                                                                                       | 283,0                 | 41,7       | 35,5      | 31,6 | 48,8 | 38,0                |
| 4. N <sub>20</sub> P <sub>20</sub>                                                                                       | 295,0                 | 45,0       | 36,1      | 36,7 | 45,9 | 39,6                |
| 5. N <sub>20</sub> P <sub>20</sub> K <sub>20</sub>                                                                       | 287,6                 | 43,3       | 35,3      | 37,1 | 42,7 | 38,4                |
| In the rows at sowing                                                                                                    |                       |            |           |      |      |                     |
| 6. P <sub>20</sub>                                                                                                       | 284,3                 | 42,7       | 38,0      | 32,9 | 48,8 | 39,9                |
| 7. P <sub>40</sub>                                                                                                       | 300,1                 | 45,6       | 39,5      | 36,9 | 50,7 | 42,4                |
| 8. N <sub>20</sub> P <sub>20</sub>                                                                                       | 315,0                 | 48,0       | 41,9      | 45,3 | 48,4 | 45,2                |
| 9. N <sub>40</sub> P <sub>40</sub>                                                                                       | 328,0                 | 51,0       | 38,3      | 49,4 | 55,5 | 47,7                |
| 10. N <sub>20</sub> P <sub>20</sub> K <sub>20</sub>                                                                      | 322,0                 | 47,2       | 38,0      | 40,6 | 52,3 | 43,2                |
| 11. N <sub>40</sub> P <sub>40</sub> K <sub>40</sub>                                                                      | 334,0                 | 47,9       | 35,8      | 44,7 | 53,0 | 44,5                |
| 12. N <sub>12</sub> P <sub>52</sub>                                                                                      | 310,0                 | 47,1       | 41,0      | 44,2 | 47,0 | 44,1                |
| HCP <sub>05</sub>                                                                                                        | 4,7                   | 3,7        | 39        | 4,3  | 3,8  | 4,1                 |
| Note: P – double granular superphosphate; NP – nitrophos; NPK – nitrophoska; N <sub>12</sub> P <sub>52</sub> – ammophos. |                       |            |           |      |      |                     |

Higher increases were obtained from the application of double DOX fertilizers-(NP)40 and (NPK)40. At the same time, the use of relatively high standards of ammophos N24P104 gave a positive result in all years of research. The influence of the superphosphate was the smallest of all the studied types of fertilizers. A significant increase in the yield of fodder units on average for all years was obtained only with an increase in the dose to 40 kg / ha. Thus, the productivity of maize crops with a row placement of complex fertilizers is in all cases higher than with scattered.

At the same time, nitrophos and nitrophosphate should in this case be applied in limited doses. And only in years with moderate moisture (2011) and uniform distribution of precipitation during the growing season, the dose of nitrophos can be increased to 40 kg / ha.

The decrease in the increments from the use of nitrogen-phosphorus-potassium fertilizers (nitrophoska) in comparison with nitrogen-phosphorus (nitrophos), especially in arid conditions, is explained by the fact that the placement of potassium fertilizers in rows, especially in dry years, causes oppression of growth and development processes. The use of high doses of fertilizers simultaneously with sowing creates foci of different concentrations in the soil, so with an increase in the concentration of salts of the soil solution in the zone of the focus, the growth of corn roots and their branching is suspended.

This disrupts the metabolism and reduces the ability of plants to withstand negative external factors.

Row-by-row use of complex maize tuks, which are in dire need of nutrients from an early period of life, resulted in better quality products than from their scattered application. So, if you broadcast the location of the fat content crude protein accounted for 11.21-of 11.94%. The introduction of a full dose (NPK)60 increased it to 12.02%. In the localization of fertilizers, the protein concentration was 11.04-13.19% depending on the type and dose of the tuks. At the same time, the highest content was provided by nitrofoska (NPK)20 -12,92%.

Row fertilizer application had a positive impact on the nutritional value of corn mass. At the same time, the yield of digestible protein with the introduction of nitrofosk was higher by 21.9, and nitrophos – by 9.1%. compared with similar doses, introduced at random – respectively 3.2 and 3.3 C/ha. From the increased norms, the protein content increased by 11.1% for nitrophos (NP)40, for superphosphate P40 – to 9.7%, for other types of fertilizers, these indicators were lower.

Row placement of fertilizers dramatically increases their energy efficiency, especially at a relatively low dose. At the same time, the lowest energy costs per feed unit were when applying a low dose of superphosphate (1,7-2,2 MJ). Of the other studied types of fertilizers, the most effective was the use of nitrophos at a dose of 20 kg / ha (3.5 MJ). There was also the highest energy coefficient. Effective is the entry in row nitrophoska (NPK)20 and ammophos N<sub>12</sub>P<sub>52</sub>.

**Conclusion.** An important component of biological melioration of solonchets is the sole and salinauskait cultivation of fodder and forage crops – barley, oats, panic, Sudan grass, sweet clover, a., Wheatgrass, Wheatgrass and contrary. Only by improving the structure of crops that do not require additional costs, it is possible to increase the production of feed, especially in economic entities saturated with saline soils. Corn for silage should be placed in the system of soil-protective crop rotations. The best precursors are leguminous and forage and annual grasses.

The introduction of complex mineral fertilizers in rows when sowing corn increases the payment of fertilizers for the harvest of feed. 3-5 times. Higher increases are provided by nitrophos (8,2-10,7 C/ha) and ammophos (7,1-7,6 C/ha), which gives the maximum conditionally net income and increases in the green mass of maize the content of crude protein, fat and reduces the proportion of fiber.

**Б. М. Кошен, А. С. Шаяхметова, М. Тоқтар, Б. М. Кушенов**

М. Қозыбаев атындағы Солтүстік-Қазақстан мемлекеттік университеті, Петропавл, Қазақстан

#### **СОЛТҮСТІК ҚАЗАҚСТАН МАЛ-АЗЫҚ ӨНДІРІСІ**

**Аннотация.** Мақала Республиканың солтүстігіндегі жемшөп өндірісінің жағдайы мен болашағы жайлы мәселелерге арналған. Солтүстік Қазақстанның өсімдік шаруашылығында жемшөп өндірісі астық саласы ретінде алғашқы орында тұр.

Солтүстік Қазақстанда кебірлі кешендер 30 млн.га аланды алып жатыр, оның 80% сүрлем және жайылым ретінде пайдаланылады. Осы жерлерді дұрыс пайдалану топырақ құнарлылығын және жемшөптік дақылдардың өнімділігін арттыруға мүмкіндік туғызады. Бұл жерлердің тиімділігіне түпкілікті өзгерту енгізу арқылы ғана қол жеткізуге болады.

Солтүстік Қазақстанда сүрлемге арналған жүгері негізгі жемшөптік дақыл болып саналады және энергетикалық көрсеткіштері бойынша күйіс қайыратын жануарлар рационының 40% құрайды. Жүгерінің ерте пісетін будандарының өнімділігі мен құнарлылығы агротехникаға байланысты. Әсіресе, себу мерзімі, себу мөлшері және ору мерзімі өте маңызды.

**Түйін сөздер:** жүгері, өсімдік шаруашылығы, жемшөп- өндірісі, өнімділік, ауылшаруашылық техникасы.

**Б. М. Кошен, А. С. Шаяхметова, М. Тоқтар, Б. М. Кушенов**

Северо-Казахстанский государственный университет имени М. Козыбаева, Петропавловск, Казахстан

#### **ПРОИЗВОДСТВО КОРМОВ НА СЕВЕРЕ КАЗАХСТАНА**

**Аннотация.** Статья посвящена состоянию и перспективам кормопроизводства на севере страны. В растениеводстве кормопроизводство, как зерновая отрасль Северного Казахстана занимает первое место.

В Северном Казахстане солончаковые комплексы занимают площадь 30 млн.га из которых 80% используются в качестве силоса и пастбища. Правильное использование этих земель повысит продуктивность почвенного плодородия и кормовых культур. Это может быть достигнуто только путем окончательного изменения эффективности этих земель.

В Северном Казахстане для силоса кукуруза считается основной кормовой культурой, а энергетический индекс составляет 40% рациона животных. Продуктивность и плодородие семян раннего созревания кукурузы зависят от агротехники. Особенно важно сроки сева, урожайность и сроки сбора урожая.

**Ключевые слова:** кукуруза, растениеводство, кормопроизводство, продуктивность, агротехники.

#### Information about authors:

Koshen B. M., doctor of agricultural sciences, professor, M. Kozybaev north Kazakhstan university, Petropavl, Kazakhstan; gul\_94@bk.ru; <https://orcid.org/0000-0002-9744-3179>

Shayakhmetova A. S., candidate of agricultural sciences, M. Kozybaev north Kazakhstan university, Petropavl, Kazakhstan; adelina\_renata@bk.ru; <https://orcid.org/0000-0002-0367-4970>

Toktar M., PhD, M. Kozybaev north Kazakhstan university, Petropavl, Kazakhstan; murat-toktar@mail.ru; <https://orcid.org/0000-0002-0953-7491>

Koshenov B. M., candidate of agricultural sciences. M. Kozybaev north kazakhstan university, Petropavl, Kazakhstan. kerei\_kyzy@mail.ru; <https://orcid.org/0000-0003-3896-895X>

#### REFERENCES

- [1] Kantureyev M.T. Development of fodder production in Kazakhstan // News of the National academy sciences of the Republic of Kazakhstan. Series of agricultural sciences. 2019. Vol. 1(49). P. 51-54. <https://doi.org/10.32014/2019.2224-526X.7>
- [2] Asanov K.A., Shah B.P. Hay meadows and pastures of Kazakhstan. Alma-Ata: Kainar, 1987. 289 p.
- [3] Kuchanov B.M. Status and prospects of forage production in Northern Kazakhstan // Forage production. 1998. N 12. P. 2-5.
- [4] Eskov A.I., Okorokov V.V. Reclamation and use of salt licks // Comaprison. 1986. N 5. P. 15-19.
- [5] Smailov K.S., Alimaev I.I. Grassland agriculture of Kazakhstan. Alma-Ata: Kainar, 1987. 289 p.
- [6] Kiryushin V.I., Moiseenko I.G. Improvement of natural forage lands on meadow saline and highly saline soils. Questions of Genesis, reclamation and soil protection of Northern Kazakhstan. Tselinograd, 1972. P. 186-198.

NEWS

OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN

SERIES OF AGRICULTURAL SCIENCES

ISSN 2224-526X

Volume 5, Number 53 (2019), 100 – 103

<https://doi.org/10.32014/2019.2224-526X.67>

UDC 636.082.453

**D. T. Sultanbai<sup>1</sup>, G. K. Zhaksylykova<sup>1</sup>, K. O. Baigabylov<sup>1</sup>, A. D. Baimukanov<sup>2</sup>**

<sup>1</sup>Educational Scientific and Production Center Bayserke-Agro LLP, Talgar district, Almaty region, Kazakhstan,

<sup>2</sup>Russian State Agrarian University –

Moscow Agricultural Academy named after K. A. Timiryazev, Moscow, Russia.

E-mail: darinasultan@lenta.ru, gulnurzh@ro.ru, unpcbayerke-agro@mail.ru, aidartaidar98@mail.ru

## COMPARATIVE ASSESSMENT OF FERTILIZATION RATE OF HEIFERS AT INSEMINATION WITH SEXED SEMEN

**Abstract.** The article presents the results of artificial insemination of Holstein-Friesian heifers. The research was performed on a comparative analysis of the fertility of insemination of the Holstein-Friesian mating heifers according to the hormonal stimulation program and natural estrus, and the analysis of the fertility of the heifers inseminated by semen divided by sex over the 2nd estrous cycle was carried out. As a result, 133 animals were inseminated with same-sex seed and after 40-45 days during a rectal examination with an ultrasound scan, 61.6% of heifers were recognized as pregnant and corresponded to the insemination date. In the group of heifers hormonally treated, a pregnancy amounted to 53.9%. According to the results of artificial insemination of mating heifers in two estrous cycles, the average fruitfulness out of 247 recorded inseminations was 59% and the insemination rate at the end of two inseminations was 1.69, of which 1.68 in the first insemination and 1.7 in the second insemination.

**Keywords:** sexed semen, fruitfulness of insemination, mating heifers, Holstein-Friesian breed, pregnancy, barrenness, artificial insemination, synchronization, estrus, sexual cycle, thawing of semen, prostaglandin.

**Introduction.** In Kazakhstan the most important direction in the development of animal husbandry is the intensification of production, based on modern scientific achievements ensuring high productivity of animal products. The introduction of advanced technologies for the production of livestock products creates the conditions for the most complete manifestation of the genetic capacity of animals. At the same time, particular importance is attached to the development and mastering of effective methods of biotechnology, the creation on their basis of effective methods of reproduction of high-value farm animals.

Over the past decades, biological science is rapidly developing and setting up new directions that not only help to solve problems, but also outlines the paths of a fundamentally new biological production, which has long been putting production practice in front of science. The rapidly expanding knowledge of life processes not only allows these processes to be adapted for practical purposes, but also to manage them, as well as to create very promising new systems in practical terms that do not exist in nature, although they are similar to existing ones.

A drastic solution to the problem of animal reproduction is currently based on the transition to non-traditional ways of increasing fertility. For this purpose, a number of biotechnological methods are used, based on in-depth studies of reproductive function, the hormonal status of its regulation, and also on the improvement of reproduction techniques. The need to use a sexed semen in order to accelerate the breeding stock expansion in breeding farms is beyond doubt.

Currently, in practice, many farms use it, despite the relatively high cost with low fertility. Relatively average fertility of same-sex semen in comparison with the usual one is below 5 to 25%, which also depends on some external factors, as the qualification of inseminator, the general condition, and level of preparing animals, stress factors. To obtain effective results, semen producers recommend sticking to certain parameters, such as temperature and time of defrosting, terms of artificial insemination, optimal age and live weight of mating heifers, the time limit for introducing semen into the genital tract after defrosting.

Expressly recommend not to inseminate lactating cows, as well as in combination with programs of hormonal estrus synchronization, as this can lead to a significant decrease in results. In this regard, we carried out research work on a comparative assessment of the fertilization rate of mating heifers of the Holstein-Friesian breed upon the hormonal stimulation program and natural estrus, and also we analyzed the fruitfulness of insemination of the heifers with semen divided by sex in 2 estrous cycles.

**The basis for performing the research work.** State order by the Ministry of Agriculture of the Republic of Kazakhstan for 2018–2020. Budget Program 267 "Increasing the accessibility of knowledge and research", subprogram 101 "Program-targeted funding of research and activities" on the topic "Transfer and adaptation of technologies for automating technological processes of livestock production on the basis of model farms in dairy cattle breeding using 100 cows from different regions of the Republic of Kazakhstan".

**Material and research methods.** The research work was carried out on the basis of the dairy complex PZ Almaty of Talgar district, Almaty region. The main breed of the dairy complex is the cattle of the Holstein-Friesian breed of German and Dutch breeding. The number of mating heifers at the time of the experiment on the farm was 263 animals aged 12 to 16 months old, with a live weight from 350 to 460 kg, of which 196 animals were selected for conducting research from April to July 2019.

The synchronization program for heifers was carried out according to the classical scheme, which provides for the injection of prostaglandin with an interval of 11 days. Artificial insemination was carried out in identifying signs of estrus 12-14 hours after the injection of the drug within 2-4 days. The property of prostaglandin drugs is based on the absorption of yellow body secreting progesterone hormone, which inhibits the subsequent start of the estrus [1, 2].

A considerable aspect of the modern technology of reproduction of cattle is hormonal stimulation [3]. On that basis, before the hormonal treatment, animals were examined rectally to determine the size and shape of the ovaries, the presence, and severity of the yellow body [1, 2]. The luteal phase of the cycle corresponds to the optimal time for an injection of drugs. Prostaglandin is administered intramuscularly at doses indicated in the instructions. This scheme allows to identify in the estrus with subsequent insemination of at least 60% of the treated livestock population with two injections of prostaglandin. As a rule, animals are bulling 48-72 hours after injection of the drug. Non-bulling animals are re-treated 10-11 days after the first injection of PG F<sup>2</sup>- $\alpha$ .

Semen thawing was carried out in a water bath at a temperature of 36°C for 35 seconds and the maximum time from thawing to insemination period was no more than 10 minutes. Artificial insemination was performed once without the use of the gonadotropin-releasing hormone. For artificial insemination of Holstein-Friesian heifers, frozen-thawed semen was selected, divided by the sex of a servicing bull Marvel (Sex Ultra 4M) with a concentration of 4 million spermium in a single dose.

**Research results.** In dairy cattle breeding, the economically feasible efficiency of reproduction of broodstock and the use of genetically healthy livestock are of paramount importance [4]. The issue of using purebred breeding and industrial crossbreeding of cattle have a special value, in order to obtain early maturing offspring during reproduction. [5].

Currently, despite the indisputable achievements in reproductive physiology, the efficiency of reproduction has a steady tendency to decrease. In this regard, the task of the research was to study the effectiveness of artificial insemination of heifers with sexed semen in conditions of farms in Almaty region.

The practical application of frozen, sexed semen of servicing bulls, has begun in a number of countries since 2000. At the same time, different countries have obtained unequivocal results on the fertility of females and the sex ratio in the offspring. According to researchers, when studying the effectiveness of artificial insemination of heifers with sexed semen, it was shown that fruitfulness from single insemination in three experimental farms was 25.6%, 45.3%, and 52.7% respectively, and obtaining calves from insemination with sexed semen was obtained in offspring 90.6% of females compared to 46.1% of females in the control group, inseminated by common semen [6, 7].

As can be seen from the table, at natural estrus, 133 heifers of Holstein-Friesian breed were inseminated with same-sex semen, of which during two estrous cycles (45 days) after insemination 14 animals returned to estrus. After 1.5 months (40-45 days), during rectal examination with ultrasound, 82 cows were recognized as pregnant animals (61.6% of fruitful insemination) and corresponded to the date of

Table 1 – Comparative results of insemination and pregnancy of heifers during insemination with sexed semen

| Indicators                                     | At a natural estrus, animals |      | Athormonal stimulation, animals |      |
|------------------------------------------------|------------------------------|------|---------------------------------|------|
|                                                | n                            | %    | n                               | %    |
| Selected and undergone artificial insemination | 133                          | 100  | 63                              | 100  |
| Return to estrus                               | 37                           | 27.8 | 14                              | 22.2 |
| Pregnant                                       | 82                           | 61.6 | 34                              | 53.9 |
| Dry                                            | 14                           | 10.6 | 15                              | 23.8 |

insemination, and 14 animals or 10.6% were dry. In the group of hormonally treated heifers, of 63 cows, 14 heifers returned to estrus and 34 heifers were pregnant in the study on ultrasound, which amounted to 53.9%, and 15 animals or 23.8% were dry.

Thus, according to the results of 2 groups of animals inseminated with same-sex frozen-thawed semen in hormonally treated heifers, the fertilization rate was lower by 7.7% - 61.6% versus 53.9% respectively.

It was established that the main factor of grouping during the work was the daily selection from the livestock of heifers as they came to estrus and, accordingly, the group of heifers selected for hormonal treatment consisted of animals which more than 1.5 months have not shown sexual signs. This means some violation of the reproductive function.

Table 2 – Results of insemination of the Holstein-Friesian heifers with sexed semen in two rounds

| Indicators                                                                               | Artificially inseminated, animals | Pregnant, animals |      |
|------------------------------------------------------------------------------------------|-----------------------------------|-------------------|------|
|                                                                                          | n                                 | n                 | %    |
| First artificial insemination                                                            | 196                               | 116               | 59.1 |
| Repeated artificial insemination (repeat breeding after the 1st artificial insemination) | 51                                | 30                | 58.8 |
| Total                                                                                    | 247                               | 146               | 59   |

According to the results of artificial insemination of mating heifers in two rounds, the average percentage of fruitfulness out of 247 recorded inseminations was 59%, while significant differences in two inseminations were not observed and were 59.1 and 58.8%, respectively. At the same time, the average insemination rate at the end of two inseminations was 1.69, of which 1.68 in the first insemination and 1.7 in the second insemination.

Д. Т. Султанбай<sup>1</sup>, Г. К. Жаксылыкова<sup>1</sup>, К. О. Байгабылов<sup>1</sup>, А. Д. Баймұқанов<sup>2</sup>

<sup>1</sup>“Байсерке-Агро” оқу ғылыми-өндірістік орталығы” ЖШС, Талғар ауданы, Алматы облысы, Қазақстан,

<sup>2</sup> Ресей мемлекеттік аграрлық университеті – К. А. Тимирязев атындағы Мәскеу ауылшаруашылық академиясы, Мәскеу, Ресей

### ЖЫНЫСЫ БОЙЫНША БӨЛІНГЕН ҰРЫҚПЕН ҰРЫҚТАНДЫРУ КЕЗІНДЕГІ ҚАШАРЛАРДЫҢ ҰРЫҚТАНДЫРЫЛУЫН САЛЫСТЫРМАЛЫ БАҒАЛАУ

**Аннотация.** Мақалада голштино-фриз тұқымдас қашарларды қолдан ұрықтандыру нәтижелері берілген. Гармональды ынталандыру және табиғи жыныстық күйлеу бағдарламасы бойынша голштино-фриз тұқымының шағылыстыру қашырларының ұрықтануының жемістілігін салыстырмалы талдау бойынша зерттеу жұмысы жүргізілді, сондай-ақ 2-ші жыныстық цикл бойынша жыныспен бөлінген қашарлардың тұқыммен ұрықтандырылуының жемістілігіне талдау жүргізілді. Нәтижесінде 133 бас қашарлардың бір жынысты тұқымымен ұрықтандырылып, 40-45 күннен кейін УДЗ ректальді зерттеуінде 61,6 % буаз деп танылып, ұрықтандыру күніне сәйкес келді. Гормондық өңделген қашарлардың тобы бойынша буаздық 53,9% құрады. Қашарларды қолдан ұрықтандырудың екінші жыныстық циклі нәтижелері бойынша есепке алынған 247 ұрықтандырудың орташа пайызы 59% - ды құрады және екі ұрықтандыру қорытындысы бойынша ұрықтандыру коэффициенті 1,69-ды құрады, оның ішінде бірінші ұрықтандыру бойынша 1,68 және екінші ұрықтандыру бойынша 1,7-ні құрады.

**Түйін сөздер:** жынысы бойынша бөлінген тұқым, ұрықтандырудың жемісті болуы, шағылыстыратын қашарлар, голштино-фриз тұқымдары, буаздық, қысырлық, жасанды ұрықтандыру, синхрондау, жыныстық күйлеу, жыныстық цикл, ұрықты жібіту, простагландин.

Д. Т. Султанбай<sup>1</sup>, Г. К. Жаксылыкова<sup>1</sup>, К. О. Байгабылов<sup>1</sup>, А. Д. Баймуканов<sup>2</sup>

<sup>1</sup>ТОО «Учебный научно-производственный центр «Байсерке-Агро»,  
Талгарский район, Алматинская область, Республика Казахстан,

<sup>2</sup>Российский государственный аграрный университет –  
Московская сельскохозяйственная академия им. К. А. Тимирязева, Москва, Россия

### СРАВНИТЕЛЬНАЯ ОЦЕНКА ОПЛОДОТВОРЯЕМОСТИ ТЕЛОК ПРИ ОСЕМЕНЕНИИ СЕМЕНЕМ РАЗДЕЛЕННОЕ ПО ПОЛУ

**Аннотация.** В статье представлены результаты проведения искусственного осеменения телок голштино-фризской породы. Была проведена исследовательская работа по сравнительному анализу плодотворности осеменения случных телок голштино-фризской породы по программе гормональной стимуляции и естественной половой охоте, а также проведен анализ плодотворности осеменения телок семенем разделенное по полу по 2-м половым циклам. В результате было осеменено однополым семенем 133 гол. телок, и через 40-45 дн. при ректальном исследовании на УЗИ 61,6 % были признаны стельными и соответствовали дате осеменения. По группе телок гормонально обработанных стельность составила 53,9%. По результатам искусственного осеменения случных телок по двум половым циклам средний процент плодотворности из 247 учтенных осеменений составил 59 % и коэффициент осеменяемости по итогам двух осеменений составил 1,69, из них по первому осеменению 1,68 и 1,7 по второму.

**Ключевые слова:** семя разделенное по полу, плодотворность осеменения, случные телки, голштино-фризская порода, стельность, яловость, искусственное осеменение, синхронизация, половая охота, половой цикл, размораживание семени, простагландин.

#### Information about the authors:

Sultanbai Darina Tavaldivna, Senior Researcher, ESPC Bayserke-Agro LLP, Talgar District, Almaty Region, Kazakhstan; darinasultan@lenta.ru; <https://orcid.org/0000-0001-9502-7481>

Zhaksylykova Gulnur Kenesbekovna, Senior Researcher, ESPC Bayserke-Agro LLP, Talgar District, Almaty Region, Kazakhstan; gulnurzh@ro.ru; <https://orcid.org/0000-0001-9020-5656>

Baigabylov K. O., Senior Researcher, ESPC Bayserke-Agro LLP, Talgar District, Almaty Region, Kazakhstan; unpcbayerke-agro@mail.ru; <https://orcid.org/0000-0002-5267-2031>

Baimukanov Aidar Dastanbekouly - student Master of the Faculty of Zootechnics and Biology of the Russian State Agrarian University - Moscow Agricultural Academy named after K.A. Timiryazev, Moscow, Russian Federation. E-mail: aidartaidar98@mail.ru, <https://orcid.org/0000-0001-9669-864X>

#### REFERENCES

[1] Minina N.G., Yoshchik N.N. (2007). Comparative characteristics of reproductive function indicators of first-calf cows of domestic and foreign breeding in stimulated estrus. Actual problems of intensive development of livestock // Collection of scientific papers of the Belarusian State Agricultural Academy. Gorki. Issue 10. Part 2. P. 51-57 (in Russ.).

[2] Minina N.G., Yoshchik N.N. (2007). Hormonal stimulation of the sexual function of cows // Modern technologies of agricultural production. 10th International Scientific and Practical Conference. Grodno. P. 132-133 (in Russ.).

[3] Baimukanov D.A., Seidaliyev N.B., Alentayev A.S., Abugaliyev S.K., Semenov V.G., Dalibayev E.K., Zhamalov B.S., Muka Sh.B. (2019) Improving the reproductive ability of the dairy cattle // Reports of the National academy of sciences of the Republic of Kazakhstan. 2019. Vol. 2, N 324. P. 20-31. <https://doi.org/10.32014/2019.2518-1483.33> ISSN 2518-1483 (Online), ISSN 2224-5227 (Print).

[4] Ombayev A.M., Alentayev A.S., Baimukanov D.A., Karatayeva M., Nurbayev S. (2017). Selection of dairy cattle by cytogenetic status // News of the National academy of sciences of the Republic of Kazakhstan. Series of agrarian sciences. 2017. N 2(38). P. 18-26 (in Russ.).

[5] Baimukanov D.A., Pristupa V.N., Kolosov Yu.A., Donnik I.M., Torosyan D.S., Kolosov A.Yu., Orlova O.N., Yuldashbayev Yu.A., Chylbak-ool S.O. (2019). Improvement of breeding and productive traits of Kalmyk cattle breed // Bulletin of the National academy of sciences of the Republic of Kazakhstan. 2019. Vol. 2, N 378. P. 128-145. <https://doi.org/10.32014/2019.2518-1467.51> ISSN 2518-1467 (Online), ISSN 1991-3494 (Print).

[6] Dunin M.I. (2009). The quality of sexed semen of bulls. Animal husbandry of Russia. M. N 6. P. 40-41 (in Russ.).

[7] Dunin M.I. (2009). Study of mobility and vitality of sexed sperm of Holstein bulls. Selection, feeding, maintenance of farm animals and technology for production of livestock products. VNlplem. Issue 22. P. 13-16 (in Russ.).

**NEWS**

OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN

**SERIES OF AGRICULTURAL SCIENCES**

ISSN 2224-526X

Volume 5, Number 53 (2019), 104 – 112

<https://doi.org/10.32014/2019.2224-526X.68>

UDC 551.583

**Zh. S. Mustafayev, A. T. Kozykeyeva, A. M. Kamaliyev**

Kazakh national agrarian university, Almaty, Kazakhstan.  
E-mail: z-mustafa@rambler.ru, aliya.kt@yandex.ru, kamaliyev\_1972@mail.ru

**CLIMATIC CHANGES IN THE BASIN  
OF THE TRANSBOUNDARY SHU RIVER**

**Abstract.** On the basis of multi-year information and analytical materials «Kyrgyzhydromet» (Kyrgyz Republic) and «Kazhydromet» (Republic of Kazakhstan), that is, meteorological stations located in the catchment area of the transboundary river Shu, covering the years 1930–2017, climate change was estimated landscape catenas in the catchment area of the Shu river basin, which showed that in the period of instrumental observations (1981–2017) in comparison with the baseline (1941–1960) in the mountain class of landscapes (eluvial facies i) (Theo-Ashuu meteorological station) there was a decrease in average monthly and annual air temperatures, which led to a cooling of the climate, and an increase in precipitation increases the natural moisture content of the natural system. At the same time, starting from the piedmont class of landscapes (transeluvial facies) to the flat subclass of landscapes (subaccarpal facies), an increase in mean monthly and annual air temperatures and a decrease in precipitation led to an increase in the duration of the biological active period and aridization of the climate, which must be taken into account in the complex arrangement of the catchment Shu river basin.

**Keywords:** climate, catchment, river, basin, change, analysis, assessment, air temperature, precipitation, landscape.

**Relevance.** Climate is the most important continuously operating environment-forming factor in the natural system, affecting the conditions of habitat formation and human activity. The climatic conditions of the natural system are constantly changing, that is, continuously changing, subject to the complex laws of evolution of the climate system.

The main climate-forming factors of the catchment of river basins are natural zones, which are expressed by meteorological indicators, that is, mainly air temperature and precipitation, which are among the most important geographical characteristics of the natural system, strictly obeying the law of geography - the law of geographical zonality [1, 2].

**Purpose of the study** is to assess the current climate change in the catchment area of the Shu river basin and its dependence on long-term changes in average annual air temperatures and precipitation as environmental factors.

**Objectofstudy** – the Shu river originating from Teskey Ala To'o and the Kyrgyz range. The Shu River flows through the territories of Kyrgyzstan and Kazakhstan. The length of the river is 1186 km, of which within Kazakhstan is 800 km. Catchment area is 67 500 km<sup>2</sup>. Main tributaries: right –Chong-Kemin, Yrgayty, Kakpatas; on the left - Alamedin, Aksu, Kuragaty. In the lower reaches, the river flows through the Kazakh territory, forming the northern border of the Moyynkum desert, dries out in the sands only during the flood, falling into the drainless saline lake Akzhaykyn among the extensive salt marshes of the Achykol depression [1, 2].

**Materials and research methods.** In the work, the long-term information-analytical materials of the «Kyrgyzhydromet» of the Kyrgyz Republic and «Kazgidromet» of the Republic of Kazakhstan on air temperature and precipitation were used, that is, the climatic characteristics were determined according to 5 meteorological stations located in the drainage basin of the Shu river basin covering the formation and storage areas of the hydrological drain [3, 4]. Analysis of climatic characteristics produced using catenary

approach which involves geomorphological schematization landscape catenas catchment river Shu basins, characterized in zone mountain class landscapes (eluvial facies), piedmont landscapes subclass (transeluvial facies), piedmont plains subclass (transaccumulative facies) and plain class landscapes (superaquial and subaquial facies) [5, 6].

Research methods were formed on the basis of the level of issues to be solved, that is, to identify and coordinate changes in the studied climatic characteristics, the estimated parameters of linear trends were used [7].

**Research results.** Forecasting and assessment of climate change in the catchment area of the Shu river basin was carried out on the basis of perennial information and analytical materials from the «Kyrgyzhydromet» of the Kyrgyz Republic and «Kazgidromet» of the Republic of Kazakhstan on air temperature and precipitation in the period 1940-2017, with four stages every 20 years old. The change in air temperature and precipitation for individual periods in comparison with the base period was determined as the difference between the climatic index of the  $i$ -th period and the baseline observation period, that is:  $\Delta t_i = t_i - t_{\theta}$  and  $\Delta O_{ci} = O_{ci} - O_{c\theta}$ , where  $\Delta t_i$ ,  $\Delta O_{ci}$  - change in air temperature and precipitation for individual periods;  $t_i$ ,  $O_{ci}$  - air temperature and precipitation of the  $i$ -th period;  $t_{\theta}$ ,  $O_{c\theta}$  - air temperature and precipitation of the base period. From this position, a statistical description of the state of the climate system and the variability of the characteristics of its components in different periods of time within the framework of the geomorphological schematization of landscape catenas in the catchment area of the Shu river basin, based on the variability of monthly and annual assessments of climatic characteristics (table).

Air temperature change ( $t_i$ , °C) and precipitation ( $O_{ci}$ , mm) in the drainage basin of the river Shu

| Months                                                                         | Average for<br>1941-1960 years<br>(base) | Average Climatic indicators during the observation period |              |           |              |           |              |
|--------------------------------------------------------------------------------|------------------------------------------|-----------------------------------------------------------|--------------|-----------|--------------|-----------|--------------|
|                                                                                |                                          | 1961-1980                                                 |              | 1981-2000 |              | 2001-2017 |              |
|                                                                                |                                          | $t_i$                                                     | $\Delta t_i$ | $t_i$     | $\Delta t_i$ | $t_i$     | $\Delta t_i$ |
| 1                                                                              | 2                                        | 3                                                         | 4            | 5         | 6            | 7         | 8            |
| Average monthly air temperature, °C                                            |                                          |                                                           |              |           |              |           |              |
| Mountain landscape class (eluvial facies) - Theo-Ashuu weather station         |                                          |                                                           |              |           |              |           |              |
| January                                                                        | -11,6                                    | -11,6                                                     | 0,0          | -10,9     | 0,7          | -14,7     | -3,1         |
| February                                                                       | -10,8                                    | -10,9                                                     | -0,1         | -10,7     | 0,1          | -13,7     | -2,9         |
| March                                                                          | -6,8                                     | -6,6                                                      | 0,2          | -7,2      | -0,4         | -7,8      | -1,0         |
| April                                                                          | -1,5                                     | -1,1                                                      | 0,4          | -1,0      | 0,4          | -2,7      | -1,2         |
| May                                                                            | 2,3                                      | 2,6                                                       | 0,3          | 2,7       | 0,4          | 1,7       | -0,6         |
| June                                                                           | 6,1                                      | 6,3                                                       | 0,2          | 6,0       | -0,1         | 5,2       | -0,9         |
| July                                                                           | 8,6                                      | 8,6                                                       | 0,0          | 9,0       | 0,4          | 7,4       | -1,2         |
| August                                                                         | 8,1                                      | 8,7                                                       | 0,6          | 9,0       | 0,6          | 7,4       | -0,7         |
| September                                                                      | 4,5                                      | 4,3                                                       | -0,2         | 4,2       | -0,3         | 4,2       | -0,3         |
| October                                                                        | -1,0                                     | -1,2                                                      | -0,1         | -2,5      | -1,5         | -2,0      | -1,0         |
| November                                                                       | -6,2                                     | -5,9                                                      | 0,3          | -7,2      | -1,0         | -7,8      | -1,6         |
| December                                                                       | -9,0                                     | -8,8                                                      | 0,2          | -10,7     | -1,7         | -12,9     | -3,9         |
| Average                                                                        | -1,4                                     | -1,3                                                      | 0,1          | -1,6      | -0,2         | -3,0      | -1,6         |
| Foothill subclass of landscapes (transeluvial facies) - Baitik weather station |                                          |                                                           |              |           |              |           |              |
| January                                                                        | -4,2                                     | -5,5                                                      | -1,3         | -3,8      | 0,4          | -5,5      | -1,3         |
| February                                                                       | -3,5                                     | -4,9                                                      | -1,4         | -4,1      | -0,6         | -5,0      | -1,5         |
| March                                                                          | 0,6                                      | 0,5                                                       | -0,1         | -0,3      | 0,9          | 2,0       | 1,4          |
| April                                                                          | 6,3                                      | 7,7                                                       | 1,4          | 6,7       | 0,4          | 7,8       | 1,5          |

| Continuation of table                                                                             |      |       |      |      |      |      |      |
|---------------------------------------------------------------------------------------------------|------|-------|------|------|------|------|------|
| 1                                                                                                 | 2    | 3     | 4    | 5    | 6    | 7    | 8    |
| May                                                                                               | 11,4 | 12,2  | 0,6  | 11,2 | 0,2  | 13,0 | 1,6  |
| June                                                                                              | 15,1 | 16,7  | 1,6  | 15,7 | 0,6  | 16,9 | 1,8  |
| July                                                                                              | 18,1 | 19,5  | 1,4  | 18,3 | 0,2  | 18,6 | 0,5  |
| August                                                                                            | 17,2 | 18,1  | 0,9  | 17,5 | 0,3  | 17,8 | 0,6  |
| September                                                                                         | 12,6 | 12,9  | 0,3  | 12,6 | 0,0  | 13,5 | 0,9  |
| October                                                                                           | 6,6  | 6,7   | 0,1  | 6,2  | 0,4  | 6,5  | -0,1 |
| November                                                                                          | 0,4  | 1,7   | 1,3  | 1,5  | 1,1  | 1,1  | 0,7  |
| December                                                                                          | -3,3 | -2,4  | 0,9  | -1,9 | 1,4  | -4,4 | -1,1 |
| Average                                                                                           | 6,4  | 6,9   | 0,5  | 6,6  | 0,2  | 6,9  | 0,5  |
| Foothill plain subclass of landscapes (transaccumulative facies) - Bishkek meteorological station |      |       |      |      |      |      |      |
| January                                                                                           | -3,8 | -4,3  | -0,5 | -3,1 | 0,7  | -2,3 | 1,5  |
| February                                                                                          | -2,5 | -2,9  | -0,4 | -1,5 | 1,0  | -0,4 | 2,1  |
| March                                                                                             | 3,8  | 4,6   | 0,8  | 4,0  | 0,2  | 7,0  | 3,2  |
| April                                                                                             | 11,5 | 12,8  | 1,3  | 12,1 | 0,6  | 12,9 | 1,4  |
| May                                                                                               | 17,0 | 17,0  | 0,0  | 16,9 | -0,1 | 18,4 | 1,4  |
| June                                                                                              | 21,0 | 21,9  | 0,9  | 22,2 | 1,2  | 23,3 | 2,3  |
| July                                                                                              | 24,2 | 22,9  | -1,3 | 23,7 | -0,5 | 25,4 | 1,3  |
| August                                                                                            | 22,8 | 22,9  | 0,1  | 24,9 | 2,1  | 24,3 | 1,5  |
| September                                                                                         | 17,5 | 17,6  | 0,1  | 18,3 | 0,8  | 19,0 | 1,5  |
| October                                                                                           | 10,5 | 10,6  | 0,1  | 10,6 | 0,1  | 11,8 | 1,3  |
| November                                                                                          | 1,5  | 3,8   | 2,3  | 3,2  | 1,7  | 4,9  | 3,4  |
| December                                                                                          | -4,0 | -1,7  | 2,3  | -0,5 | 3,5  | -1,6 | 2,4  |
| Average                                                                                           | 10,0 | 10,6  | 0,6  | 11,0 | 1,0  | 10,6 | 0,6  |
| Plain subclass of landscapes (superaquial facies) - Tole bi weather station                       |      |       |      |      |      |      |      |
| January                                                                                           | -9,4 | -9,4  | 0,0  | -6,1 | 3,3  | -6,8 | 1,6  |
| February                                                                                          | -6,3 | -4,0  | 2,3  | -4,0 | 2,3  | -3,6 | 2,7  |
| March                                                                                             | 0,4  | 3,3   | 2,9  | 3,3  | 2,9  | 6,2  | 5,8  |
| April                                                                                             | 11,1 | 13,0  | 1,9  | 12,7 | 1,6  | 13,1 | 2,0  |
| May                                                                                               | 17,3 | 18,1  | 0,8  | 17,9 | 0,6  | 19,0 | 1,7  |
| June                                                                                              | 22,1 | 24,3  | 1,2  | 23,3 | 1,2  | 24,0 | 1,9  |
| July                                                                                              | 25,0 | 25,6  | 0,6  | 25,5 | 0,5  | 25,4 | 0,4  |
| August                                                                                            | 23,5 | 23,0  | 0,5  | 23,8 | 0,3  | 23,9 | 0,4  |
| September                                                                                         | 17,9 | 16,9  | -1,0 | 18,0 | 0,1  | 18,0 | 0,1  |
| October                                                                                           | 9,0  | 9,3   | 0,3  | 9,6  | 0,6  | 11,7 | 2,7  |
| November                                                                                          | -1,8 | -1,6  | 0,2  | 2,0  | 3,8  | 2,9  | 4,7  |
| December                                                                                          | -8,0 | -4,5  | 3,5  | -2,4 | 5,6  | -5,1 | 2,9  |
| Average                                                                                           | 8,4  | 9,5   | 1,1  | 10,3 | 1,9  | 10,7 | 2,3  |
| Plain subclass of landscapes (superaquial facies) - Ulanbel weather station                       |      |       |      |      |      |      |      |
| January                                                                                           | -9,8 | -10,6 | -0,8 | -7,5 | 2,3  | -7,8 | 2,0  |
| February                                                                                          | -7,5 | -9,0  | -1,5 | -7,2 | 0,3  | -4,9 | 2,6  |
| March                                                                                             | 0,6  | 0,7   | 0,1  | 0,9  | 0,3  | 4,0  | 3,4  |
| April                                                                                             | 11,1 | 12,2  | 1,1  | 13,1 | 2,0  | 13,0 | 1,8  |
| May                                                                                               | 18,2 | 19,2  | 1,0  | 18,9 | 0,7  | 20,1 | 1,9  |

| Continuation of table                                                                             |       |       |       |       |       |       |        |
|---------------------------------------------------------------------------------------------------|-------|-------|-------|-------|-------|-------|--------|
| 1                                                                                                 | 2     | 3     | 4     | 5     | 6     | 7     | 8      |
| June                                                                                              | 23,3  | 24,4  | 1,1   | 26,1  | 2,4   | 25,5  | 2,2    |
| July                                                                                              | 25,8  | 25,3  | -0,5  | 27,3  | 1,5   | 26,9  | 1,1    |
| August                                                                                            | 23,7  | 23,7  | 0,0   | 24,8  | 1,1   | 25,4  | 1,7    |
| September                                                                                         | 17,6  | 17,1  | -0,5  | 17,5  | -0,1  | 17,0  | -0,6   |
| October                                                                                           | 7,8   | 8,0   | 0,2   | 8,3   | 0,5   | 9,8   | 2,0    |
| November                                                                                          | -2,0  | 0,4   | 2,4   | 0,2   | 2,2   | 1,1   | 3,1    |
| December                                                                                          | -7,2  | -6,0  | 1,2   | -5,6  | 1,6   | -6,7  | 0,5    |
| Average                                                                                           | 8,5   | 8,8   | 0,3   | 9,7   | 1,2   | 10,3  | 1,8    |
| Atmospheric precipitation ( $O_{ci}$ ), mm                                                        |       |       |       |       |       |       |        |
| Mountain landscape class (eluvial facies) - Theo-Ashuu weather station                            |       |       |       |       |       |       |        |
| January                                                                                           | 25,0  | 32,0  | 7,0   | 27,0  | 2,0   | 23,0  | -2,0   |
| February                                                                                          | 56,0  | 38,0  | -18,0 | 21,0  | -35,0 | 40,0  | -16,0  |
| March                                                                                             | 87,0  | 59,0  | -26,0 | 45,0  | -42,0 | 54,0  | -33,0  |
| April                                                                                             | 41,0  | 72,0  | 31,0  | 61,0  | 20,0  | 59,0  | 18,0   |
| May                                                                                               | 90,0  | 87,0  | -3,0  | 85,0  | -5,0  | 81,0  | -9,0   |
| June                                                                                              | 60,0  | 88,0  | 28,0  | 84,0  | 24,0  | 118,0 | 58,0   |
| July                                                                                              | 64,0  | 67,0  | 3,0   | 64,0  | 0,0   | 92,0  | 28,0   |
| August                                                                                            | 35,0  | 45,0  | 10,0  | 45,0  | 10,0  | 56,0  | 21,0   |
| September                                                                                         | 50,0  | 43,0  | -7,0  | 54,0  | 4,0   | 55,0  | -5,0   |
| October                                                                                           | 44,0  | 66,0  | 22,0  | 71,0  | 27,0  | 63,0  | 19,0   |
| November                                                                                          | 46,0  | 50,0  | 4,0   | 55,0  | 9,0   | 49,0  | 3,0    |
| December                                                                                          | 30,0  | 37,0  | 7,0   | 32,0  | 2,0   | 51,0  | 21,0   |
| Annual                                                                                            | 628,0 | 684,0 | 56,0  | 644,0 | 16,0  | 741,0 | 113,0  |
| Foothill subclass of landscapes (transeluvial facies) - Baitik weather station                    |       |       |       |       |       |       |        |
| January                                                                                           | 19,0  | 19,0  | 0,0   | 22,0  | 3,0   | 24,0  | 5,0    |
| February                                                                                          | 21,0  | 25,0  | 4,0   | 25,0  | 4,0   | 28,0  | 7,0    |
| March                                                                                             | 54,0  | 48,0  | -6,0  | 43,0  | -11,0 | 46,0  | -8,0   |
| April                                                                                             | 75,0  | 84,0  | 9,0   | 64,0  | -11,0 | 60,0  | -15,0  |
| May                                                                                               | 84,0  | 93,0  | 9,0   | 65,0  | -19,0 | 62,0  | 22,0   |
| June                                                                                              | 86,0  | 75,0  | -11,0 | 43,0  | -43,0 | 40,0  | -46,0  |
| July                                                                                              | 48,0  | 52,0  | 4,0   | 25,0  | -23,0 | 24,0  | -24,0  |
| August                                                                                            | 29,0  | 31,0  | 2,0   | 15,0  | -14,0 | 16,0  | -13,0  |
| September                                                                                         | 21,0  | 26,0  | 5,0   | 12,0  | -19,0 | 11,0  | -10,0  |
| October                                                                                           | 34,0  | 39,0  | 5,0   | 33,0  | -1,0  | 32,0  | -2,0   |
| November                                                                                          | 33,0  | 35,0  | 2,0   | 33,0  | 0,0   | 35,0  | 2,0    |
| December                                                                                          | 21,0  | 21,0  | 0,0   | 25,0  | 4,0   | 30,0  | 9,0    |
| Annual                                                                                            | 525,0 | 548,0 | 23,0  | 405,0 | 20,0  | 408,0 | -117,0 |
| Foothill plain subclass of landscapes (transaccumulative facies) - Bishkek meteorological station |       |       |       |       |       |       |        |
| January                                                                                           | 23,0  | 26,0  | 3,0   | 25,0  | 2,0   | 32,0  | 9,0    |
| February                                                                                          | 27,0  | 33,0  | 6,0   | 30,0  | 3,0   | 40,0  | 13,0   |
| March                                                                                             | 56,0  | 48,0  | -6,0  | 45,0  | -9,0  | 51,0  | 5,0    |
| April                                                                                             | 69,0  | 81,0  | 12,0  | 66,0  | -3,0  | 77,0  | 8,0    |
| May                                                                                               | 58,0  | 63,0  | 5,0   | 62,0  | 4,0   | 65,0  | 7,0    |

|                                                                             |       |       |        |       |       |       | End of table |
|-----------------------------------------------------------------------------|-------|-------|--------|-------|-------|-------|--------------|
| 1                                                                           | 2     | 3     | 4      | 5     | 6     | 7     | 8            |
| June                                                                        | 43,0  | 36,0  | -7,0   | 34,0  | -9,0  | 34,0  | -9,0         |
| July                                                                        | 16,0  | 16,0  | 0,0    | 21,0  | 5,0   | 19,0  | 3,0          |
| August                                                                      | 9,0   | 14,0  | 5,0    | 13,0  | 4,0   | 12,0  | 3,0          |
| September                                                                   | 14,0  | 17,0  | 3,0    | 20,0  | 6,0   | 16,0  | 2,0          |
| October                                                                     | 31,0  | 38,0  | 7,0    | 41,0  | 10,0  | 46,0  | 15,0         |
| November                                                                    | 35,0  | 43,0  | 8,0    | 44,0  | 9,0   | 47,0  | 12,0         |
| December                                                                    | 27,0  | 28,0  | 1,0    | 32,0  | 5,0   | 39,0  | 12,0         |
| Annual                                                                      | 408,0 | 443,0 | 35,0   | 433,0 | 25,0  | 478,0 | 70,0         |
| Plain subclass of landscapes (superaquial facies) - Tole bi weather station |       |       |        |       |       |       |              |
| January                                                                     | 49,0  | 19,0  | -30,0  | 21,0  | -28,0 | 29,0  | -20,0        |
| February                                                                    | 20,0  | 17,0  | -3,0   | 21,0  | 1,0   | 28,0  | 8,0          |
| March                                                                       | 63,0  | 26,0  | -37,0  | 24,0  | -39,0 | 34,0  | -29,0        |
| April                                                                       | 42,0  | 29,0  | -17,0  | 25,0  | -17,0 | 38,0  | -4,0         |
| May                                                                         | 50,0  | 25,0  | -25,0  | 24,0  | -26,0 | 33,0  | -17,0        |
| June                                                                        | 22,0  | 15,0  | -7,0   | 24,0  | 2,0   | 23,0  | 1,0          |
| July                                                                        | 12,0  | 12,0  | 0,0    | 10,0  | -2,0  | 17,0  | 5,0          |
| August                                                                      | 12,0  | 9,0   | -3,0   | 5,0   | -7,0  | 10,0  | 2,0          |
| September                                                                   | 6,0   | 10,0  | 4,0    | 10,0  | 4,0   | 9,0   | 3,0          |
| October                                                                     | 21,0  | 36,0  | 15,0   | 27,0  | 6,0   | 39,0  | 18,0         |
| November                                                                    | 36,0  | 28,0  | -6,0   | 38,0  | 2,0   | 38,0  | 2,0          |
| December                                                                    | 41,0  | 42,0  | 1,0    | 36,0  | -5,0  | 30,0  | -11,0        |
| Annual                                                                      | 374,0 | 268,0 | -106,0 | 265,0 | 109,0 | 328,0 | -46,0        |
| Plain subclass of landscapes (superaquial facies) –Ulanbel weather station  |       |       |        |       |       |       |              |
| January                                                                     | 13,0  | 17,0  | 4,0    | 19,0  | 6,0   | 13,0  | 0,0          |
| February                                                                    | 13,0  | 15,0  | 2,0    | 19,0  | 6,0   | 14,0  | 1,0          |
| March                                                                       | 26,0  | 23,0  | -3,0   | 22,0  | -4,0  | 18,0  | -8,0         |
| April                                                                       | 22,0  | 30,0  | 8,0    | 25,0  | 3,0   | 21,0  | -1,0         |
| May                                                                         | 19,0  | 22,0  | 3,0    | 24,0  | 5,0   | 26,0  | 7,0          |
| June                                                                        | 14,0  | 9,0   | -5,0   | 9,0   | -5,0  | 10,0  | -4,0         |
| July                                                                        | 5,0   | 5,0   | 0,0    | 7,0   | 2,0   | 3,0   | -2,0         |
| August                                                                      | 7,0   | 3,0   | -4,0   | 2,0   | -5,0  | 6,0   | -1,0         |
| September                                                                   | 1,0   | 4,0   | 3,0    | 4,0   | 3,0   | 1,0   | 0,0          |
| October                                                                     | 10,0  | 19,0  | 9,0    | 14,0  | 4,0   | 11,0  | 1,0          |
| November                                                                    | 14,0  | 24,0  | 10,0   | 22,0  | 8,0   | 16,0  | 2,0          |
| December                                                                    | 14,0  | 24,0  | 10,0   | 22,0  | 8,0   | 13,0  | -1,0         |
| Annual                                                                      | 158,0 | 195,0 | 37,0   | 189,0 | 31,0  | 162,0 | 4,0          |

Evaluation of seasonal changes was made relative to the base period (1941-1960) according to the weather station Teo-Ashu, located in the mountainous area of the catchment basin of the Shu river basin, and showed that in the period 1961-1980, 1981-2000 and 2001-2017 there was a decrease monthly air temperatures up to  $-1,6^{\circ}\text{C}$  and a reduction in the duration of the biological active period ( $t_i > +5^{\circ}\text{C}$ ) (figure 2). At the same time, an increase in precipitation to 113 mm is observed (table).

When assessing the change in the climatic characteristics of the foothill (transeluvial) zone of transformation of the geo-drainage of the Shu river basin's catchment area, long-term information and

analytical materials of the Baitik weather station covering the years 1915-2017, which is the Kyrgyz-hydrometstationary network of the Kyrgyz Republic, located in the foothill zone Teskey Ala- Too and Kyrgyz Range, at an altitude of 1590 m (table and figure 2).

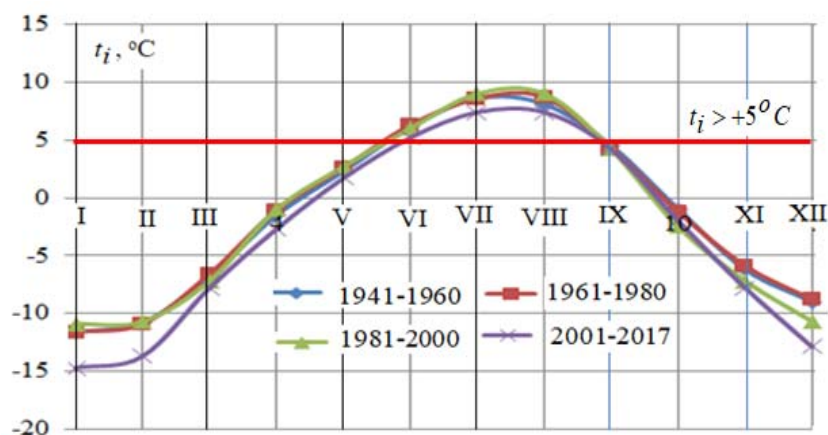


Figure 1 – Comparative seasonal changes in mean monthly air temperature and an estimate of the change in the duration of the biological active period (mountain landscape class (eluvial facies) – Theo-Ashu weather station)

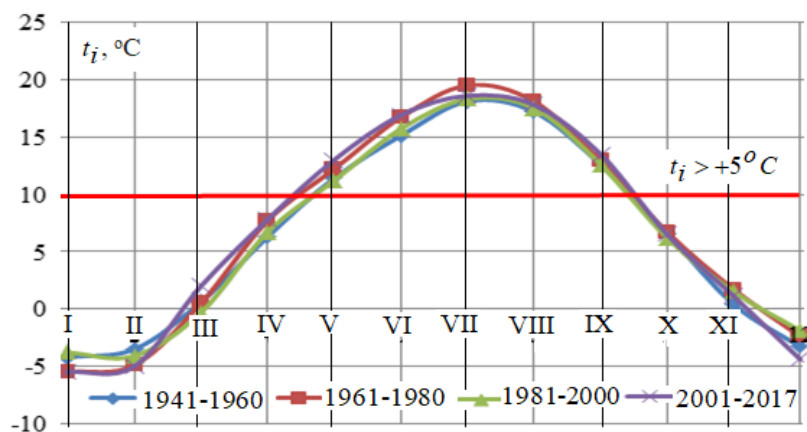


Figure 2 – Comparative seasonal changes in mean monthly air temperature and an estimate of the change in the duration of the biological active period (foothill landscape class (transeluvial facies) – Baitik meteorological station)

Comparison of the average monthly air temperatures for the base period of 1941–1960 over the years 1961–1980, 1981–2000, and 2001–2017 in the piedmont (transeluvial) zone of the Shu river basin, based on information and analytical materials from the Baitik weather station, showed that the largest temperature increase (at all altitudes) was observed in the warmer months -April, May, June, July, August, and September, whereas in the cold period the air temperature drops, and in annual terms the air temperature rises by 0.0-0.5 °C.

At the same time, there is a clear tendency for a decrease in precipitation, that is, in comparison with the base period (525 mm), it decreases to 117.0 mm and there is an increase in the duration of the biological active period 1961-1980 and 1981-2000, however, in the period 2001-2017, a significant reduction in the duration biological active period.

The climatic characteristic of the foothill plain (transaccumulative) catchment area of the Shu river basin, which passes through the Kochkars and Ortogay depressions, which enter the Shuys depression through the Bo'om gorge, is characterized by average annual air temperatures and atmospheric precipitation of the Bishkek weather station, located at an altitude of 756 m (table and figure 3).

Evaluation of seasonal and annual air temperature changes made relative to the base period (1941-1960) based on long-term information and analytical materials of the Bishkek weather station located in the foothill flat landscape subclass (transaccumulative facies) showed that 1961-1980, 1981-2000 and 2001-2017 years, the average monthly and annual air temperature increases by 0.6-1.0 °C and

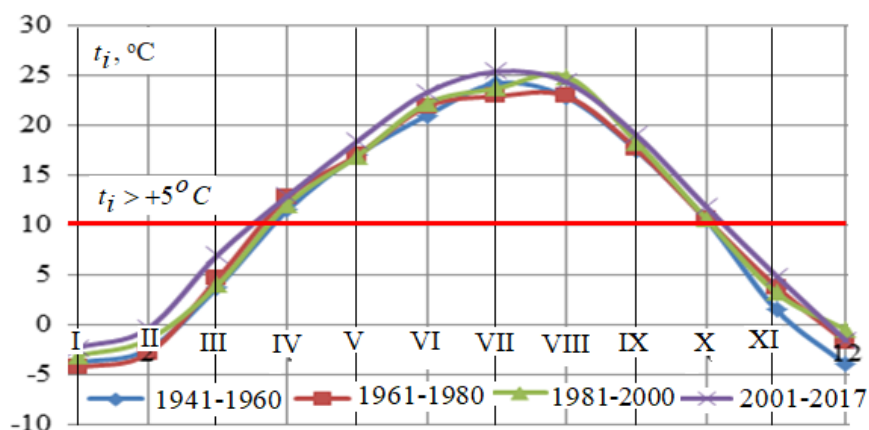


Figure 3 – Comparative seasonal changes in mean monthly air temperature and assessment of changes in the duration of the biological active period (piedmont plain landscape subclass (transaccumulative facies) - Bishkek meteorological station)

precipitation by 25-70 mm are constantly observed. At the same time, a significant increase in the average duration of the biological active period, which leads to arid climate.

The assessment of changes in climatic indicators of a flat (superaqual) zone with a reduced transformation of the geosk of the catchment area of the Shu River basin is represented by the Tole Bi meteorological station located at an altitude of 456 m (table and figure 4).

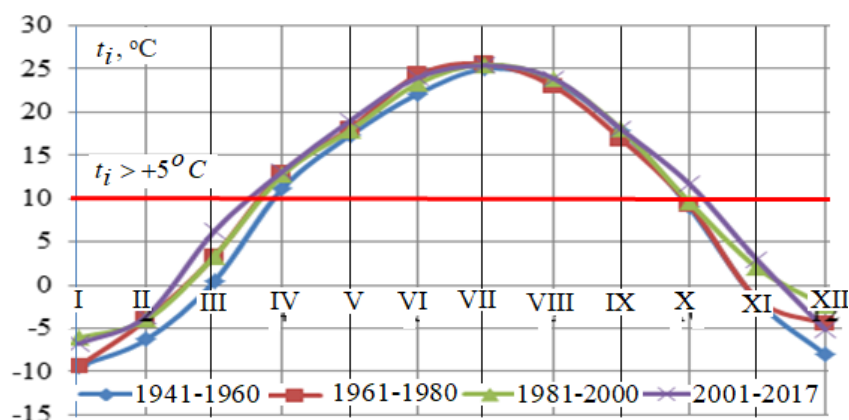


Figure 4 – Comparative seasonal changes in mean monthly air temperature and an estimate of the change in the duration of the biological active period (plain landscape subclass (supersquivic facies) – Tole bi meteorological station)

As can be seen from table 1 and figure 4, a comparative assessment of changes in air temperature made relative to the base period (1941-1960) based on long-term information and analytical materials from the Tole bi weather station showed that 1961-1980, 1981-2000 and 2001-2017 there is significant increase in average monthly air temperatures to 5.0 °C and per annum by 1.1-2.3 °C. At the same time, in comparison with the base period (1941-1960) of precipitation, a period of decrease by 45-106 mm and an increase in the duration of the biological active period are observed.

The climatic characteristic of the flat (subaqual) zone is the accumulation of the geostok of the catchment area of the Shu river basin, which is an intercontinental delta, that is, Gulyaevs (with a total length of about 140-150 km and a width of 50-60 km), Ulanbels (a length of 100 km and a width of 6-8 km) and Kamkalins (about 150 km long and up to 3-25 km wide) are represented by long-term archival materials of the Ulanbel weather station, located at 266.0 m of the land surface (table and figure 5).

As can be seen from Table 1 and Figure 5, there is a significant increase in average annual and monthly air temperatures in comparison with the baseline observation period (1941-1960), however, a sharp decrease in precipitation is not observed, that is, a decrease of 4-35 mm is observed in the period, which led to an increase in the duration of the biological active period.

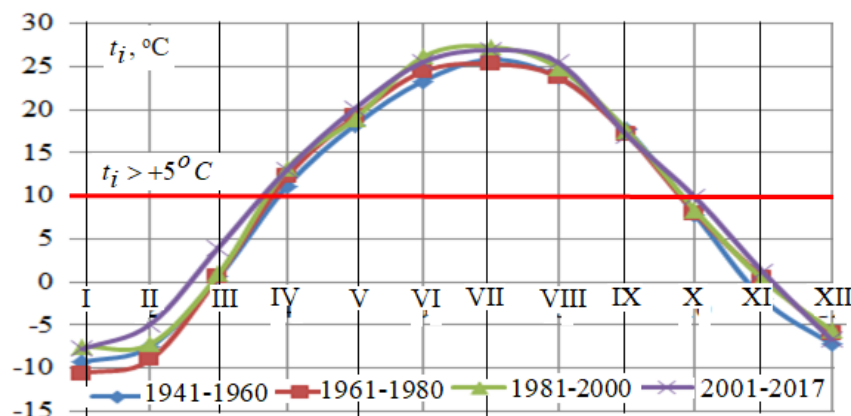


Figure 5 – Comparative seasonal changes in mean monthly air temperature and an estimate of the change in the duration of the biological active period (plainlandscape subclass (superaqual facies) – Ulanbelmeteorological station)

**Conclusions.** Thus, on average, in the catchment area of the Shu river basin during the instrumental observations (1981-2017) compared with the baseline (1941-1960) in the mountain landscape class (eluvial facies) (Teo-Ashu weather station), there was a decrease in monthly and annual air temperatures, which led to a cooling of the climate and an increase in precipitation is observed, increasing the natural moisture content of the natural system. At the same time, starting from the piedmont class of landscapes (transeluvial facies) to the flat subclass of landscapes (subaccarpal facies), an increase in mean monthly and annual air temperatures and a decrease in precipitation led to an increase in the duration of the biological active period and aridization of the climate, which must be taken into account in the complex arrangement of the catchment Shu river basin.

**Ж. С. Мұстафаев, Ә. Т. Қозыкеева, А. М. Камалиев**

Қазақ ұлттық аграрлық университеті, Алматы, Қазақстан

#### ШЕКАРА АРАЛЫҚ ШУ ӨЗЕНІНІҢ АЛАБЫНЫҢ КЛИМАТЫНЫҢ ӨЗГЕРУІ

**Аннотация.** Шекара аралық Шу өзенінің сужинау алабына орналасқан, метеорологиялық бекеттердің, яғни «Қырғызгидромет» (Қырғыз Республикасы) және «Қазгидромет» (Республика Қазақстан) ұжымдарының 1930-2017 жылдарды қамтитын көпжылдық ақпараттық-талдау мәліметтері бойынша Шу өзенінің сужинау алабының ландшафттық катендерін геоморфологиялық желілеудің негізінде, климаттың өзгеруіне бағалау жүргізілген, ал ол көрсеткендей, базалық бақалау кезеңін (1941-1960 жж.) қазіргі бақалау кезеңімен (1981-2017 жж.) салыстырған кезде таулы аймақтық ландшафттық (элювиальдық фация) топта (Тео-Ашуу метеорологиялық бекеті) орташа айлық және жылдық ауаның температурасының төмендегені байқалады және бұл климаттың салқындауына әкелді, ал жауын-шашынның көбеюі табиғи жүйенің табиғи ылғалдылығын арттырады. Сонымен қатар тау етегіндегі ландшафттық (трансэлювиальдық фация) топтардан бастап жазықтық аймақтың ландшафттық (субаквиальдық фация) топтарда орташа айлық және жылдық ауаның температурасының жоғарылауы және жауын-шашынның азаюы, биологиялық белсенді кезеңінің ұзақтығының ұлғайуына және климаттық құрғақшылыққа әкелетін болғандықтан, Шу өзенінің сужинау алабын кешенді үйлестіру кезінде, оны ескеру қажет.

**Түйін сөздер:** климат, сужинау, өзен, алабы, өзгеру, талдау, бағалау, ауа температурасы, атмосфералық жауын-шашын, ландшафт.

**Ж. С. Мустафаев, А. Т. Козыкеева, А.М. Камалиев**

Казахский национальный аграрный университет, Алматы, Казахстан

#### КЛИМАТИЧЕСКИЕ ИЗМЕНЕНИЯ БАСЕЙНА ТРАНСГРАНИЧНОЙ РЕКИ ИШУ

**Аннотация.** На основе многолетних информационно-аналитических материалов «Кыргызгидромет» (Кыргызской Республики) и «Казгидромет» (Республики Казахстан), то есть метеорологических станций, расположенных в водосборе бассейна трансграничной реки Шу, охватывающих 1930-2017 годы произведена оценка изменения климата, на основе геоморфологической схематизации ландшафтных катен водосбора

речного бассейна Шу, которая показала, что в период инструментальных наблюдений (1981-2017 гг. ) в сравнении с базовым (1941-1960 гг.) в горном классе ландшафтов (элювиальная фация) (метеостанция Гео-Ашуу) происходило снижение среднемесячных и годовых температур воздуха, которые приводили к похолоданию климата, и наблюдается увеличение атмосферных осадков повышающие естественную влагообеспеченность природной системы. При этом начиная с предгорного класса ландшафтов (трансэлювиальная фация) до равнинного подкласса ландшафтов (субаквиальная фация) наблюдается повышение среднемесячных и годовых температур воздуха и снижение атмосферных осадков, которые привели к увеличению длительности биологического активного периода и аридизации климата, что необходимо учитывать при комплексном обустройстве водосбора бассейна реки Шу.

**Ключевые слова:** климат, водосбор, река, бассейн, изменение, анализ, оценка, температура воздуха, атмосферные осадки, ландшафт.

**Information about authors:**

Mustafaev Zh. S., Doctor of Technical Sciences, Professor, Kazakh national agrarian university, Almaty, Kazakhstan; z-mustafa@rambler.ru; <https://orcid.org/0000-0003-2425-8148>

Kozykeeva A. T., Doctor of Technical Sciences, Professor, Kazakh national agrarian university, Almaty, Kazakhstan; aliya.kt@yandex.ru; <https://orcid.org/0000-0003-0581-0881>

Kamaliyev A. M., PhD student, Kazakh national agrarian university, Almaty, Kazakhstan; kamaliyev\_1972@mail.ru

**REFERENCES**

- [1] Ilyasov S., Zabenko O., Gaydamak N., Kirilenko A., Myrsaliyev N., Shevchenko V., Penkina L. Climate profile of the Kyrgyz Republic. Bishkek, 2013. 99 p.
- [2] Development of cooperation on adaptation to climate change in the transboundary basins of the Chu and Talas rivers Kazakhstan and Kyrgyzstan (Summary). Zoi Environment Network, 2014. 40 p.
- [3] Applied reference book on the climate of the USSR. Series 13: Perennial data. P. 1-6. Issue 18: KazSSR. L.: Gidrometeoizdat, 1989. Vol. 2. 656 p.
- [4] Applied reference book on the climate of the USSR. Series 13: Perennial data. P. 1-6. Issue 32: Kirghiz SSR. L.: Hydrometeoizdat, 1989. 589 p.
- [5] Kireycheva L.V., Kozykeeva A.T., Dauletbai S.D. Complex arrangement of the river Shu (monograph). Saarbrücken. Deutschland, 2016. 140 p.
- [6] Mustafaev Zh.S., Kozykeeva A.T., Zhanymkhan K., Aldiyarova A.E., Mosiej Józef. The methods of assessment of maximum allowable impacts ecologically on small rivers // News of the National academy of sciences of the Republic of Kazakhstan. Series of geology and technical sciences. 2019. Vol. 2, N 434. P. 30-38. <https://doi.org/10.32014/2019.2518-170X.35>
- [7] Khokhlov V.N. A quantitative description of climate change in Europe in the second half of the twentieth century // Ukrainian Journal of Hydrometeorological Journal. 2007. N 2. P. 35-42.

## NEWS

OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN

## SERIES OF AGRICULTURAL SCIENCES

ISSN 2224-526X

Volume 5, Number 53 (2019), 113 – 125

<https://doi.org/10.32014/2019.2224-526X.69>

UDC 632.7.636.084.414

**I. I. Temreshev<sup>1</sup>, A. M. Makezhanov<sup>1</sup>, A. M. Tursynkulov<sup>1</sup>, A. B. Yeszhanov<sup>2</sup>**<sup>1</sup>Zh. Zhiembayev Kazakh Research Institute of Plant Protection and Quarantine of the Ministry of Agriculture, Almaty, Kazakhstan,<sup>2</sup>M. Aikimbaev Kazakh Scientific Center for Quarantine and Zoonotic Diseases, Almaty, Kazakhstan.  
E-mail: temreshev76@mail.ru; Makezhanov.arman@bk.ru, askhat\_t-26@mail.ru, aidyn.eszhanov@gmail.com**ON SPECIES COMPOSITION OF INSECTA COLEOPTERA  
OF FEED CROP FIELDS IN THE KERBULAK BRANCH  
OF BAYSERKE-AGRO LLP**

**Abstract.** For the territory of the fields of forage crops (wheat grain and corn) of the Kerbulak branch of “Bayserke Agro” LLP, 52 species of winged insects were identified, belonging to 45 genera from 13 families and 2 suborders. both in numbers and in species diversity, lamellar beetles, Scarabaeidae, are represented by 9 genera and 9 species. They are followed by Curculionidae - 6 genera and 6 species, Chrysomelidae - 5 genera and 5 species, Meloidae and Histeridae - 3 genera and 5 species in each family. Coccinellidae, Tenebrionidae and Dermestidae are represented by 4 species, Cerambycidae, Cleridae and Elateridae - 2 species each, and finally, Silphidae - 1 species. Negative economic value have 30 species. Useful entomophages and soil forming agents - 22 species. The number of harmful species does not exceed the economic threshold of harmfulness. Thus, the agrocenosis of the fields of forage crops is currently in equilibrium, and additional measures to limit the number of pests are not required. However, in the future, under favorable conditions, some species, for example, Turkestan maize duply Pentodon bidens (Pallas, 1771), can produce an outbreak of mass reproduction. The dominant position in terms of quantity and diversity of representatives of the Scarabaeidae family is explained by the fact that intensive livestock breeding is carried out here. The high number and variety of coprobiontic species of lamellar beetles is an indicator of the good condition of forage crop agrocenoses of the Kerbulak branch of Bayserke Agro LLP, since they play an important role in the disposal of livestock waste and soil enrichment with organic matter.

**Key words:** Coleoptera, Insecta, Coleoptera, forage crops, wheat grain, corn, “Bayserke Agro” LLP.

**Introduction.** The study of the species composition of different groups of invertebrates in the fields of agricultural crops is a very urgent task. Among them are many species that are economically significant in the production of agricultural products. Because of this, we have repeatedly studied various invertebrates of the fields of forage crops - beetles, orthopteroid insects, semi-rigid, soil-inhabiting representatives of the mesofauna, spiders, blood-sucking ticks and mollusks [1-19]. However, all these studies were carried out directly in the head office of “Bayserke Agro” LLP, in the Talgar district of Almaty region, and did not capture the Kerbulak branch of this farm. Valuable fodder crops such as wheatgrass and corn are grown in this department. Therefore, this year we conducted studies on the invertebrate fauna of the mentioned cultures.

One of the most important groups of invertebrates are insects from the order Coleoptera, or beetles. Beetles are the largest group among insects and living creatures in general. As of 2015, the order has 400,000 species, which is 40 % of all insect species or 25 % of all animal species. Given the species not yet described, their number is estimated at 2.1 million species. Beetles are widespread throughout the globe, in six zoogeographic areas, except for Antarctica, the Arctic and the highest mountain peaks. The most species-rich order is represented in tropical regions. Approximately 62 % of the total beetle diversity is made up of representatives of only 6 families: weevils (Curculionidae) - 60,000 species, staphylinids (Staphylinidae) - 47,700, ground beetles (Carabidae) - 30,000, lamellar-like (Scarabaeidae) - 27,800, leaf-eating (Chrysomelidae) - 36 350, and longhorn beetle (Cerambycidae) - 26 000 [20-23, 25-27].

The size of the beetles varies widely. The largest species of beetles are the lumberjack-titan (*Titanus giganteus*) from South America, reaching a length of 167 mm, the South American beetle-hercules (*Dynastes hercules*), individual males of which reach a length of up to 171 mm and large-toothed deer (*Macrodonia cervicornis*), with the maximum recorded male 169 mm long. The smallest beetles in the world are feather-winger (Ptiliidae) *Scydosella musawasensis* (from 0.325 mm to 0.352 mm) [24].

Among the coleopterans, there are representatives of most of the main feeding types that are known within the class of insects. Beetles are represented by both numerous predators (polyphagous and specialized), and the overwhelming majority of herbivorous forms (phytophages). Among the latter, there are both leaf-feeding species and consumers of roots (rhizophages), flowers and pollen (anthophagous), wood and bark (xylophagus), fruits or seeds (karpofages). Most phytophages feed on living plant tissues, but some are also able to feed on dry wood. Vast biological groups are made up of beetles that feed on fungi (mycetophages), as well as species that feed on rotting and decaying animals and plant remains (necrophages and saprophages) and detritophages that feed on dry or slowly decomposing substances of plant and animal origin. Named groups are connected by multiple transitions. Among beetles (wood-cutters, lamellar, click beetles and other families), there are species whose imago do not feed at all and live off the stock of nutrients accumulated at the larval stage of development. But for most beetles, especially long-living ones, imago feeding ("additional feeding") is necessary to extend the life and maturation of eggs. The nutrition pattern of the larvae and imago of most groups of beetles is very similar, but in others the nutrition of these phases is completely different. For example, flower chafer beetle larvae live in soil, humus, decaying plant remains, and beetles feed on flowers or flowing sap of trees. Longhorn beetles in the larval phase feed mainly on wood or under the bark of trees, less often on the stems of herbaceous plants, and many imago are found on flowers and feed on pollen. In some cases, the larvae are predators, while the imago feed on plant matter [25-27].

Of greatest practical importance for the agricultural sector are phytophagous beetles. Larvae and beetles of a number of lamellar species are pests of forest, fruit and agricultural crops. For example, in the years of mass reproduction, May beetles can completely eat tree leaves. A large group of pests is formed by leaf beetles, which damage crops and young plantings of various forest and agricultural plants. Of particular note are the Colorado beetles and their larvae that damage plants of the solanaceous family - potatoes, tomatoes, eggplant, etc. Beetles are of great importance as pests of the forest. Among them there are quite a bit of leaf-eating species that can systematically or periodically breed in mass. Wood pests (longhorn beetles, bark beetles, jewel beetles, death-watch beetles) are more diverse and numerous, among which there are dangerous pests that damage healthy trees and cause their weakening and drying out, as well as technical pests that reduce the quality of harvested wood. The larvae of click beetles (wireworms) are pests of cultivated plants. Some species bite potato and root tubers, damage young stems, others harm grapes by eating buds and young shoots. Skin-beetles are dangerous pests of stocks of animal and vegetable origin, sericulture and museum collections. In sericulture, grena and silk-worm cocoons are destroyed. The larvae and imago of large diving beetles and scavenger beetles, as well as the larvae of large species, can feed on fish fry, causing harm to fisheries. To combat a number of pests, predatory ladybugs, ground beetles, checkered beetles, staphilins, etc. are used. The hemolymph of some beetles contains toxic substances, in particular cantharidin. If it is ingested orally, it can cause serious poisoning and even death. Especially poisonous is hemolymph of ladybugs, red-winged birds, soft-wing flower beetles, and meloids. Representatives of the last family can isolate droplets of yellow hemolymph from the joints of the hips and lower legs, which, on contact with the skin, causes chemical burns that are similar to abscesses with watery contents. In case of accidental eating of these bugs with food, cases of the death of livestock are known. The hemolymph of the Paederus beetles that live on the banks of water bodies is also poisonous. They can be caught on fish lying at the place of catch. Accidentally eating such a bug with fish can cause severe poisoning. At the same time, coleopterans play a useful role as soil-forming agents, for example, dung beetles and rhinos [25-27].

Thus, the study of the species composition of beetles in the fields of forage crops is not only scientific, but also a practical necessity. This determines the relevance of this work.

**Materials and methods.** The material was collected in Kербулак district of the Almaty region by the authors of the publication in June-August 2019 when performing phytosanitary monitoring of grain and corn crops and other works as part of the project of the Ministry of Agriculture of the Republic of

Kazakhstan BR 06249249 “Development of a complex system of productivity increase and farm animals breeding qualities improvement, on example of “Bayserke Agro” LLP under subproject 2 “Improving the technologies of cultivation and harvesting of forage crops”.

When collecting the material, standard entomological techniques were used - soil traps, manual collection, inspection of vegetation, manure and dead animals. The collected beetles were pickled in plastic mordants with ethyl acetate and later laid out on cotton entomological mattresses. Then, collected material was partially used for toxicological analyzes for pesticides and heavy metals.

Identification of beetle species collected on the territory of grain and corn crops of the Kerbulak branch of Bayserke Agro LLP, the refinement of the bioecology and economic significance was carried out using summaries and guide books from the list of literature [25-33].

Coordinates of sampling sites:

- 1) corn - N 44°7'41.42" E 77°11'45.47";
- 2) wheatgrass field 1 - N 44°16'20.85" E 77°24'11.38";
- 3) wheatgrass field 2 - N 44°15'59.24" E 77°24'52.81".

**Research results.** As a result of studies in the territory of the Kerbulak branch of “Bayserke-Agro” LLP, the following species of beetles were identified. Their brief characteristics, taxonomic affiliation, and images of individual representatives in figures 1–9 are given below.

Suborder Adephaga – Carnivore beetles

Family Carabidae – Ground beetles

*Amara ovata* (Fabricius, 1792). Phytophage, sometimes harms.

Material: 1 ex. - 15.07.2019, corn, soil trap, I.I. Temreshev, A.M. Makezhanov, A.M. Tursynkulov; 1 ex. - 15.08.2019, wheatgrass field 1, soil trap, A.B. Yeszhanov, A.M. Makezhanov, I.I. Temreshev, A.M. Tursynkulov.

*Brachinus crepitans* Linnaeus, 1758. Cracking bomber. Entomophage. Larvae are parasites of pupae of other beetles.

Material: 1 ex. - 15.07.2019, corn, soil trap, I.I. Temreshev, A.M. Makezhanov, A.M. Tursynkulov; 1 ex. - 16.07.2019, wheatgrass field 1, manual collection, I.I. Temreshev.

*Dixus eremita* Dejean, 1825. Dim dixus. Entomophage.

Material: 1 ex. - 15.07.2019, corn, hand picking, I.I. Temreshev 1 ex. - 16.07.2019, wheatgrass field 2, manual collection, I.I. Temreshev.



Figure 1 – Ground beetle *Dixus eremita* Dejean, 1825

Suborder Polyphaga – Omnivorous beetles

Family Histeridae – Hister beetles

*Hister uncinatus* Illiger, 1807. Hook-shaped Hister beetle. Entomophage. In manure, soil, humus, on the corpses of animals.

Material: 1 ex. - 15.07.2019, corn, soil trap, I.I. Temreshev, A.M. Makezhanov, A.M. Tursynkulov; 2 ex. - 15.07.2019, wheatgrass field 2, manual collection, I.I. Temreshev; 1 ex. - 14.08.2019, on a dead fox, picking with tweezers, A.B. Yeszhanov.

*Margarinotus bickhardti* Reitter, 1910. Entomophage. In manure, soil, humus, on the corpses of animals.

Material: 2 ex. - 14.08.2019, on a dead fox, picking with tweezers, A.B. Yeszhanov.

*Saprinus cribellatus* Marseul, 1855. Entomophage. In manure, soil, humus, on the corpses of animals. Beetles feed on larvae of flies, beetles, etc. Larvae usually inhabit carrion or decaying vegetation, where they also prey.

Material: 2 ex. - 14.08.2019, on a dead fox, picking with tweezers, A.B. Yeszhanov.

*S. niger* Motschulsky, 1849. Black Hister beetle. Entomophage. In manure, soil, humus, on the corpses of animals.

Material: 3 ex. - 14.08.2019, on a dead fox, picking with tweezers, A.B. Yeszhanov.

*S. virescens* (Paykull, 1798). Greenish Saprin. Entomophage. Unlike the majority of Hister beetles, the beetle lives on the leaves of various plants, where it predares by eating eggs and leaf-eating larvae.

Material: 1 ex. - 15.07.2019, corn, on the leaves of corn, I.I. Temreshev.



Figure 2 –*Hister uncinatus* Illiger, 1807

#### Family Silphidae – Carrion beetles

*Phosphuga atrata* (Linnaeus, 1758). Black carrion beetle. Necrophage and predator. It eats clams, worms, caterpillars.

Material: 3 ex. - 15.08.2019, wheatgrass field 1, soil trap, A.B. Yeszhanov, A.M. Makezhanov, I.I. Temreshev, A.M. Tursynkulov; 2 ex. - 16.07.2019, wheatgrass field 2, manual collection, I.I. Temreshev.

#### Family Dermestidae – Skin beetles

*Anthrenus pimpinellae* (Fabricius, 1775). Skin beetle femoral flower. Necrophage. Larvae is a pest of stocks and seeds. The imago damages the anthers of flowering plants.

Material: 1 ex. - 15.07.2019, corn, on the flowers of Sophora, manual collection, I.I. Temreshev.



Figure 2 – Skin beetle *Dermestes coronatus* Steven, 1808

*Attagenus angustatus* Ballion, 1871. Narrowed skin-eater. Necrophage Larva is a pest of stocks and seeds. The imago damages the anthers of flowering plants.

Material: 1 ex. - 15.07.2019, corn, on the fly, I.I. Temreshev.

*Dermestes coronatus* Steven, 1808. Crowned skin beetle. Necrophage imago and larvae are pests of stocks and raw materials, zoological collections.

Material: 13 ex. - 15.07.2019, corn, soil trap, I.I. Temreshev, A.M. Makezhanov, A.M. Tursynkulov.

*D. undulatus* Brahm, 1790. Imago and larvae are pests of stocks and leather raw materials, zoological collections.

Material: 1 ex. - 15.07.2019, corn, soil trap, I.I. Temreshev, A.M. Makezhanov, A.M. Tursynkulov; 2 ex. - 16.07.2019, wheatgrass field 2, manual collection, I.I. Temreshev.

#### Family Cleridae – Checkered beetles.

*Trichodes hauseri* Escherich, 1893. The imago is a predator. The biology of the larva is unknown.

Material: 2 ex. - 12.06.2019, wheatgrass field 2, on a sow thistle, manual collection, I.I. Temreshev; 1 ex. - 15.07.2019, corn, on the flowers of Sophora, manual collection, I.I. Temreshev.

*T. axillaris* Fischer-Waldheim, 1842. The imago is a predator. Larvae are parasites of locust egg capsules.

Material: 1 ex. - 14.06.2019, wheatgrass field 1, on ferule, manual collection, I.I. Temreshev; 1 ex. - 15.07.2019, wheatgrass field 1, on the flowers of sow thistle, manual collection, I.I. Temreshev.

#### Family Elateridae – Click beetles

*Aelosomus rossi* Germar, 1844. The Ross's Click beetle. Phytophage. No harm.

Material: 3 ex. - 12.06.2019, wheatgrass field 2, manual collection, I.I. Temreshev; 2 ex. - 15.07.2019, corn, soil trap, I.I. Temreshev, A.M. Makezhanov, A.M. Tursynkulov; 3 ex. - 15.07.2019, wheatgrass field 1, soil trap, I.I. Temreshev, A.M. Makezhanov, A.M. Tursynkulov; 2 ex. - 15.07.2019, wheatgrass field 2, soil trap, I.I. Temreshev, A.M. Makezhanov, A.M. Tursynkulov.

*Agriotes meticulosus* Candeze, 1863. Turkestan sowing Click beetle. Polyphagous soil habiting pest.

Material: 2 ex. - 12.06.2019, wheatgrass field 2, manual collection, I.I. Temreshev; 1 ex. - 15.07.2019, corn, soil trap, I.I. Temreshev, A.M. Makezhanov, A.M. Tursynkulov.

#### Family Scarabaeidae - Scarabaeidae

*Cetonia aurata viridiventrtris* Reitter, 1896. Green rose chafer. Larvae in wood dust, manure. Imago harm flowering plants, ears of grain, fruits of fruit trees.

Material: 7 ex. - 12.06.2019, corn, on corn and Sophora, manual collection, I.I. Temreshev; 6 ex. - 15.07.2019, corn, on the sofa, hand picking, I.I. Temreshev; 10 ex. - 13.06.2019, breadcrumbs field 1, on the thistle, manual collection, I.I. Temreshev; 5 ex. - 14.06.2019, wheatgrass field 2, on thistle and thistle, I.I. Temreshev; 8 ex. - 15.07.2019, corn, on the sofa, grants of east, corn, manual collection, I.I. Temreshev.

*Chironitis haroldi* (Ballion, 1871). Harold's Chironit. Coprophage. In the manure. Soil former.

Material: 9 ex. - 15.07.2019, wheatgrass field 1, soil trap, I.I. Temreshev, A.M. Makezhanov, A.M. Tursynkulov; 11 ex. - 15.08.2019, wheatgrass field 2, in manure, soil trap, I.I. Temreshev, A.B. Yeszhanov, A.M. Makezhanov, A.M. Tursynkulov; 17 ex. - 15.08.2019, wheatgrass field 1, in manure, soil trap, I.I. Temreshev, A.B. Yeszhanov, A.M. Makezhanov, A.M. Tursynkulov.

*Copris lunaris* (Linnaeus, 1758). Lunar copra. Coprophage. In the manure. Soil former.

Material: 3 ex. - 15.07.2019, wheatgrass field 1, soil trap, I.I. Temreshev, A.M. Makezhanov, A.M. Tursynkulov; 4 ex. - 16.07.2019, wheatgrass field 2, soil trap, I.I. Temreshev, A.M. Makezhanov, A.M. Tursynkulov.

*Gymnopleurus aciculatus* Gebler, 1845. Common pill beetle. Coprophage. Soil former.

Material: 7 ex. - 15.07.2019, corn, soil trap, I.I. Temreshev, A.M. Makezhanov, A.M. Tursynkulov; 19 ex. - 15.07.2019, wheatgrass field 1, soil trap, I.I. Temreshev, A.M. Makezhanov, A.M. Tursynkulov; 28 ex. - 16.07.2019, wheatgrass field 2, soil trap, I.I. Temreshev, A.M. Makezhanov, A.M. Tursynkulov; 41 ex. - 14.07.2019, wheatgrass field 1, soil trap, I.I. Temreshev, A.M. Makezhanov, A.M. Tursynkulov; 17 ex. - 15.08.2019, wheatgrass field 2, in manure, A.B. Yeszhanov, A.M. Makezhanov, I.I. Temreshev;

23 ex. - 15.08.2019, wheatgrass field 1, in manure, soil trap, A.B. Yeszhanov, A.M. Makezhanov, I.I. Temreshev, A.M. Tursynkulov.

*Onitis humerosus* (Pallas, 1771). The broad-shouldered dung beetle. Coprophage. Soil former.

Material: 3 ex. - 15.07.2019, corn, soil trap, I.I. Temreshev, A.M. Makezhanov, A.M. Tursynkulov; 5 ex. - 15.07.2019, wheatgrass field 1, soil trap, I.I. Temreshev, A.M. Makezhanov, A.M. Tursynkulov; 6 ex. - 08.15.2019, wheatgrass field 1, in manure, soil trap, A.B. Yeszhanov, A.M. Makezhanov, I.I. Temreshev, A.M. Tursynkulov.

*Onthophagus taurus* (Schreber, 1759). The bull manure-eater or two-horned manure-eater. Coprophage. Soil former.

Material: 2 ex. - 15.07.2019, corn, soil trap, I.I. Temreshev, A.M. Makezhanov, A.M. Tursynkulov; 12 ex. - 15.07.2019, wheatgrass field 1, soil trap, I.I. Temreshev, A.M. Makezhanov, A.M. Tursynkulov; 16 ex. - 16.07.2019, wheatgrass field 2, soil trap, I.I. Temreshev, A.M. Makezhanov, A.M. Tursynkulov; 11 ex. - 15.08.2019, wheatgrass field 2, in manure, A.B. Yeszhanov, A.M. Makezhanov, I.I. Temreshev; 15 ex. - 15.08.2019, wheatgrass field 1, in manure, soil trap, A.B. Yeszhanov, A.M. Makezhanov, I.I. Temreshev, A.M. Tursynkulov.

*Oryctes nasicornis* (Linnaeus, 1758). Common rhinoceros beetle. Larvae in wood dust, manure, soil, sometimes accidentally harm the roots of plants. Soil former.

Material: 1 specimen - 15.07.2019, wheatgrass field 1, dead on the field, I.I. Temreshev.

*Oxythyrea cinctella* Schaum, 1841. Larvae in wood dust, manure, compost, imago strongly harm flowering plants, gnaw grains of milk ripeness.

Material: 12 ex. - 12.06.2019, wheatgrass field 2, on a sow thistle, manual collection, I.I. Temreshev; 19 ex. - 15.07.2019, wheatgrass field 1, on the flowers of a thistle, manual collection, I.I. Temreshev; 15 ex. - 14.08.2019, corn, at the endowment of the east, manual collection, I.I. Temreshev.

*Pentodon bidens* (Pallas, 1771). Turkestan corn rhinoceros beetle. Multi-pest crop pest. Larva lives in soil.

Material: 2 ex. - 15.07.2019, corn, soil trap, I.I. Temreshev, A.M. Makezhanov, A.M. Tursynkulov.



Figure 4 – Dung beetle *Gymnopleurus aciculatus* Gebler, 1845

#### Family Tenebrionidae – Darkling beetles

*Gonocephalum rusticum* Olivier, 1811. Rustic sluggish. Beetles and larvae harm seedlings of various cultures. Common.

Material: 3 ex. - 12.06.2019, wheatgrass field 2, manual collection, I.I. Temreshev; 4 ex. - 15.07.2019, wheatgrass field 1, manual collection, I.I. Temreshev; 2 ex. - 16.07.2019, wheatgrass field 2, soil trap, I.I. Temreshev, A.M. Makezhanov, A.M. Tursynkulov; 3 ex. - 15.08.2019, wheatgrass field 2, manual collection, I.I. Temreshev; 1 ex. - 15.08.2019, wheatgrass field 1, manual collection, I.I. Temreshev.

*Microdera iliensis* Skopin, 1961. *Microdera* Ili. It lives in aeolian sediments under plants on gravelly sandy loamy and sandy soils.

Material: 2 ex. - 12.06.2019, wheatgrass field 2, manual collection, I.I. Temreshev; 3 ex. - 15.08.2019, wheatgrass field 2, soil trap, manual harvesting, A.B. Yeszhanov, A.M. Makezhanov, I.I. Temreshev, A.M. Tursynkulov.

*Omophlus deserticola* Kirsch, 1869. Steppe pollen eater. Larvae in the soil harm plant roots. Beetles damage flowers of various cultures. Mass species.

Material: 4 ex. - 12.06.2019, corn, wheat grass creeping, I.I. Temreshev.

*Trigonoscelis nodosa* (Fischer von Waldheim, 1821) ssp. *schrenki* Gebler 1845. Schrenk's Darkling beetle. It lives in sands with a diverse relief and varying degrees of overgrowing. Larvae in fixed tuberous sand under bushes of *Calygonum* and sand acacia.

Material: 1 ex. - 12.06.2019, wheatgrass field 2, manual collection, I.I. Temreshev; 2 ex. - 12.06.2019, corn, hand picking, I.I. Temreshev.



Figure 5 – Darkling beetle *Gonocephalum rusticum* Olivier, 1811

#### Family Meloidae – Blister beetles

*Epicauta erythrocephala* (Pallas, 1776). Red-headed blister. Larvae are parasites of locust and grasshoppers egg capsules. Imago harms cultivated plants. Severe damage to soybean leaves was noted.

Material: 1 ex. - 15.07.2019, corn, soil trap, I.I. Temreshev, A.M. Makezhanov, A.M. Tursynkulov.

*Hycleus atratus* (Pallas, 1773). Small floral blister. Larvae are parasites of locust and grasshoppers egg capsules. Imago harms cultivated plants.

Material: 5 ex. - 12.06.2019, corn, at the endowment of the east, manual collection, I.I. Temreshev; 2 ex. - 15.07.2019, corn, soil trap, I.I. Temreshev, A.M. Makezhanov, A.M. Tursynkulov.



Figure 6 – Blister *Mylabris quadripunctata* (Linnaeus, 1767)

*Mylabris crocata* (Pallas, 1781). The saffron blister. Marked food on chicory, cornflower, tulips, gallows, chondrill, bindweed, chingil, astragalus, poppies; registered as a pest of crops. Parasite of Moroccan locust, grasshoppers.

Material: 3 ex. - 12.06.2019, corn, on the sofa and gifts of the east, manual collection, I.I. Temreshev; 4 ex. - 15.07.2019, corn, soil trap, I.I. Temreshev, A.M. Makezhanov, A.M. Tursynkulov.

*M. geminata* Fabricius, 1798. Southern blister. It is registered as a pest of a number of crops. The parasite of the grasshoppers.

Material: 4 ex. - 12.06.2019, corn, on the sofa, hand picking, I.I. Temreshev; 2 ex. - 15.07.2019, corn, soil trap, I.I. Temreshev, A.M. Makezhanov, A.M. Tursynkulov.

*M. quadripunctata* (Linnaeus, 1767). Four-point blister. Larvae are parasites of locust egg capsules. Imago harms cultivated plants.

Material: 6 ex. - 12.06.2019, corn, at the endowment of the Oriental and Sophora, manual collection, I.I. Temreshev; 3 ex. - 15.07.2019, corn, soil trap, I.I. Temreshev, A.M. Makezhanov, A.M. Tursynkulov.

#### Famiy Coccinellidae – Ladybugs

*Adalia bipunctata* Linnaeus, 1758. Two-pointed Adalia. Entomophage of aphids and other homopterans.

Material: 9 ex. - 12.06.2019, corn, wheatgrass creeping and leaves of corn, manual collection, I.I. Temreshev; 7 ex. - 15.07.2019, corn, on the leaves of corn, manual collection, I.I. Temreshev.

*Coccinella septempunctata* (Linnaeus, 1758). Seven-pointed ladybugs. Entomophage of aphids and other homopterans.

Material: 8 ex. - 12.06.2019, corn, on the sofa and wheat grass creeping, manual collection, I.I. Temreshev; 5 ex. - 15.07.2019, corn, on the sofa and corn, manual collection, I.I. Temreshev.

*Harmonia axyridis* (Pallas, 1773). Asian ladybug. Entomophage of aphids and other homopterans. In the USA and Europe it is considered a dangerous invasive species.

Material: 2 ex. - 12.06.2019, corn, on the sofa and corn, manual collection, I.I. Temreshev; 1 ex. - 15.07.2019, corn, at the endowment of the East, manual collection, I.I. Temreshev.

*Hippodamia (Adonia) variegata* (Goeze, 1777). Changeable ladybug. Entomophage of aphids and other homopterans.

Material: 7 ex. - 12.06.2019, corn, wheat grass creeping wheat, corn and Sophora, manual collection, I.I. Temreshev; 11 ex. - 13.06.2019, wheatgrass field 1, on a thistle and white marie, manual collection, I.I. Temreshev; 9 ex. - 14.06.2019, wheatgrass field 2, on a sow thistle, white marie and thistle, I.I. Temreshev; 10 ex. - 15.07.2019, corn, on the sofa, grants of east, corn, manual collection, I.I. Temreshev; 5 ex. - 12.08.2019, corn, wheat grass creeping, manual collection, I.I. Temreshev.



Figure 7 – Ladybug *Harmonia axyridis* (Pallas, 1773)

## Family Cerambycidae - Longhorn beetles

*Agapanthia leucaspis* Steven, 1817. White-carapace Agapanthia. Larvae develop in the stems of sow thistle, bodykie, and muzzle. Imago on flowers may slightly damage anthers.

Material: 1 ex. - 12.06.2019, corn, on the sofa, hand picking, I.I. Temreshev; 1 ex. - 15.07.2019, corn, on the flowers of Sophora, manual collection, I.I. Temreshev.

*A. violacea* Fabricius, 1775. Valerian Longhorn beetles. Larvae harm alfalfa and other legumes, valerian, and asteraceae.

Material: 2 ex. - 12.06.2019, wheatgrass field 2, on a sow thistle, manual collection, I.I. Temreshev; 1 ex. - 15.07.2019, wheatgrass field 1, on the thistle, manual collection, I.I. Temreshev.

## Family Chrysomelidae - Leaf beetles

*Cassida nebulosa* Linnaeus, 1758. Beetroot shield. On a swan, marie, shiritse, etc. It harms beets.

Material: 4 ex. - 15.07.2019, wheatgrass field 1, on Marie White, manual collection, I.I. Temreshev.

*Chaetocnema aridula* Gyllenhal, 1827. Southern stem flea. It harms cereals.

Material: 3 ex. - 12.06.2019, corn, wheat grass creeping, I.I. Temreshev; 6 ex. - 15.07.2019, grain box field 1, on a grain box, manual collection, I.I. Temreshev.

*Hispa atra* Linnaeus, 1767. Dark shield. Imago dults and larva on cereals.

Material: 2 ex. - 12.06.2019, corn, wheat grass creeping, I.I. Temreshev; 1 ex. - 15.07.2019, wheatgrass field 1, manual collection, I.I. Temreshev.

*Phyllotreta vittula* (Redtenbacher, 1849). Striped bread flea. Strongly harms cultivated and wild-growing cereals.

Material: 4 ex. - 12.06.2019, corn, wheat grass creeping, I.I. Temreshev; 3 ex. - 15.07.2019, wheatgrass field 1, manual collection, I.I. Temreshev, A.M. Makezhanov, A.M. Tursynkulov.

*Psylliodes cucullata* Illiger, 1807. Secretive-headed cereal flea. It harms cereals, sometimes tree species of the elm family - elm, etc.

Material: 1 ex. - 12.06.2019, corn, wheat grass creeping, I.I. Temreshev; 2 ex. - 15.07.2019, corn, on the leaves of corn, manual collection, I.I. Temreshev.



Figure 8 – Leaf eater *Phyllotreta vittula* (Redtenbacher, 1849)

## Family Curculionidae - Weevils

*Asproparthenis foveicollis* (Gebler, 1834). Eastern beetroot weevil. On Chenopodiaceae. It harms beetroot.

Material: 2 ex. - 12.06.2019, corn, on the ground, hand picking, I.I. Temreshev; 1 ex. - 15.07.2019, corn, soil trap, I.I. Temreshev, A.M. Makezhanov, A.M. Tursynkulov; 2 ex. - 12.06.2019, corn, on the ground, hand picking, I.I. Temreshev.

*Chloebius immeritus* Boheman, 1834. Small green licorice weevil. On licorice, turanga, tamarix and sucker. It hurts. Was marked by us on corn.

Material: 8 ex. - 11.06.2019, corn, on the leaves of corn, manual collection, I.I. Temreshev; 5 ex. - 15.07.2019, corn, on the leaves of corn, manual collection, I.I. Temreshev; 2 ex. - 12.08.2019, corn, dead on the ground, I.I. Temreshev, A.M. Makezhanov.

*Larinus turbinatus* Gyllenhal, 1835. Safflower weevil. On Asteraceae. It harms safflower.

Material: 3 ex. - 12.06.2019, breadcrumbs field 1, on the thistle, manual collection, I.I. Temreshev; 5 ex. - 15.07.2019, wheatgrass field 1, on a sow thistle, manual collection, I.I. Temreshev; 1 ex. - 15.07.2019, wheatgrass field 2, soil trap, I.I. Temreshev, A.M. Makezhanov, A.M. Tursynkulov, A.B. Yeszhanov.

*Lixus algirus* Linnaeus, 1758. Bean Frankman. On legumes, malva and Chenopodiaceae. It harms raspberries.

Material: 2 ex. - 12.06.2019, corn, on the sofa, hand picking, I.I. Temreshev; 3 ex. - 13.08.2019, wheatgrass field 1, on Astragalus, manual collection, I.I. Temreshev.

*Sitona callosus* Gyllenhal, 1834. Brown nodule weevil. On various legumes. It harms clover, alfalfa, sainfoin, sand acacia, etc.

Material: 3 ex. - 12.06.2019, corn, on the sofa, hand picking, I.I. Temreshev; 5 ex. - 12.08.2019, corn, on the sofa, hand picking, I.I. Temreshev; 3 ex. - 12.08.2019, breadcrumbs field 1, on astragalus, manual collection, I.I. Temreshev; 4 ex. - 12.08.2019, wheatgrass field 2, on Astragalus, manual collection, I.I. Temreshev.

*Xanthochelus nomas* (Pallas, 1771). Wandering Weevil. On Asteraceae. Marked as a sugar beet pest.

Material: 2 ex. - 12.06.2019, breadcrumbs field 1, on the thistle, manual collection, I.I. Temreshev; 1 ex. - 13.08.2019, corn, dead on the ground, I.I. Temreshev.



Figure 9 - Weevil *Larinus turbinatus* Gyllenhal, 1835

**Discussion of research results.** As a result of the research, for the fields of forage crops in the territory of the Kerbulak branch of “Bayserke Agro” LLP, a total of 52 species of beetles were identified, belonging to 45 genera from 13 families and 2 suborders and having different economic significance. Of these, both larva and species diversity are dominated by lamellar beetles - Scarabaeidae, represented by 9 genera and 9 species. They are followed by Curculionidae - 6 genera and 6 species, Chrysomelidae - 5 genera and 5 species, Meloidae and Histeridae - 3 genera and 5 species in each family. Coccinellidae, Tenebrionidae and Dermestidae are represented by 4 species, Cerambycidae, Cleridae and Elateridae - 2 species each, and finally, Silphidae - 1 species.

**Findings.** Of the 52 species of beetles found on the territory of forage crops of the Kerbulak branch of “Bayserke Agro” LLP, the number of species of negative economic importance is 30. Useful species are entomophages and soil-formers - 22. Moreover, the number of harmful species does not exceed the economic threshold of harmfulness. Thus, we can conclude that the agrocenosis of the fields of forage crops is currently in equilibrium, and additional measures to limit the number of pests are not required. However, it should be kept in the mind that in the future, under favorable conditions, some species, for example, Turkistan corn rhinoceros beetle *Pentodon bidens* (Pallas, 1771), can give an outbreak of mass

reproduction. The dominant position in the number and species composition of the representatives of the Scarabaeidae family is largely due to the fact that not only plant growing, but also intensive livestock breeding is carried out in the studied territory - cattle, horses, camels and sheep are bred. The high abundance and species diversity of coprobiontic species of lamellar beetles is also an indicator of the good condition of forage crop agroecosystems of the Kerbulak branch of "Bayserke Agro" LLP, since they play an important role in the disposal of livestock waste and enrichment of the soil with organic substances.

**Research funding source.** The work was prepared as part of the project of the Ministry of Agriculture of the Republic of Kazakhstan BR 06249249 "Development of a complex system of productivity increase and farm animals breeding qualities improvement, on example of "Bayserke Agro" LLP under subproject 2 "Improving the technologies of cultivation and harvesting of forage crops".

**И. И. Темрешев<sup>1</sup>, А. М. Макежанов<sup>1</sup>, А. М. Турсынкулов<sup>1</sup>, А. Б. Есжанов<sup>2</sup>**

<sup>1</sup>ҚР АШМ ТОО Ж. Жиёмбаев атындағы Қазақ өсімдік қорғау және карантин ғылыми зерттеу институты, Алматы, Қазақстан,

<sup>2</sup>М. Айқымбаев атындағы Қазақ зооноздық және карантиндік инфекциялар ғылыми орталығы, Алматы, Қазақстан

**"БАЙСЕРКЕ-АГРО" ЖШС КЕРБҰЛАҚ БӨЛІМШЕСІНІҢ ЖЕМ-ШӨП ДАҚЫЛДАРЫ  
АЛҚАПТАРЫНЫҢ ҚАТТЫ ҚАНАТТЫ (INSECTA, COLEOPTERA) ЖӘНДІКТЕРДІҢ  
ТҮРЛІК ҚҰРАМЫ ТУРАЛЫ**

**Аннотация.** Аумағы үшін алаңдарын жемшөп дақылдарын (еркекшөптің мен жүгері), Кербұлақ аудандық бөлімшесі "Байсерке Агро" ЖШС анықталды 52 түрі жетеккрылых жәндіктердің жататын 45 аударылған 13 тұқымдасқа және 2-ші подотряд. Бойынша саны және түрлік әртүрлілігі басым Scarabaeidae тұқымдас, ұсынылған 9 родами және 9 түрі бар. Одан кейінгі орында Curculionidae – 6 босану және 6-түрлері, Chrysomelidae – 5, босану және 5-түрлері, Meloidae және Histeridae – 3 түрі және 5 түр әр түр. Coccinellidae, Tenebrionidae және Dermestidae ұсынылған 4 түрлерімен, Cerambycidae, Cleridae және Elateridae – 2 түрін, және, ақырында, Silphidae – 1. Теріс шаруашылық маңызы бар 30 түрі. Пайдалы энтомофагтар мен топырақ түзушілер – 22 түрі. Саны зиянды түрлерінің аспайды экономикалық зияндылық шегінен. Сонымен, агроценоз алаңдарын жемшөп дақылдарын қазіргі уақытта мұнда орналасқан артық жүктеменің тең таралуын жай-күйі және шектеу жөнінде қосымша шаралар зиянкестер санының талап етілмейді. Алайда, болашақта қолайлы жағдайларда кейбір түрлері, мысалы, түркістан жүгері дупляк *Pentodon bidens* (Pallas, 1771), бере жарқылды жаппай көбеюі. Үстем жағдайын сандық және түрлі тобы өкілдерінің Scarabaeidae түсіндіріледі мұнда қарқынды мал шаруашылығы қызметі. Жоғары саны мен әртүрлілігі копробионт Scarabaeidae тұқымдасқа көрсеткіші болып табылады жақсы жағдайын аумақтарындағы агроценоздардың жемшөп дақылдарының Кербұлақ бөлімінің "Байсерке Агро" ЖШС, өйткені олар маңызды рөл атқарады және қалдықтарды кәдеге жарату мал және байыту топырақты органикалық заттармен.

**Түйін сөздер:** Қатты қанаттылар, Insecta, Coleoptera, жемдік дақылдар, еркекшөп, жүгері, «Байсерке Агро» ЖШС.

**И. И. Темрешев<sup>1</sup>, А. М. Макежанов<sup>1</sup>, А. М. Турсынкулов<sup>1</sup>, А. Б. Есжанов<sup>2</sup>**

<sup>1</sup>ТОО Казахский научно-исследовательский институт защиты и карантина растений им. Ж. Жиёмбаева МСХ РК, Алматы, Казахстан,

<sup>2</sup>Казахский научный центр зоонозных и карантинных инфекций им. М. Айқымбаева, Алматы, Казахстан

**О ВИДОВОМ СОСТАВЕ ЖЕСТКОКРЫЛЫХ НАСЕКОМЫХ (INSECTA, COLEOPTERA) ПОЛЕЙ  
КОРМОВЫХ КУЛЬТУР КЕРБУЛАКСКОГО ОТДЕЛЕНИЯ ТОО «БАЙСЕРКЕ-АГРО»**

**Аннотация.** Для территории полей кормовых культур (житняка и кукурузы) Кербулакского отделения ТОО «Байсерке Агро» было выявлено 52 вида жесткокрылых насекомых, относящихся к 45 родам из 13 семейств и 2-х подотрядов. как по численности, так и по видовому разнообразию доминируют пластинчатусые жуки - Scarabaeidae, представленные 9 родами и 9 видами. За ними следуют Curculionidae – 6 родов и 6 видов, Chrysomelidae – 5 родов и 5 видов, Meloidae и Histeridae – по 3 рода и 5 видов в каждом семействе. Coccinellidae, Tenebrionidae и Dermestidae представлены 4 видами, Cerambycidae, Cleridae и Elateridae – по 2 вида, и наконец, Silphidae – 1 вид. Отрицательное хозяйственное значение имеют 30 видов. Полезные энтомофаги и почвообразователи – 22 вида. Численность вредных видов не превышает экономического порога вредоносности. Таким образом, агроценоз полей кормовых культур в настоящее время здесь находится в равновесном состоянии, и дополнительных мер по ограничению численности вредителей не требуется.

Однако, в будущем при благоприятных условиях некоторые виды, например, туркестанский кукурузный дупляк *Pentodon bidens* (Pallas, 1771), могут дать вспышку массового размножения. Доминирующее положение в количественном отношении и разнообразии представителей семейства Scarabaeidae объясняется тем, что здесь ведется интенсивная животноводческая деятельность. Высокая численность и разнообразие копробионтных видов пластинчатоусых жуков является показателем хорошего состояния агроценозов кормовых культур Кербулакского отделения ТОО «Байсерке Агро», так как они играют важную роль в утилизации отходов скота и обогащении почвы органическими веществами.

**Ключевые слова:** Жесткокрылые, Insecta, Coleoptera, кормовые культуры, житняк, кукуруза, ТОО «Байсерке Агро».

#### Information about authors:

Temreshev I. I., Zh. Zhiembayev Kazakh Research Institute of Plant Protection and Quarantine of the Ministry of Agriculture, Almaty, Kazakhstan; temreshev76@mail.ru; <https://orcid.org/0000-0003-0004-4399>

Makezhanov A. M., Zh. Zhiembayev Kazakh Research Institute of Plant Protection and Quarantine of the Ministry of Agriculture, Almaty, Kazakhstan; Makezhanov.arman@bk.ru; <https://orcid.org/0000-0003-1587-1979>

Tursynkulov A. M., Zh. Zhiembayev Kazakh Research Institute of Plant Protection and Quarantine of the Ministry of Agriculture, Almaty, Kazakhstan; aidyn.eszhanov@gmail.com; <https://orcid.org/0000-0003-1108-8506>

Yeszhanov A. B., Zh. Zhiembayev Kazakh Research Institute of Plant Protection and Quarantine of the Ministry of Agriculture, Almaty, Kazakhstan; askhat\_t-26@mail.ru; <https://orcid.org/0000-0001-6572-5668>

#### REFERENCES

[1] Temreshev I.I. (2015) Orthopteroid insects (Insecta: Mantoptera, Dictyoptera, Dermaptera, Orthoptera) collected on crops of feed and industrial crops of “Bayserke Agro” LLP // Materials of the International scientific conference “Innovative environmentally friendly technologies for plant protection”, September 24-25, 2015, Almaty, The Republic of Kazakhstan. Almaty: Taugul-Print. P. 206-212 (in Russ.).

[2] Temreshev I.I., Yesenbekova P.A. (2015) Insects included in the Red Book of the Republic of Kazakhstan and the Red Book of Almaty Region, found on crops of fodder and industrial crops of “Bayserke Agro” LLP // Materials of the International Scientific Conference “Innovative Environmentally Safe Technologies for Plant Protection”, September 24-25, 2015, Almaty, The Republic of Kazakhstan. Almaty: Taugul-Print. P. 216-222 (in Russ.).

[3] Temreshev I.I., Yesenbekova P.A., Kenzhegaliev A.M. (2015) Coleoptera (Insecta, Coleoptera) harvested on the crops of fodder and industrial crops of “Bayserke Agro” LLP // Materials of the International scientific conference “Innovative environmentally friendly technologies for plant protection”, September 24-25, 2015, Almaty, Republic of Kazakhstan. Almaty: Taugul-Print. P. 223-232 (in Russ.).

[4] Temreshev I.I., Yesenbekova P.A., Kenzhegaliev A.M. (2015) Hymenoptera - entomophages of feed crop pests in the experimental fields of the “Bayserke Agro” LLP Almaty region that do not live in artificial nests // Materials of the International Scientific and Practical Conference “New Strategy for Scientific and Educational Priorities in the Context of the Development of the Agro-Industrial Complex” dedicated to the 85th anniversary of the Kazakh National Agricultural University November 27-28, 2015. Vol. II. Almaty. P. 102-105 (in Russ.).

[5] Temreshev I.I., Yesenbekova P.A., Kenzhegaliev A.M. (2015) Entomophages of forage crop pests that inhabit artificial nests on the experimental fields of the “Bayserke Agro” LLP Almaty Region // Materials of the International Scientific and Practical Conference “New Strategy for Scientific and Educational Priorities in the Context of the Development of the Agro-Industrial Complex” dedicated to the 85th anniversary of the Kazakh National Agrarian University 27 November 28-28, 2015. Vol. II. Almaty. P. 105-109 (in Russ.).

[6] Temreshev I.I., Yesenbekova P.A., Kenzhegaliev A.M., Sagitov A.O. (2016) Fauna and economic importance of spiders (Arachnida, Aranei) in the fields of forage crops of the Almaty region of Kazakhstan // News of science of Kazakhstan. Agriculture and forestry. 2 (128): 175-185 (in Russ.).

[7] Temreshev I.I., Yesenbekova P.A., Kozhabaeva G.E., Sultanova N.Zh., Zhanarbekova A.B. (2016) On the species composition of sucking-insect pests of feed crops in the fields of Almaty region // Materials of the international scientific-practical conference “Zoos of Kazakhstan, prospects and development”, November 3-4, 2016. Almaty: Nur-Print. P. 138-143 (in Russ.).

[8] Temreshev I.I., Yesenbekova P.A., Kenzhegaliev Y.M., Sagitov A.O., Muhamadiev N.S., Homziak J. (2017) Diurnal insect pollinators of legume forage crops in Southeastern Kazakhstan // International Journal of Entomology Research. 2 (2): 17-30 (in Eng.).

[9] Temreshev, I.I., Yesenbekova, P.A., Sagitov, A.O., Mukhamadiev, N.S., Sarsenbaeva, G.B., Ageenko, A.V., & Homziak, J. (2018). Evaluation of the effect of locally produced biological pesticide (AkKøbelek™) on biodiversity and abundance of beneficial insects in four forage crops in the Almaty region of Kazakhstan // International Journal of Environment, Agriculture and Biotechnology (IJEAB). 3 (1): 72-91. <http://dx.doi.org/10.22161/ijeab/3.1.10> (in Eng.).

[10] Temreshev I.I., Yesenbekova P.A., Sagitov A.O., Mukhamadiev N.S. (2017) To the knowledge of the fauna of hemorrhhages (Neuroptera, Hemerobiidae) in the fields of forage crops of the Almaty region of the Republic of Kazakhstan // Proceedings of the National Academy of Sciences of the Republic of Kazakhstan. A series of biological and medical. 5 (321): 228-234 (in Russ.).

- [11] Temreshev I.I., Ageenko A.V., Sagit I. (2018) Leafhoppers, threehoppers and spittlebugs (Hemiptera, Auchenorrhyncha) - soybean pests in the southeast of the Republic of Kazakhstan // News of the National Academy of Sciences of the Republic of Kazakhstan. Series of Agrarian Sciences. 1 (43): 26-33 (in Eng.).
- [12] Temreshev I.I., Ageenko A.V., Sagit I. (2018) Ground malacofauna (Mollusca, Gastropoda) of fields of fodder crops of the Almaty oblast // News of the National academy of sciences of the Republic of Kazakhstan. Series of Agrarian Sciences. 4 (46): 26-36 (in Eng.).
- [13] Temreshev I.I. (2018) Additional Information on the Fauna of the Coleoptera (Insecta, Coleoptera) of Fodder Crops of the Almaty Region // Ecology and Conservation of the Animal World: Materials of the International Scientific and Practical Conference November 6, 2018 - Almaty: KazNPU named after Abay. P. 59-64 (in Russ.).
- [14] Temreshev I.I., Tursynkulov A.M. (2018) A preliminary list of harmful invertebrates on soybean crops of Bayserke Agro LLP // Materials of the International Scientific Conference "Formation and Development of Science for Plant Protection and Quarantine in the Republic of Kazakhstan" December 6, 2018. Almaty. P. 559-570 (in Russ.).
- [15] Temreshev I.I. (2019) Additional information about the mesofauna of the soil in the fields of forage crops of Bayserke Agro LLP. Science, Production, Business: Current State and Ways of Innovative Development of the Agricultural Sector by the Example of Bayserke Agro Agricultural Holding: Proceedings of the international scientific and practical conference dedicated to the 70th anniversary of the well-deserved figure of the Republic of Kazakhstan Dosmukhambetov Temirkhan Minaidarovich (April 4-5, 2019, Almaty, Kazakhstan). Under the general. ed. Acad. B.T. Zhumagulova, A.O. Sagitova, N.M. Temirbekova. Vol. 2. Almaty. P. 140-146 (in Russ.).
- [16] Temreshev I.I., Yeszhanov A.B., Tursynkulov A.M., Bolatbekova B. (2019) Laboratory tests of the biological preparation Nemaslug® against harmful mollusks inhabiting the sown areas of "Bayserke Agro" LLP // Science, Production, Business: Current status and innovative development of the agricultural sector as exemplified by Bayserke Agro Agricultural Holding: Proceedings of the international scientific and practical conference dedicated to the 70th anniversary of the honored worker of the Republic of Kazakhstan Temirkhan Mynaydarovich Dosmukhambetov (April 4-5, 2019, Almaty, Kazakhstan). Under the general. ed. Acad. B.T. Zhumagulova, A.O. Sagitova, N.M. Temirbekova. Vol. 2. Almaty. P. 147-152 (in Russ.).
- [17] Yesenbekova P.A., Temreshev I.I., Kenzhegaliev A.M., Tursynkulov A.M., Dosmukhambetov T.M. (2019) Hemiptera (Hemiptera: Heteroptera) - pests of grain (barley, triticale, wheat) Bayserke-Agro LLP // News of the National academy of sciences of the Republic of Kazakhstan. A series of agricultural sciences. 2 (50): 21-30. <https://doi.org/10.32014/2019.2224-526X.12> ISSN 2224-526X (in Eng.).
- [18] Yesenbekova P.A., Temreshev I.I., Kenzhegaliev A.M., Tursynkulov A.M., Dosmukhambetov T.M. (2019) Bed bugs (Hemiptera: Heteroptera) - alfalfa pests of Bayserke-Agro LLP // News of the National academy of sciences of the Republic of Kazakhstan. A series of agricultural sciences. 2 (50): 55-65. <https://doi.org/10.32014/2019.2224-526X.17> ISSN 2224-526X (in Eng.).
- [19] Temreshev I.I., Makezhanov A.M., Tursynkulov A.M., Yeszhanov A.B. (2019) Bloodsucking ticks (Arachnida, Acari, Ixodida), collected in «Bayserke Agro» LLP // News of the National academy of sciences of the Republic of Kazakhstan. Series of Agricultural Sciences. 4 (52): 41-48. <https://doi.org/10.32014/2019.2224-526X.48> (in Eng.).
- [20] Footitt, Robert G. & Adler, Peter H. (2009) Insect Biodiversity: science and society. Blackwell Publishing Ltd. ISBN 978-1-4051-5142-9 (in Eng.).
- [21] Arnett R.H., Jr., M.C. Thomas, P.E. Skelley, J.H. Frank. (2002) American Beetles. Vol. 2. New York: CRC Press (in Eng.).
- [22] Beutel R.G., R.A.B. Leschen. (2005) Handbook of Zoology: A Natural History of the Phyla of the Animal Kingdom, Vol. IV. Arthropoda: Insecta, Part 38. Coleoptera, Beetles. Vol. 1. Morphology and Systematics. Berlin: Walter de Gruyter. 296-344 (in Eng.).
- [23] Caryn Juliana Micheli. (2006) Studies on the longhorned woodboring beetles (Coleoptera: Cerambycidae) of the West Indies: Thesis. Directed by: Professor Charles Mitter. 1-163 (in Eng.).
- [24] Polilov A. (2015) How small is the smallest? New record and remeasuring of *Scydosella musawasensis* Hall, 1999 (Coleoptera, Ptiliidae), the smallest known free-living insect. ZooKeys. Pensoft Publishers. 526: 61-64. doi: 10.3897/zookeys.526.653 (in Eng.).
- [25] Guide book of insects of the European part of the USSR. (1965) Vol. II. Coleoptera and fan-winged. Under the total. ed. G.Ya. Bay Bienenko. M.-L.: Science (in Russ.).
- [26] Coleoptera, or beetles. (1989, 1992, 1996) Ler P.A. (Ed.): Guide book of insects of the Far East of the USSR. Vol. III. Part 1-3 (in Russ.).
- [27] Insects and ticks - pests of crops. (1974) Vol. II. Coleoptera. Ed. O.L. Kryzhanovskiy. L.: Nauka (in Russ.).
- [28] Baitenov M.S. (1974) Weevil beetles of Central Asia and Kazakhstan. Alma-Ata: Science (in Russ.).
- [29] Kryzhanovskiy O.L., Reichardt A.N. (1976) Beetles of the superfamily Histeroidea (families Sphaeritidae, Histeridae, Synteliidae). Fauna of the USSR. Coleoptera insects. 111 (4). L.: Nauka (in Russ.).
- [30] Nikolaev G.V. (1987) Lamellar beetles (Coleoptera, Scarabaeoidea) of Kazakhstan and Central Asia. Alma-Ata: Publishing House of Science of the Kazakh SSR (in Russ.).
- [31] Savoyskaja G.I. (1983) Coccinellids: Systematics, agricultural pest management. Alma-Ata: Nauka (in Russ.).
- [32] Skopin N.G. (1961) Materials on the fauna and ecology of darkling beetles (Coleoptera, Tenebrionidae) of South-East Kazakhstan. Transactions of the Kazakh Research Institute of Plant Protection. Alma-Ata: Kazakh State Publishing House of Agricultural Literature. VI: 172-208 (in Russ.).
- [33] Temreshev I.I. (2017) Pests of stocks and raw materials common on the territory of the Republic of Kazakhstan, and some related and quarantine species (species composition and brief technology of protective measures). Second edition, revised and revised. Almaty: Nur-Print (in Russ.).

## МАЗМҰНЫ

|                                                                                                                                                                                                                      |     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Әділханқызы А., Алтысбаева Қ.А., Мұхтарханова А.А., Найманова Б., Чадинова А.М.                                                                                                                                      |     |
| Жабық алаң жағдайында <i>tetranychus urticae</i> К. қарсы күресте <i>Phytoseiulus persimilis</i> А.-Н. пайдалану.....                                                                                                | 5   |
| Сагитов А.О., Мұхамдиев Н.С., Меңдібаева Г.Ж., Ұзақбаева М.А. Майбұршақ дақылын инновациялық технологиямен өсіру және зиянды ағзалардан бірегей қорғау жүйесі.....                                                   | 5   |
| Султанова Н.Ж., Бекежанова М.М., Сарсенбаева Г.Б., Джаймурзина А.А., Усембаева Ж.С., Сагитов А.О.                                                                                                                    |     |
| Ауылшаруашылық дақылдар тұқымының фитоталдау нәтижелері.....                                                                                                                                                         | 16  |
| Спанов А.А., Султанбай Д.Т., Баймұқанов А.Д. "Байсерке-Агро" ЖШС жағдайында ет бағытындағы бұқашықтардың өнімділігінің салыстырмалы нәтижелері».....                                                                 | 22  |
| Баймұқанов Д.А. Қазақ бактриан тұқымының түйелерінің сүттілігін бағалау мен арттырудың тиімді тәсілдері.....                                                                                                         | 27  |
| Керімжанова Б.Ф., Иванова Л.Н., Ильин А.И. Кустардың А Тұмауына қарсы күресте иодты қосылысының эффективтілігіне баға беру.....                                                                                      | 32  |
| Нурманбекова Г.К., Дүйсенова Р. Аймақтық инновациялық саясатты іске асыру.....                                                                                                                                       | 39  |
| Темрешев І.И., Успанов А.М., Есжанов А.Б., Кенжеғалиев А.М., Макежанов А.М., Болатбекова Б.Б.                                                                                                                        |     |
| Актарофит биологиялық препаратының әртүрлі зиянды артроподтарға арналған зертханалық зерттеулерінің нәтижелері туралы.....                                                                                           | 45  |
| Калимолдинова А.С., Жаксылыкова Г.К., Чиндалиев А.Е., Байгабылов К., Баймұқанов А.Д.                                                                                                                                 |     |
| «Байсерке-Агро» ЖШС голштинтұқымының 6 айға дейінгі бұзауының өсу жағдайы.....                                                                                                                                       | 54  |
| Исаева Ж.Б. Қордай ауданы жағдайында табиғи жайылымдарды тиімді пайдалану.....                                                                                                                                       | 58  |
| Мазкират Ш., Бабисекова Д.И., Дидоренко С.В., Ержебаева Р.С. SSR маркерлерін пайдалана отырып, қытай бұршақ сорттары мен селекциялық линияларын фотопериодка сезімтал <i>E7</i> гені бойынша идентификациялау.....   | 54  |
| Мұстафаев Ж.С., Қозыкеева А.Т., Сагаев А.А., Алимбаев Е.Н. Сырдарья өзенінің төменгі алабындағы су ағынының техногендік өзгеруі.....                                                                                 | 74  |
| Бекенов Д.М., Спанов А.А., Кенчинбаева Н.С., Баймұқанов А.Д. Шығыс Қазақстан облысы жағдайында сүтті бағыттағы сиырларда аналық без функциясының фолликулярлық киста түрінде бұзылуымен күресу әдісін жетілдіру..... | 84  |
| Исхан К.Ж. Отандық табын жылқы тұқымдарының өнімді профилі.....                                                                                                                                                      | 88  |
| Кошен Б.М., Шаяхметова А.С., Тоқтар М., Кушенов Б.М. Солтүстік Қазақстан мал-азық өндірісі.....                                                                                                                      | 93  |
| Султанбай Д.Т., Жаксылыкова Г.К., Байгабылов К.О., Баймұқанов А.Д. Жынысы бойынша бөлінген ұрықпен ұрықтандыру кезіндегі қашарлардың ұрықтандырылуын салыстырмалы бағалау.....                                       | 101 |
| Мұстафаев Ж.С., Қозыкеева Ә.Т., Камалиев А.М. Шекара аралық шу өзенінің алабының климатының өзгеруі.....                                                                                                             | 105 |
| Темрешев И.И., Макежанов А.М., Турсынқұлов А.М., Есжанов А.Б. "Байсерке-Агро" ЖШС Кербұлақ бөлімшесінің жем-шөп дақылдары алқаптарының қатты қанатты (Insecta, Coleoptera) жәндіктердің түрлік құрамы туралы.....    | 114 |

## СОДЕРЖАНИЕ

|                                                                                                                                                                                                                                                               |     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <i>Адилханкызы А., Алтысбаева К.А., Мухтарханова А.А., Найманова Б., Чадинова А.М.</i>                                                                                                                                                                        |     |
| Использование <i>Phytoseiulus persimilis</i> А.-Н. в борьбе против <i>tetranychus urticae</i> К. в закрытом грунте.....                                                                                                                                       | 5   |
| <i>Сагитов А.О., Мухамадиев Н.С., Мендибаева Г.Ж., Узакбаева М.А.</i> Интегрированная система защиты сои от вредителей и инновационная технология возделывания.....                                                                                           |     |
|                                                                                                                                                                                                                                                               | 5   |
| <i>Султанова Н.Ж., Бекежанова М.М., Сарсенбаева Г.Б., Джаймурзина А.А., Усембаева Ж.С., Сагитов А.О.</i>                                                                                                                                                      |     |
| Результаты фитоэкспертизы семян сельскохозяйственных культур.....                                                                                                                                                                                             | 16  |
| <i>Спанов А.А., Султанбай Д.Т., Баймуканов А.Д.</i> Сравнительные результаты продуктивности бычков мясного направления в условиях ТОО «Байсерке-Агро».....                                                                                                    |     |
|                                                                                                                                                                                                                                                               | 22  |
| <i>Баймуканов Д.А.</i> Эффективные приемы оценки и повышения молочности верблюдов породы казахский бактриан.....                                                                                                                                              |     |
|                                                                                                                                                                                                                                                               | 27  |
| <i>Керимжанова Б.Ф., Иванова Л.Н., Ильин А.И.</i> Оценка эффективности иодсодержащего комплекса в борьбе с гриппом птиц А.....                                                                                                                                |     |
|                                                                                                                                                                                                                                                               | 32  |
| <i>Нурманбекова Г.К., Дуйсенова Р.Ж.</i> Реализация региональной инновационной политики.....                                                                                                                                                                  |     |
|                                                                                                                                                                                                                                                               | 39  |
| <i>Темрешев И.И., Успанов А.М., Есжанов А.Б., Кенжегалеев А.М., Макежанов А.М., Болатбекова Б.Б.</i>                                                                                                                                                          |     |
| О результатах лабораторных испытаний биологического препарата Актарофит на различных видах вредных членистоногих.....                                                                                                                                         | 45  |
| <i>Калимолдинова А.С., Жаксылыкова Г.К., Чиндалиев А.Е., Байгабылов К., Баймұқанов А.Д.</i>                                                                                                                                                                   |     |
| Рост и развитие телят голштинской породы в молочном комплексе ТОО «Байсерке-Агро».....                                                                                                                                                                        | 54  |
| <i>Исаева Ж.Б.</i> Рациональное использование естественных пастбищ в условиях Кордайского района.....                                                                                                                                                         |     |
|                                                                                                                                                                                                                                                               | 58  |
| <i>Мазкират Ш., Бабисекова Д.И., Дидоренко С.В., Ержебаева Р.С.</i> Идентификация гена чувствительности к фотопериоду <i>E7</i> у сортов и селекционных линии сои с использованием SSR-маркеров.....                                                          |     |
|                                                                                                                                                                                                                                                               | 54  |
| <i>Мустафаев Ж.С., Козыкеева А.Т., Сагаев А.А., Алимбаев Е.Н.</i> Антропогенные изменения стока в низовьях реки Сырдарьи.....                                                                                                                                 |     |
|                                                                                                                                                                                                                                                               | 74  |
| <i>Бекенов Д.М., Спанов А.А., Кенчинбаева Н.С., Баймуканов А.Д.</i> Усовершенствование метода борьбы с расстройством функций яичников в форме фолликулярной кисты у коров молочного направления продуктивности в условиях Восточно-Казахстанской области..... |     |
|                                                                                                                                                                                                                                                               | 84  |
| <i>Исхан К.Ж.</i> Продуктивный профиль табунных лошадей отечественных пород.....                                                                                                                                                                              |     |
|                                                                                                                                                                                                                                                               | 88  |
| <i>Кошен Б.М., Шаяхметова А.С., Тоқтар М., Кушенов Б.М.</i> Производство кормов на севере Казахстана.....                                                                                                                                                     |     |
|                                                                                                                                                                                                                                                               | 93  |
| <i>Султанбай Д.Т., Жаксылыкова Г.К., Байгабылов К.О., Баймуканов А.Д.</i> Сравнительная оценка оплодотворяемости телок при осеменении семенем разделенное по полу.....                                                                                        |     |
|                                                                                                                                                                                                                                                               | 101 |
| <i>Мустафаев Ж.С., Козыкеева А.Т., Камалиев А.М.</i> Климатические изменения бассейна трансграничной рек Ишу.....                                                                                                                                             |     |
|                                                                                                                                                                                                                                                               | 105 |
| <i>Темрешев И.И., Макежанов А.М., Турсынкулов А.М., Есжанов А.Б.</i> О видовом составе жесткокрылых насекомых (Insecta, Coleoptera) полей кормовых культур Кербулакского отделения ТОО «Байсерке-Агро».....                                                   |     |
|                                                                                                                                                                                                                                                               | 114 |

## CONTENTS

|                                                                                                                                   |     |
|-----------------------------------------------------------------------------------------------------------------------------------|-----|
| <i>Adilkhankyzy A., Alpysbaeva K.A., Mukhtarkhanova A.A., Naimanova B.Zh., Chadinova A.M.</i>                                     |     |
| Use of phytoseiulus persimilis A.-H. in the fight against tetranychus urticae K. in greenhouses.....                              | 5   |
| <i>Sagitov A.O., Mukhamadiyev N.S., Mengdibayeva G.Zh., Uzakbayeva M.A.</i> Integrated system if protection                       |     |
| of soybeans from pests and the innovative technology of cultivation.....                                                          | 5   |
| <i>Sultanova N.Zh., Bekezhanova M.M., Sarsenbaeva G.B., Jaimurzina A.A., Ussembaeva Zh.S., Sagitov A.O.</i>                       |     |
| Results of phyto expertise of agricultural cultures seeds.....                                                                    | 16  |
| <i>Spanov A.A., Sultanbai D.T., Baimukanov A.D.</i> Comparative results of productivity of meat-type bull-calves                  |     |
| in the conditions of Bayserke-Agro LLP.....                                                                                       | 22  |
| <i>Baimukanov D.A.</i> Efficient techniques of estimation and enhancing milking capacity of the Kazakh bactrian camels.....       | 27  |
| <i>Kerimzhanova B.F., Ivanova L.N., Ilyin A.I.</i> Efficiency of the iodine-containing complex against avian influenza            |     |
| A virus series.....                                                                                                               | 32  |
| <i>Nurmanbekova Gulmira, Duiskenova Raigul.</i> Realization of regional innovation policy.....                                    | 39  |
| <i>Temreshev I.I., Uspanov A.M., Yeszhanov A.B., Kenzhegaliev A.M., Makezhanov A.M., Bolatbekova B.B.</i>                         |     |
| About the results of laboratory tests of the biological drug Actharophyt on different species of arthropod pests.....             | 45  |
| <i>Kalimoldinova A.S., Zhaksylykova G.K., Chindaliyev A.E., Baigabylov K., Baimukanov A.D.</i>                                    |     |
| Growth and development of calves of Holstein breed in the dairy complex of the Bayserke-Agro LLP.....                             | 54  |
| <i>Issaeva Zh. B.</i> Rational use of natural pastures in terms of Korday district.....                                           | 58  |
| <i>Mazkirat Sh., Babissekova D.I., Didorenko S.V., Yerzhebayeva R.S.</i> Identification of photoperiod sensitivity gene <i>E7</i> |     |
| in soybean cultivars and breeding lines using SSR markers.....                                                                    | 54  |
| <i>Mustafayev Zh.S., Kozykeyeva A.T., Sagaev A.A., Alimbaev E.N.</i> Anthropogenic changes in drain                               |     |
| in lowers of the Syrdarya river.....                                                                                              | 74  |
| <i>Bekenov D.M., Spanov A.A., Kenchinbayev N.S., Baimukanov A.D.</i> Updating the treatment method of the follicular              |     |
| ovarian cysts in cows of the dairy productivity direction in the East-Kazakhstan region.....                                      | 84  |
| <i>Iskhan K.Zh.</i> Productive profile of herd horses of domestic breeds.....                                                     | 88  |
| <i>Koshen B.M., Shayakhmetova A.S., Toktar M., Koshenov B.M.</i> Forage production in the Northern part of Kazakhstan.....        | 93  |
| <i>Sultanbai D.T., Zhaksylykova G.K., Baigabylov K.O., Baimukanov A.D.</i> Comparative assessment of fertilization rate           |     |
| of heifers at insemination with sexed semen.....                                                                                  | 101 |
| <i>Mustafayev Zh.S., Kozykeyeva A.T., Kamaliyev A.M.</i> Climatic changes in the basin of the transboundary Shu river.....        | 105 |
| <i>Temreshev I.I., Makezhanov A.M., Tursynkulov A.M., Yeszhanov A.B.</i> On species composition of Insecta                        |     |
| Coleoptera of feed crop fields in the Kerbulak branch of Bayserke-Agro LLP.....                                                   | 114 |

---

**Publication Ethics and Publication Malpractice  
in the journals of the National Academy of Sciences of the Republic of Kazakhstan**

For information on Ethics in publishing and Ethical guidelines for journal publication see <http://www.elsevier.com/publishingethics> and <http://www.elsevier.com/journal-authors/ethics>.

Submission of an article to the National Academy of Sciences of the Republic of Kazakhstan implies that the described work has not been published previously (except in the form of an abstract or as part of a published lecture or academic thesis or as an electronic preprint, see <http://www.elsevier.com/postingpolicy>), that it is not under consideration for publication elsewhere, that its publication is approved by all authors and tacitly or explicitly by the responsible authorities where the work was carried out, and that, if accepted, it will not be published elsewhere in the same form, in English or in any other language, including electronically without the written consent of the copyright-holder. In particular, translations into English of papers already published in another language are not accepted.

No other forms of scientific misconduct are allowed, such as plagiarism, falsification, fraudulent data, incorrect interpretation of other works, incorrect citations, etc. The National Academy of Sciences of the Republic of Kazakhstan follows the Code of Conduct of the Committee on Publication Ethics (COPE), and follows the COPE Flowcharts for Resolving Cases of Suspected Misconduct ([http://publicationethics.org/files/u2/New\\_Code.pdf](http://publicationethics.org/files/u2/New_Code.pdf)). To verify originality, your article may be checked by the Cross Check originality detection service <http://www.elsevier.com/editors/plagdetect>.

The authors are obliged to participate in peer review process and be ready to provide corrections, clarifications, retractions and apologies when needed. All authors of a paper should have significantly contributed to the research.

The reviewers should provide objective judgments and should point out relevant published works which are not yet cited. Reviewed articles should be treated confidentially. The reviewers will be chosen in such a way that there is no conflict of interests with respect to the research, the authors and/or the research funders.

The editors have complete responsibility and authority to reject or accept a paper, and they will only accept a paper when reasonably certain. They will preserve anonymity of reviewers and promote publication of corrections, clarifications, retractions and apologies when needed. The acceptance of a paper automatically implies the copyright transfer to the National Academy of Sciences of the Republic of Kazakhstan.

The Editorial Board of the National Academy of Sciences of the Republic of Kazakhstan will monitor and safeguard publishing ethics.

Правила оформления статьи для публикации в журнале смотреть на сайте:

**www.nauka-nanrk.kz**

<http://agricultural.kz/index.php/en/>

Редактор *М. С. Ахметова, Т. М. Апендиев, Д. С. Аленов*  
Верстка на компьютере *Д. Н. Калкабековой*

Подписано в печать 14.10.2019.  
Формат 60x88 1/8. Бумага офсетная. Печать – ризограф.  
8,2 п.л. Тираж 300. Заказ 5.