

Kosilov V. I., Doctor of Agricultural Sciences, Professor, **the main author**, <https://orcid.org/0000-0003-4754-1771>

FSFEIHPE Orenburg State Agrarian University, Russian Federation, Orenburg, Cheiyuskintsev str., 18, 460014, kosilov_vi@bk.ru

Zakirova F. B., Candidate of Agricultural Sciences, Associate professor, <https://orcid.org/0000-0002-4467-5427>

Non-profit JSC «Zhangir Khan West Kazakhstan Agrarian Technical University», Institute of Veterinary Medicine and Agrotechnology, Republic of Kazakhstan, Uralsk, Zhangir Khan str., 51, faruza_zakir@mail.ru

Zhubantayev I. N., Candidate of Agricultural Sciences, Associate Professor, <https://orcid.org/0000-0002-9218-5414>

Private Higher Professional Educational Institution West Kazakhstan innovative-technological university, Republic of Kazakhstan, Uralsk, Nursultan Nazarbayev av., 208, zhubantayev@mail.ru

Kadrallyeva B. T., PhD, acting associate professor, <https://orcid.org/0000-0002-5161-5561>

Non-profit JSC «Zhangir Khan West Kazakhstan Agrarian and Technical University», Republic of Kazakhstan, Uralsk, Zhangir Khan str., 51, 090009, bkadralieva@mail.ru

Kassimova G. V., Candidate of Agricultural Sciences, acting associate professor, <https://orcid.org/0000-0002-9109-2486>

Non-profit JSC «Zhangir Khan West Kazakhstan Agrarian and Technical University», Republic of Kazakhstan, Uralsk, Zhangir Khan str., 51, gulsara.kasimova@mail.ru

Darmenova A. G., candidate of Veterinary Sciences, senior lecturer, <https://orcid.org/0000-0002-9935-1729>

Non-profit JSC «Zhangir Khan West Kazakhstan Agrarian Technical University», Institute of Veterinary Medicine and Agrotechnology, Zhangir Khan 51, Uralsk, Republic of Kazakhstan, albina-uralsk@mail.ru

Yertleuova B. U., PhD, acting associate professor, <https://orcid.org/0000-0003-1990-570X>

Non-profit JSC «Zhangir Khan West Kazakhstan Agrarian Technical University», Institute of Veterinary Medicine and Agrotechnology, Zhangir Khan 51, Uralsk, Republic of Kazakhstan, aliba.87@mail.ru

FEATURES OF THE REPRODUCTIVE CAPACITY OF THE MALE CAMEL PRODUCERS IN WESTERN KAZAKHSTAN

ANNOTATION

This scientific article presents the results of a study of the reproductive ability of males of Kazakh double-humped camels (borax) in the continental climate of Western Kazakhstan. The study was conducted in the peasant farm of S.K. Sundetkaliev, Zhangalinsky district, from 2019 to 2024. The developed research scheme made it possible to study the behavior and physiological parameters of animals in three key periods: before the beginning of the sexual season (September-October), during the period of active sexual activity (December-April) and after the extinction of sexual characteristics (May).

The main attention was paid to the clinical manifestations of sexual activity, as well as the nature and peculiarities of the manifestation of sexual reflexes in males. The study included observations of the behavior of Borax, as well as measurements of body temperature, pulse rate and respiration twice a day — in the morning and in the evening.

The results showed that with the beginning of the breeding season, males show marked aggressiveness and a change in eating behavior — they refuse to feed and actively seek out females. These changes are accompanied by characteristic physical reactions, such as foaming at the mouth and rhythmic contractions of the upper lip muscles.

Physiological parameters also undergo significant changes. After the completion of mating, there is an increase in body temperature, which is associated with an increase in sexual activity.

Thus, the results of the study emphasize the importance of taking into account the physiological changes in borax during the breeding season in order to optimize their maintenance conditions and control the reproductive process. Understanding these processes can help improve breeding methods and increase

animal productivity. In the future, it is necessary to continue studying the influence of various factors on the reproductive performance of camels in order to develop effective breeding strategies in Kazakhstan.

Key words: *Kazakh bactrian, camel, physiological parameters, borax-producer, spermiogenesis.*

Introduction. Camel breeding in Kazakhstan is a traditionally established branch of productive animal husbandry. Camel breeding is of great economic importance in the economic development of the vast territories of Kazakhstan, half of which are located in desert and semi-desert regions. The task of zootechnical science and practice at the present stage is to preserve and improve various economically useful and biologically valuable properties of Kazakh Bactrians [1,2].

Camels produce meat with high fertility, wool with high heat capacity and softness, and milk, valuable for its nutritional and medicinal properties. Camel wool has its own characteristics: it is very light, paints well with any paint, retains heat for a long time due to its weak thermal conductivity [3-5].

The intensification of productive camel breeding places increased demands on the production technology, productivity and reproductive ability of animals.

The development of modern specialized camel breeding is largely hindered by the fact that the biological capabilities of breeding stock are far from being fully utilized in the domestic practice of this industry.

This is due to the loss of established herd reproduction technologies, which are often conducted without taking into account the peculiarities of the reproductive function of camels. Camel breeding lags far behind other branches of animal husbandry in terms of the study of breeding biology [6-9].

The issues of the physiology of sexual processes occurring in the body and genitals of camels remain poorly understood. This hinders the development of practical methods of influencing the sexual cycle and the intensification of reproduction [10].

According to the authors, bactrian camels are classified as polycyclic animals with a sexual season. The approach of the latter, first of all, can be judged by the change in the behavior of male breeders, who have sexual reflexes by the middle of December. From that time on, the producing borax (the male double-humped camel) begins to emit a specific odor, draws in its belly, and at the sight of the female, there is profuse salivation and release of viscous foam, loud gnashing of teeth with periodic drooping of the lower jaw. The male is very aggressive towards others, so from December to April they are kept isolated from each other [11-15].

In camel farms, in order to intensify herd reproduction and shorten the duration of the arousal stage of the sexual cycle, it is recommended to use male probationers.

Camels are polycyclic animals with a limited sexual season.

In the conditions of the continental climate of Western Kazakhstan, their sexual activity is manifested from December to April inclusive.

The approach of the breeding season was primarily judged by a change in the behavior of male breeders. Producers often refused to feed at the beginning of the breeding season. During this period, the animals showed rapid mobility, lying males easily jump up and actively move around the enclosure. By the middle of December, the producers had already shown sexual reflexes. From that time on, the borax producer begins to emit a specific odor, his stomach retracts. At the sight of a female borax, the producer is very worried, in several cases, convulsive contractions of the muscles of the extremities were noticed. The manufacturer, approaching the fence wall, periodically stretches his neck, nods his head. At this time, foam protrudes from the mouth, turning into copious salivation in the form of viscous foam. The foam released by the male first appears along the edges of the lips, then the foam abruptly envelops the upper and lower lips. The foamy mass is viscous in consistency, odorless, and salivation from manufacturers is accompanied by gnashing of teeth with periodic drooping of the lower jaw [16,17].

We have established the manifestation of pronounced aggressiveness of males towards each other and towards humans. Considering this circumstance, with the onset of the sexual season and the onset of sexual reflexes (from December to April), males are kept isolated from each other.

The producer borax determines the proximity of the female by smell or visually. At this time, the producer refuses and does not respond to the feed. The animal, stretching its head, turns it to the sides,

while we noted rhythmic contractions of the muscles of the upper lip, begins to actively move inside the room or territory, trying to meet the female [18,19].

Sustainable growth in livestock production and ensuring the country's food security is impossible without increasing the fertility of the breeding stock of bactrian camels. At the same time, this animal species is characterized by a long period of the reproductive cycle, infertility, low reproduction rates and the risk of infertility.

The degree of development of the reproductive system of adult livestock, the viability and safety of young animals depends on the further prosperity or extinction of the population.

The purpose of the research is to intensify the reproductive ability of bactrian camels in the specific climatic conditions of Western Kazakhstan.

Materials and methods of research. The research was conducted in the village of Sundetkaliev S.K., Zhanga district of West Kazakhstan region in the period from 2019 to 2024. A research scheme has been developed for conducting scientific research. The reproductive ability of male Kazakh Bactrian breeders was studied based on observations of their behavior before the onset of the sexual season (September-October), during the sexual season (active manifestation of sexual characteristics – December-April) and after the extinction of signs of sexual activity (May).

The clinical manifestation of sexual activity was studied during the sexual season from December to April.

In this study, we studied the characteristics of sexual activity and behavioral reactions of breeding camels during the sexual season, depending on the time of day and month of the year. We studied the nature and features of the manifestation of sexual reflexes, the reactions of males at the sight of females.

Body temperature, pulse, and respiration were determined using generally accepted methods daily, twice a day - in the morning and in the evening at 700 and 1900 throughout the study period. Body temperature was determined using an electronic thermometer, pulse, respiration by the number of contractions and exhaled air in 1 minute [20].

Results and their discussion. Camels are polycyclic animals with a limited sexual season. In the conditions of the continental climate of Western Kazakhstan, their sexual activity is manifested from December to April inclusive.

The approach of the breeding season was primarily judged by a change in the behavior of male breeders. Producers often refused to feed at the beginning of the breeding season. During this period, the animals showed rapid mobility, lying males easily jump up and actively move around the enclosure. By the middle of December, the producers had already shown sexual reflexes. From that time on, the producing borax (a male double-humped camel) begins to emit a specific odor, and its belly retracts. When a female borax is seen, the producer is very worried, and in several cases, convulsive contractions of the limb muscles have been noticed. The manufacturer, approaching the fence wall, periodically stretches his neck, nods his head. At this time, foam protrudes from the mouth, turning into copious salivation in the form of viscous foam. The foam secreted by the male first appears along the edges of the lips, then the foam abruptly envelops the upper and lower lips (Figure 1). The mucous mass is viscous in consistency, odorless, and salivation in the producers is accompanied by gnashing of teeth with periodic drooping of the lower jaw.

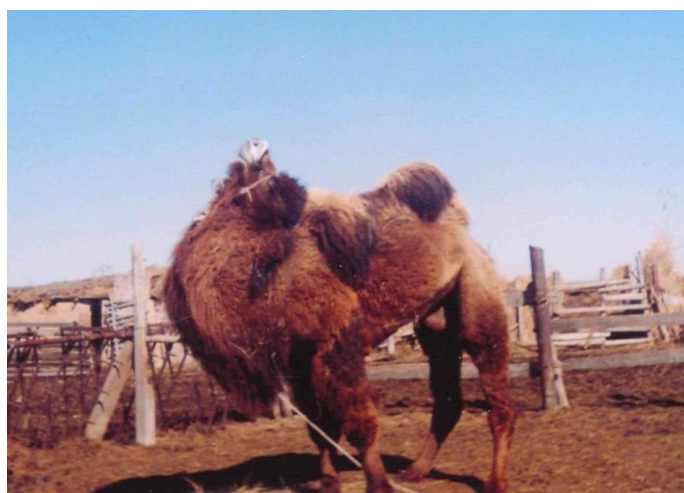


Figure 1 – Clinical manifestation of sexual activity of borax producer

We have established the manifestation of pronounced aggressiveness of males towards each other and towards humans. Considering this circumstance, with the onset of the field season and the onset of sexual reflexes (from December to April), males are kept isolated from each other.

The producer borax determines the proximity of the female by smell or visually. At this time, the producer refuses and does not respond to the feed. The animal, stretching its head, turns it to the sides, while we noted rhythmic contractions of the muscles of the upper lip, begins to actively move inside the room or territory, trying to meet the female.

We have established that the producer, released into the herd, begins to exhibit a peculiar behavior. He stretches his head and lowers it slightly, flares his nostrils and walks around the castle to identify the camel in a state of sexual hunting.



Figure 2 - A female in a state of sexual hunting

It was found that camel coitus lasts from 3 to 20 minutes. The average is 10.75. After mating is completed, the producer usually steps aside, showing no interest in other females. In these cases, the producer is taken to a pen or room and presented with food and rest.

Thus, the producer drill has well-developed sexual reflexes. Namely– erections, embracing, copulating, ejaculations in a regular sequence.

The influence of general biological indicators on the state of the body is of great scientific interest. The effects of temperature, pulse, and respiration of an animal on reproductive ability in different periods of the physiological state are described in different animal species. The exception so far is camels.

To solve this problem, we determined the temperature, pulse rate and respiration of eight Kazakh Bactrian borax producers (Figure 3,4,5)

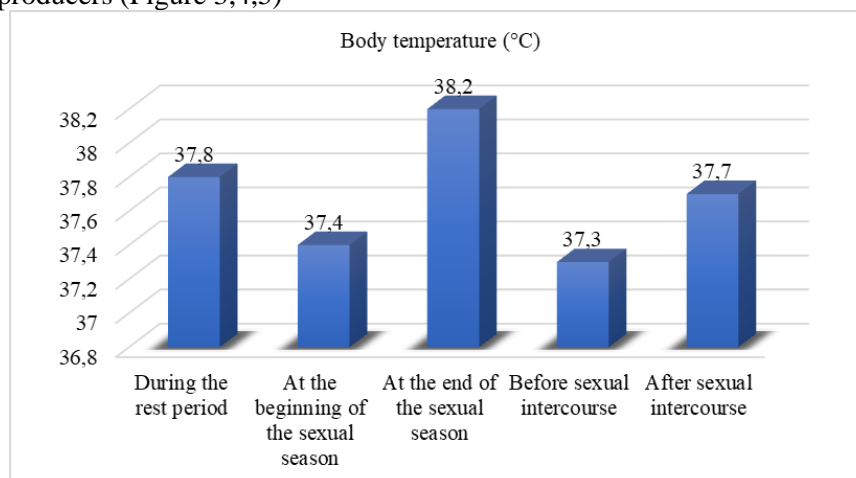


Figure 3 - Camel body temperature during sexual activity

According to Figure 2, the basal body temperature of male producers before the onset of the sexual season (rest period) was 37.8 ± 0.140 C, which is 0.40C or 1.06% higher ($p < 0.10$) than at the beginning of the sexual season and 0.80C or 1.04% higher ($p < 0.10$) is lower compared to the end of the sexual season.

The comparison of the body temperature of the producer borer before sexual intercourse and after the completion of mating was $37.3 = 0.12$ and $37.7 = 0.170$ C., respectively. The difference was 0.4 or 1.06% ($p = 0.10$).

The obtained results allowed us to establish that the total body temperature of breeding camels decreases with the onset of the sexual season and increases by the end of the sexual season. A rise in body temperature was noted after the completion of mating. We assume that this is due to the neuro-reflex processes occurring in the body of animals due to the onset of the season of sexual activity and an increase in sexual potency.

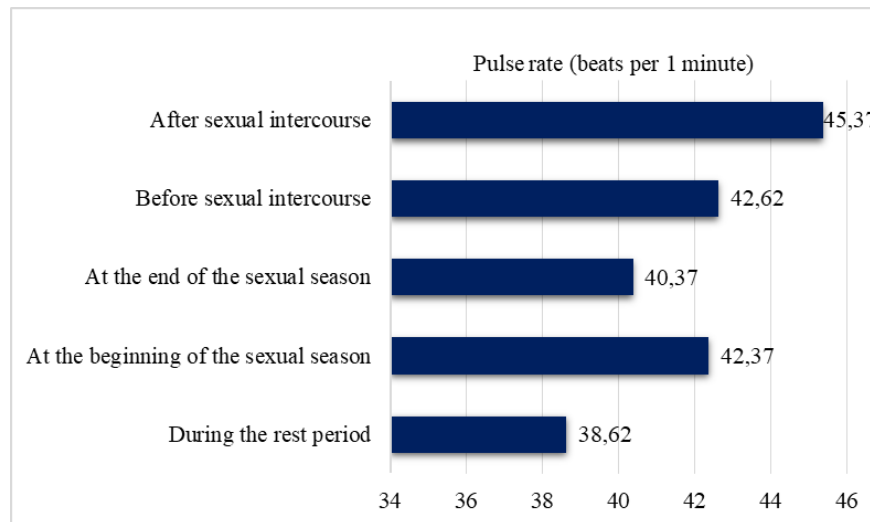


Figure 4 - Indicators of the pulse rate of camels during sexual activity

From Figure 3, it can be seen that in breeding camels, with the onset of the sexual season, the pulse rate increased sharply to 42.37 ± 1.46 , which is 3.75 beats/min or 9.7% higher compared with the rest period (38.62 ± 0.87 beats/min). This pulse trend persisted before sexual intercourse and was equal to an average of 42.62 ± 1.36 beats per minute in the camel group. The highest peak in the increase in pulse rate during sexual activity in male borers was observed after sexual intercourse at 45.37 ± 1.8 , that is, during ejaculate release, which is 6.75 beats/min or 17.5% higher than the background value. By the end of the field season, the pulse rate was $40.37 = 1.06$ beats per minute, which is 11.02% lower than the last indicator.

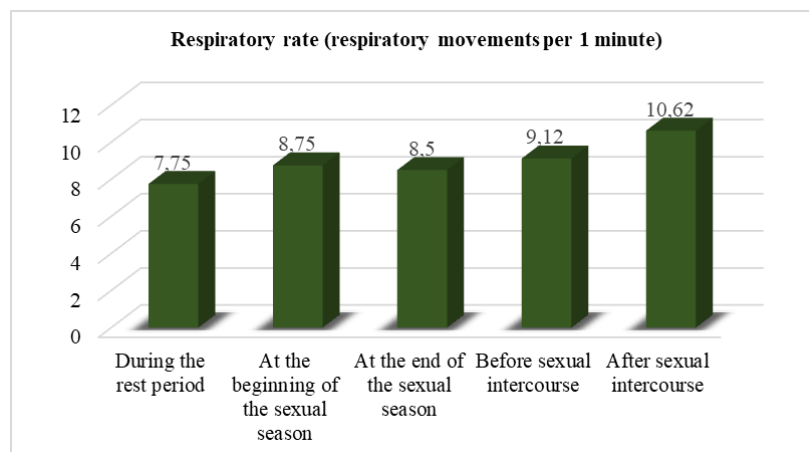


Figure 5 - Indicators of camel respiratory rate during sexual activity-news

Comparing the data in Figure 4, it can be concluded that the respiratory rate of breeding camels increases sharply before mating (9.12 ± 0.78 respiratory movements per 1 minute) and reaches its highest peak at the end of sexual intercourse (10.62 ± 0.76), which is 2.87 respiratory movements per 1 minute or 37.03% higher than before the onset of the sexual season (rest period).

Conclusion. A study of the sexual activity of borax producers in the continental climate of Western Kazakhstan revealed characteristic changes in the behavior and physiological parameters of animals during different periods of the reproductive season. Observations have shown that with the beginning of the breeding season, males show marked aggressiveness, as well as a change in eating behavior — they refuse to feed and are active in search of females. These changes are accompanied by characteristic physical reactions, such as foaming at the mouth and rhythmic contractions of the upper lip muscles.

Physiological parameters such as body temperature, pulse rate, and respiration also undergo significant changes. It was found that the basal body temperature in males before the start of the mating season was higher than during the breeding season, which may indicate the influence of neuro-reflex processes on the animal's body. After the completion of mating, there is an increase in body temperature, which may be associated with increased sexual activity.

The pulse rate increases significantly with the beginning of the sexual season and reaches its maximum during ejaculation. This confirms the connection between physiological changes and the state of sexual activity. Similarly, the frequency of respiratory movements also increases both before and during mating.

Thus, the results of the study emphasize the importance of taking into account the physiological changes in borax producers during the breeding season in order to optimize their maintenance conditions and manage the reproductive process. Understanding these processes can help improve breeding methods and increase animal productivity. In the future, it is necessary to continue studying the influence of various factors on the reproductive performance of camels in order to develop effective strategies for their breeding in Kazakhstan.

REFERENCES

- 1 Alibayev, N. N. The concept of camel industry development in the Republic of Kazakhstan for 2022-2026 [Text] / N. N. Alibayev, M. N. Ermakhanov, G. S. Abuov // Bulletin of Tuvan State University. Natural and agricultural sciences. - 2020. - Issue 2. - B. 24-30. DOI: 10.24411/2221-0458-2020-10037.
- 2 Baymukanov, D. A. The concept of development of productive and breeding camel breeding in the Republic of Kazakhstan for 2021-2030 [Text] / D. A. Baymukanov, Yu. A. Yuldashbayev, K. Zh. Iskhan, V.A. Demin // Agrarian Science. - 2020. - No. 7-8. - B. 52-60. <https://doi.org/10.32634/0869-8155-2020-340-7-52-60>.
- 3 Al-Bulushi, S. Reproductive seasonality of male dromedary camels [Text] / S. Al-Bulushi // Animal reproduction science. – 2019. – T. 202. – P.10-20. <https://doi.org/10.1016/j.anireprosci.2018.12.013>
- 4 Baymukanov, D. A. Camel breeding (Bachelor's degree) [Text] / D. A. Baymukanov, Yu. A. Yuldashbaev, D. A. Doshanov // Textbook. Moscow: KURS Publishing House, SIC INFRA - Moscow, 2016. - 184 p.
- 5 Baymukanov, D. A. Productive and breeding camel breeding [Text] / A. Baymukanov [et al.]. // Textbook for universities. - 2nd ed.- St. Petersburg: Lan, 2025. - 316 p.
- 6 Baimukanov, D. A. Regulations of development of colts of the Kazakh Bactrian breed [Text] / D. A. Baimukanov // Reports of the National Academy of Sciences of the Republic of Kazakhstan. - 2020. - No. 3. - P. 20-28.
- 7 Baymukanov, D. A. Productive and breeding camel breeding [Text] / D. A. Baymukanov, V. I., Trukhachev, A. Baymukanov. - 2nd ed. - St. Petersburg : Lan Publishing House, 2023. - 316 p.
- 8 Mohammed A. A. Unique Characteristics of Camel Body Systems: Adaptation to Harsh Conditions, Productive and Reproductive Performances: A Review [Text] / A. A. Mohammed // Indian. J. Anim. Res. – 2025. – C. 1-10. <https://doi.org/10.18805/IJAR.BF-1922>
- 9 Ali, A. Factors affecting reproductive performance in dromedary camel herds in Saudi Arabia [Text] / A. Ali // Tropical animal health and production. – 2018. – T. 50. – №. 5. – C. 1155-1160. <https://doi.org/10.1007/s11250-018-1545-3>
- 10 Dnekeshev, A. K. Changes in morpho-biochemical parameters of bactrian camel blood during different reproductive periods [Text] / A. K. Dnekeshev, F. B. Zakirova, I. N. Zhubantaev, M. S. Seitov // Theoretical scientific and practical journal of the Orenburg State Agrarian University "Izvestia". - No. 1 (69). - Orenburg, 2018. - P. -140-142.
- 11 Zakirova, F. B. The relevance of the problem of industrial camel breeding in Western Kazakhstan [Text] / F. B. Zakirova, I. N. Zhubantaev, A. K. Dnekeshev // Integration of the Scientific Community to the Global Challenges of Our Time. – 2017. – P. 484-487.

12 Padalino, B. Male camel behavior and breeding management strategies: How to handle a camel bull during the breeding season? [Text] / B.Padalino, D.Monaco, G. M.Lacalandra //Emirates Journal of Food and Agriculture. – 2015. – Т. 27. – №. 4. – С. 338. <https://doi.org/10.9755/ejfa.v27i4.19909>

13 Monaco, D. Considerations for the development of a dromedary camel (*Camelus dromedarius*) semen collection centre [Text]/ D.Monaco, G. M. Lacalandra //Animal Reproduction Science. – 2020. – Т. 212. – С. 106239. <https://doi.org/10.1016/j.anireprosci.2019.106239>

14 Mirkena, T. Camel production systems in Ethiopia: a review of literature with notes on MERS-CoV risk factors [Text] / T. Mirkena //Pastoralism. – 2018. – Т. 8. – №. 1. – С. 30. <https://doi.org/10.1186/s13570-018-0135-3>

15 Dnekeshev, A. K. The rate of growth of the suborbital nerve in the age aspect of the bactrian camel [Text]/ A. K. Dnekeshev, F. B. Zakirova, E. U. Baitlesov //Agricultural Scientific Journal. – 2022. – №. 1. – P. 55-59.

16 Zakirova, F.B. Comparative characteristics of the qualitative indicators of the coat of bactrian camels in different periods of their reproductive development [Text]/ F. B. Zakirova, A. I. Rakhmetov // Proceedings of the international Scientific and Practical conference: "Education and Science in the modern conditions of Kazakhstan's development: experience, problems and prospects", dedicated to the 70th anniversary of the West Kazakhstan State University. - Uralsk, 2002. - P. 289-291.

17 Zhubantaev, I. N. Changes in general biological and morpho-biochemical blood parameters during the sexual season in bactrian camels [Text] /I. N. Zhubantaev, F. B. Zakirova //The current state and prospects of animal husbandry development: mat. international scientific and practical conference dedicated to The 70th anniversary of the Kazakh white-headed breed.-2020.- P. 232-237

18 Zhubantaev, I.N. Reproductive ability of breeding camels and dynamics of their sexual activity during the mating season: Diss.work of a candidate of agricultural sciences.: 06.02.01 [Text]/ Zhubantaev I.N. - Uralsk, 2007.- 107 p.

19 Zakirova, F.B. The influence of reproductive ability on the productive qualities of bactrian camels in the conditions of Khan's Horde LLP and ways to improve it : abstract of the dissertation of a candidate of agricultural sciences.: 06.02.01[Text] / Zakirova F.B. - Uralsk, 2004. - 29 p.

20 Usha, B.V. Clinical diagnostics of internal non-infectious animal diseases [Text]/ B.V. Usha, I. M. Belyakov, R. M. Pushkarev//. - Moscow: Kolos, -2004. – P.487.

ТҮЙІН

Бұл ғылыми мақалада Батыс Қазақстанның континенттік климаты жағдайында қазақ бактриан түйелерінің аталықтарының репродуктивтік қабілетін зерттеу нәтижелері келтірілген. Зерттеу Жаңақала ауданының «С.Қ. Сүндетқалиев» шаруа қожалығында 2019 жылдан 2024 жылға дейін жүргізілді. Өзірленген зерттеу сұлбасы жануарлардың мінез-құлқы мен физиологиялық параметрлерін үш негізгі кезеңде зерттеуге мүмкіндік берді: жыныстық маусым басталғанға дейін (қыркүйек-қазан), белсенді жыныстық белсенділік кезеңінде (желтоқсан-сәуір) және жыныстық белгілер жойылғаннан кейін (мамыр).

Жыныстық белсенділіктің клиникалық көріністеріне, сондай-ақ аталықтардағы жыныстық рефлекстердің сипаты мен ерекшеліктеріне назар аударылды. Зерттеу барысында өндіргіш-түйелердің мінез-құлқын бақылау, сондай-ақ дене температурасын, жүрек соғу жиілігін және тыныс алуды күніне екі рет-таңертең және кешке өлшеу жүргізілді.

Нәтижелер көбею маусымының басталуымен аталықтарда айқын агрессивтілік пен азықтану тәртібінің өзгеруі байқалатынын көрсетті, яғни азықтан бас тартады және аналықтарды белсенді түрде іздейді. Бұл өзгерістер ауыздан көбік шығару және жоғарғы ерін бұлшықеттерінің жиырылуы сияқты физикалық реакциялармен бірге жүреді.

Физиологиялық параметрлер де айтарлықтай өзгерістерге ұшырайды. Жұптасу аяқталғаннан кейін дене температурасының жоғарылауы байқалады, бұл жыныстық белсенділіктің жоғарылауымен байланысты.

Осылайша, зерттеу нәтижелері оларды ұстау жағдайларын оңтайландыру және репродуктивті процесті басқару үшін көбею кезеңіндегі өндіргіш-түйелердің физиологиялық өзгерістерді есепке алудың маңыздылығын көрсетеді. Бұл процестерді түсіну асылдандыру әдістерін жақсартуға және жануарлардың өнімділігін арттыруға көмектеседі. Болашақта Қазақстанда оларды өсірудің тиімді стратегияларын әзірлеу үшін түйелердің репродуктивті көрсеткіштеріне әртүрлі факторлардың әсерін зерттеуді жалғастыру қажет.

РЕЗЮМЕ

В данной научной статье представлены результаты исследования репродуктивной способности бура-производителей казахских верблюдов-бактрианов в условиях континентального климата Западного Казахстана. Исследование проводилось в крестьянском хозяйстве «Сундеткалиев С.К.» Жангалинского района с 2019 по 2024 год. Разработанная схема исследования позволила изучить поведение и физиологические параметры животных в три ключевых периода: до начала полового сезона (сентябрь-октябрь), период половой активности (декабрь-апрель) и после угасания половых признаков (май).

Основное внимание уделялось клиническим проявлениям половой активности, а также характеру и особенностям проявления половых рефлексов у самцов. В ходе исследования были проведены наблюдения за поведением верблюдов-производителей, а также измерения температуры тела, частоты пульса и дыхания дважды в день - утром и вечером.

Результаты показали, что с началом сезона размножения у самцов наблюдается выраженная агрессивность и изменение пищевого поведения - они отказываются от корма и активно ищут самок. Эти изменения сопровождаются характерными физическими реакциями, такими как выделение пены изо рта и ритмичные сокращения мышц верхней губы.

Физиологические параметры также претерпевают значительные изменения. После завершения спаривания отмечается повышение температуры тела, что связано с увеличением половой активности.

Таким образом, результаты исследования подчеркивают важность учета физиологических изменений у бура-производителей в период воспроизводства для оптимизации условий их содержания и управления репродуктивным процессом. Понимание этих процессов может способствовать улучшению методов разведения и повышению продуктивности животных. В дальнейшем необходимо продолжить изучение влияния различных факторов на репродуктивные показатели верблюдов для разработки эффективных стратегий их разведения в Казахстане.