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**INFLUENCE OF NITRATE-NITRITE ENVIRONMENTAL
POLLUTANTS OF FEEDS ON SEXUAL ACTIVITY AND QUALITY
OF SEED OF BIRAN-MANUFACTURERS OF KARAKUL BREED**

Abstract. In the south of Kazakhstan, environmental toxicosis of animals is often encountered when feeding them with green alfalfa, fodder beet, pumpkin, carrot, cottonseed meal and other fodders, grown using mineral fertilizers, especially nitrogen fertilizers. In the karakul culture of the Republic of Kazakhstan for the first time the influence of environmental toxicants on reproductive functions of rams has been studied and the maximum permissible concentration (MPC) of nitrate-nitrite compounds in rations of karakul sheep has been established.

Keywords: nitrates, nitrites, rations, environmental assessment, seed quality, sexual activity of rams, MPC of nitrates and nitrites.

The long-term use of mineral fertilizers on irrigated lands, especially nitrogen fertilizers, leads to excessive accumulation of nitrate-nitrite toxicants in soils. The latter has a negative effect on the quality of food plants, and on the trafficking chain they transfer to the animal organism, reduces their productivity, in particular, the reproductive function of the rams [1-3].

Numerous studies have shown that the duration of spermatogenesis in rams is within 40-50 days. Therefore, the preparation of producers begins 1.5–2 months before the servicing campaign [4].

Against the backdrop of a full-fledged and balanced feeding of energy and basic nutrients, experiments were conducted to study the effect of different levels of nitrate-nitrite environmental contaminants on the reproductive functions and quality of the seed of Karakul rams. For this purpose, 5 groups of mutant analogs were created for the main biological features. The live weight of the rams in the formulation for the experiment was 67.4–61.8 kg. The number of animals in each group is three heads. The length of the preparatory period is 60 days. During the servant campaign, manufacturers continued to receive the same diet with the same nutritional content, but differing in nitrate and nitrite levels.

We have previously studied the contents of nitrates and nitrites in soil components, bulk and drinking, fodder plants of the environment.

In soils of pasture lands from the surface of the earth to the depth of the humus layer, nitrates decrease from 26.8 to 6.3 mg/kg, and in irrigated lands, this figure is within the range of 87.7 mg/kg – 50.3 mg/kg. In pasture soils, up to 30 cm layer, nitrates from 4.3 to 1.7 mg/kg were found, and on irrigated lands, these values varied within 12.5 mg/kg – 3.2 mg/kg, which is higher in average 3.8 times

For the field fodder production on irrigated lands, the waters of the Keles and Ramadan rivers of the Saryagash district of the South Kazakhstan region are used. It should be emphasized that in both rivers the content of nitrates in all the seasons of the year is higher than the MPC: in the Keles River it is within – 1.2 MPC – 4.8 MPC, and in the river Ramadan – 1.2 MPC – 5.6 MPC. Exceeding the maximum allowable concentration limit for nitrites is 1.7 times the maximum permissible concentration – 5.2 MPC and 1.9 MPC – 6.3 MPC. At the same time, the maximum values of MPC are also in May after the introduction of nitrogen fertilizers in the plantation.

The assessment of the quality of underground drinking water is strictly regulated by the MPC standards. However, the latter is designed for the water consumed by the population, and for MPC for animals, there are conflicting judgments [4]. Taking into account this circumstance, we examined the existing underground water sources of the former "Syrdarya" gas processing plant for the presence of nitrate-nitrite contaminants in the water.

As indicated above, four self-pouring artesian wells are used for watering animals in this farm. The quality of water in them fully meets the sanitary and hygienic requirements. The content of nitrates varies from 3 to 6 mg/l, and nitrites are absent.

In mine wells, the above contaminants are present in amounts significantly exceeding the limit permissible concentrations.

Our data show that in the water of all mine wells, the content of nitrates exceeds the maximum allowable concentrations, and their levels fluctuate to a large extent depending on the seasons of the year. So, for example, the content of nitrates in water varies from 45 to 54 mg/l from the beginning of the year to April. From May to September, there is a gradual increase from 47 to 81 mg/l. Since October, the amount of nitrates is declining from 73 mg / l to 45 mg / l.

It should be noted that nitrates are found in greater quantities in fresh water than in slightly salted and salty. Apparently, this is due to the suppressed state of nitrosating bacteria in highly mineralized waters.

The increased content of nitrites in the water we are inclined to explain by the dryness of the climate, the lack of precipitation in the summer, when dust-mixed animal excrement is blown into poorly equipped wells. The maximum permissible concentration of nitrates from January to April is 1.0-1.26, from May to September – 1.04-1.80, from October to December – 1.04-1.62.

The dynamics of the content of nitrites in the waters of mine wells is approximately the same as for nitrates. The amount of nitrites varies from 3.9 to 5.3 mg / l. It should be noted that a relatively high level of nitrites is found in slightly saline and salt water with the MPC coefficients – 1.45-1.60.

When cultivating crops using intensive technologies, a special place is given to the use of nitrogen fertilizers, mainly ammonium nitrate. Under these conditions, the level of nitrate nitrogen accumulated in plants depends on the absorption of nitrates from the soil, transport and their assimilation. The nature and intensity of these processes are strongly influenced by environmental factors. In particular, it was found that when using large doses of nitrogen fertilizers, when there is insufficient irrigation of irrigated land in plants, a large amount of nitrates accumulate because of incomplete denitrification of which a more toxic compound, nitrites, is formed [1].

For the environmental assessment, the amount of nitrates and nitrites in all components of the ration of feeding of sheep-producers of the preparatory and breeding seasons has been determined. Experiments show that pasture grasses of grass, calculated on the natural state of feed, contain a small amount (9–37 mg/kg) of nitrates and nitrites – (0.4–1.4 mg/kg), which is well below the established MPC.

The level of nitrate-nitrite compounds in the hay of dry alfalfa was also below the MAC.

In green alfalfa, dropped out on irrigated lands, at the beginning of the flowering phase, i.e. nitrates in the first cut were 862 ± 26.7 mg/kg, the second – 843 ± 26.2 mg/kg and the third – 817 mg/kg with the MPC, respectively: 1.7; 1.7 and 1.6.

The content of nitrites in green alfalfa within the above terms fluctuated within the limits of 14.0 mg/kg – 14.7 mg/kg with the MPC coefficients exceeding the normative indices by 1.4-1.5 times.

Carrots with natural moisture contained nitrates up to 1976 mg/kg and nitrites – 147 mg/kg, which exceeds the MPC standards, respectively, 2.5 and 1.5 times.

A large number of nitrate-nitrite compounds are found in the beet. 1 kg of raw root crop contained 3670 mg/kg nitrate and 188 mg / kg nitrite. This is higher than the standard values of MPC, respectively, 4.7 and 1.9 times.

The content of nitrates and nitrites in the natural hay is within the limits of 73 mg/kg – 134 mg/kg and 2.3 mg/kg, which is well below the MPC standards.

Nitrate compounds in alfalfa hay harvested from irrigated fields are within the limits of - 1484 mg/kg – 1927 mg/kg with the maximum permissible concentration exceeding the norm by 1.5-1.9 times.

The content of nitrites in the above-mentioned feed ranges from 12.9 to 13.9 mg/kg, with MPC values of 1.3-1.4.

In our studies, barley grains contained 340 mg/kg of nitrates and 4.9 mg/kg of nitrites, which exceeded the normative values of MPC by 1.7 and 3.5 times.

The highest content of nitrate-nitrite compounds was found in cottonseed meal. The amount of the first toxicant was at the level of 5256 mg/kg at a maximum permissible concentration of 26.3, the second, respectively, 21.4 mg/kg with a maximum permissible concentration of 15.3.

Environmental assessment of the quality of the diet of karakul rams of producers at different levels of nitrate-nitrite compounds in them. A full-fledged feeding and ecologically safe rations should provide the factory fatness of rams, mobility and generic activity, the normal quantity and quality of the seed with high fertilizing properties.

Long-term practice has shown that an increase in the rate of fertilizing with concentrated fodders for pasture maintenance of rams does not give the desired effect when preparing manufacturers for a breeding campaign and carrying out artificial insemination of queens [4].

It should be emphasized that the sheep-producers of all experimental groups received practically the same diet for the general and energy nutrition. In particular, the amount of dry matter was in the range of 1.8-1.97 kg, feed units 1.53-1.66 kg, the exchange energy – 18.0 MJ - 19.2 MJ, digestible protein 221 g – 187g.

It should be especially emphasized that, despite the absence of a significant difference in the dietary intake of rams for general and energy nutrition, it differed significantly in the content of nitrate-nitrite compounds.

The total amount of nitrates in the daily diet of rams from the control group was -808 mg, I-experimental - 3643 mg, II-experimental - 7257 mg, III-experimental - 9321 mg and IV-experimental - 11199 mg.

The consumption of nitrites by the experimental rams amounted, respectively, to the experimental groups: 13.7 mg, 181 mg, 294 mg, 294 mg and 439 mg.

The difference in environmental pollutants of feed between the extreme variants was 13.9 times for nitrates and 31.6 times for nitrites.

For 1 kg of dry matter per day, the dietary rams from the control group accounted for 427 mg of nitrate, I-experimental - 189 mg, II-experimental - 3702 mg, III-experimental - 4958 mg and IV-experimental - 5833 mg. If the amount of nitrates in the diet of rams from the control group is taken as 100%, then in subsequent experimental groups, respectively, to 433.0%, 866.9%, 1101.1% and 1366.0%, respectively.

The level of daily intake of nitrites by rams from the control group was 7.2 mg, I-experimental - 91.9 mg, II-experimental - 150 mg, III-experimental - 178 mg and IV-experimental - 181 mg. In percentage terms, these figures are respectively: 100%; 127.6%; 208.3%; 247.2% and 251.4%.

For 1 kg of live weight of experimental rams, nitrite was required: in the control group - 13.0 mg, I-experimental - 59.0 mg, II-experimental -118 mg, III-experimental - 151 mg and IV-experimental - 225 mg. In percentage terms, these figures were respectively: 100%; 453.8%; 907.6%; 1161.5% and 1730.7%.

The consumption of nitrates by lamb per unit of live weight was: 1.2 mg in the control group, 2.9 mg in the I-experimental group, 5.4 mg in the II-experimental group, 5.4 mg in the experimental group, 5.4 in the experimental group, and 7 in the IV-experimentalgroup, 0 mg. In percentage terms this is equal to: 100%; 24.6%; 400%; 450% and 583.3%.

Influence of the level of the content of nitrate-nitrite compounds in the diet on the volume and quality of the seed of Karakul rams-producers. Seed production in males depends on a variety of factors, among which a special place is occupied by the conditions of feeding.

It is known that high-grade feeding increases the general tone of the body, increases the excitability of nerve genital centers, stimulates the secretion of additional sex glands, which ultimately affects the sexual potency of the producers, the volume of ejaculate and the quality of the seed [5, 6].

As evidenced by the sheep prepared for the slaughter campaign, the volume of a single ejaculate in comparison with the initial period increased by 16.6–37.5%, the lowest value of which belongs to the producers from the control, and the largest - to the II-experimental group. Here it should be emphasized that the increased level of consumption of nitrate-nitrite compounds did not have a negative effect on the volume of the ejaculate.

The concentration of sperm of the sheep-growers during the comparable period has changed from the initial indicator from 93.6% to 108.1%. In this case, the largest increase in the number of spermatozoa occurred in the rams of the II-experimental group, and the smallest in the IV-experimental group. The latter allows one to make the assumption that high doses of nitrate-nitrite compounds reduce spermatogenesis in the genital organs of the producers.

Normalized for energy and basic elements, feeding increased the activity of spermatozoa in control, I and II experimental groups by 8.0–12.8%. The sperm activity in the sheep of the N-experimental group remained practically at the same level, and the IV-experimental decreased by 17.3%, which indicates a negative effect of environmental feed contaminants on the quality of sperm.

Resistance of spermatozoa after the preparatory period in the rams of the first three groups increased from 11.2 to 16.1%. At the same time, it increased in the seed of the producer of the III-experimental group by only 2.5%, while in the IV-experimental group it decreased by 17.9%. Hence it can be concluded that a high level of consumption of nitrate-nitrite compounds reduces the stability of spermatozoa.

It is known that from the sugar contained in the sperm of the ram and used as energy material, the first place (up to 90%) is occupied by the monosaccharide - fructose. The energy of Fructose released during respiration and glycolysis is transformed into energy of movement of spermatozoa. Strengthen this process is positively influenced by sugar and easily digestible carbohydrates. However, this did not occur in the spermatozoa of the sheep of the III and IV-experimental groups, where their energy after the preparatory period was only 6.9% and 2.4% higher, the parameters in the control, I and III-experimental groups were higher by 33, 6%, 44.2% and 52.5%. This circumstance allows us to conclude that environmental toxicants reduce the respiratory ability of spermatozoa, resulting in a decrease in the energy of spermatozoa.

One of the important indicators of the seed is its vitality, i.e. the period of conservation of activity in more or less favorable conditions. It is due to the stocks of energy material, the intensity of metabolic processes, which are directly related to the fertilizing capacity of the seed.

As can be seen from the experimental, after a two-month preparatory period, the viability of the sperm in the control group increased by 25.1%, the I-experimental by 34.7% and the II-experimental by 73.1%, indicating a significant variability in depending on the composition of the diet of producers. It manifested itself in a decrease in the survivability of spermatozoa by 4.2% and 19.2% in the case of the sheep of the III and IV-experimental groups receiving increased and high doses of toxicants in the composition of root crops and cottonseed meal.

The intensity of oxidative processes in germ cells is a criterion for the usefulness of spermatozoa. Its definition is based on the intensity of discoloration of semen by methylene blue. The less time it takes to discolor, the better the sperm. This indicator is best represented by a seed of rams from the II - experimental group, whose decolorization time after the preparatory period decreased from 8.6 minutes. up to 3.9 minutes, or more than twice. In III and IV-rams sheep increased by 1.3 and 1.6 times, respectively, indicating a negative effect of elevated and high rates of nitrate-nitrite compounds.

The survival of germ cells is mainly due to the dehydrogenase activity of the sperm. It is determined by the time of staining of sperm dehydrogenase. The principle of evaluation is the same as in the previous case. The rate of staining of the sheep seed III and IV - the experimental ones was almost three times higher than in the II-experimental, which indicates their weak experience as a result of the negative effect of nitrate-nitrite toxicants.

In the course of the experiments, we determined the cumulative properties of nitrates and nitrites in the ejaculate. Experimental data indicate that at the beginning of the preparatory period, the content of nitrates in ejaculates of all experimental groups was practically the same, and after the completion of the preparatory period, it fluctuated in a very wide range, from 32.3 mg/kg to 63.0 mg/kg. In the control group, they increased by 17.9%, I-experimental - 32.3%, II-experimental - 63.2%, III-experimental - 89.9 and IV-experimental - 135.1%.

The quantitative content of nitrates in the ejaculate at the end of the preparatory period in comparison with the initial period was, respectively, the experimental groups of rams: 107.2%, 115.9%, 95.8%, 353.1% and 686%.

Accumulation in the ejaculate of nitrate-nitrate environmental toxicants in large quantities has become, apparently, the determining factor in the decline in seed quality. This assumption is confirmed by data

on the counting of pathological forms of spermatozoa, the number of which decreased after the preparation of rams in the first three groups from 6.5% to 28.6%, and in the III and IV - experimental groups from 6.5% and 94.3%.

From the foregoing, it can be concluded that higher and higher doses of environmental toxicants contained in root crops and cotton meal have a negative impact on the quality of the seed of the sheep-producers of the Karakul breed.

The use of low-quality seed of rams-producers with artificial insemination reduced the fertility of the ewes from primary insemination by 15.7% in comparison with the normal seed.

Influence of the level of nitrate-nitrite compounds in the diet on the sexual potency of Karakul rams-producers. The sexual potency of sheep-producers is determined by a complex of unconditioned and conditioned reflexes. A characteristic feature of the complexity of sexual reflexes is that each subsequent reflex is carried out after the completion of the previous type of chain reaction: finding the queens, erecting the penis, embracing, copulating and ejaculatory reflexes.

The manifestation of each of the above reflexes depends on the mobility, fatness, and sexual activity of the producers.

The most memorable and generally characterizing activity and preparedness of the sheep for a breeding campaign are the fixation - counting the number of jumps for the ejaculation reflex and the time taken for copulation [5, 7].

Experienced data indicate that the sheep-growers from the control group used an average of -1.8 jumps in the first cage to perform the ejaculation reflex, 1.7 experiments in the I-experimental, 1.7 in the II-experimental, and 2 in the experimental-2, 6 and IV-experimental - 3.4 jumps and on the second cage, respectively: 1.9, 1.8; 1.7; 3.8 and 4.2 of the jump. From these data it follows that the least number of jumps for the ejaculation reflex was in the rams of the second experimental group, then the control and I-experimental ones.

The number of jumps in the III and IV experimental breeds produced by the sheep in comparison with the II-experimental group was 1.6 and 2.1 times higher in the first cage, and in the second, respectively, 1.7 and 2.5 times.

Conclusion.

1. The peculiarities of the functioning of the agroecosystem in the south of Kazakhstan are determined when using mineral fertilizers on irrigated lands. The quality of irrigation, drinking water and fodder crops was estimated for the content of nitrate-nitrite pollutants in them: the content of nitrates in the irrigation water of the Keles and Ramadan rivers varies within the limits respectively: 54 mg / l - 216 mg / l and 54 mg / l - 252 mg / l at MPC - 1,2-4,8 and 1,2-5,6 and nitrites - 5,61 mg / l - 17,16 mg / l and 6,27 mg / l - 20,79 mg / l at the maximum permissible concentration 1.7-5.2 m 1.9-6.3. The greatest amount of environmental toxicants is found in May and June: Water from mine wells contaminated with animal excrement contains nitrate-nitrite compounds exceeding the MPC to 1.8 times.

2. Natural pasture grasses and dry alfalfa contain chemical pollutants well below the MPC; in green alfalfa, carrots, sugar beet and cottonseed meal grown on irrigated lands with the use of nitrogen fertilizers, contains nitrates, respectively: 862 mg / kg, 1976 mg / kg, 3760 mg / kg and 5626 mg / kg with MPC - 1.7 ; 2.5; 4,7 and 26,3, and nitrites - 14,7 mg / kg, 147 mg / kg, 188 mg / kg and 214 mg / kg with MPC-1.5; 1.5; 1.9 and 15.3.

3. Against the background of a full-fledged and balanced feeding of mutton producers, permissible levels are established, calculated per 1 kg of dry matter in the diet, nitrates - 3702 mg and nitrites - 150 mg, and 1 kg of live weight, respectively, 118 mg and 4.8 mg.

The increased content of nitrate-nitrate pollutants in comparison with their optimal level in the diet reduces: the volume of ejaculate - by 4.2%, the concentration of sperm - by 15.4%, activity by 25.8%, the auditory - by 29.6% - by 42.6% of sperm cell vitality - by 52.0% with a decrease in the enzymatic activity of sperm of 2.9-3.7 times and the sexual reflex index from 4.7 to 1.8.

The use of low-quality seed of sheep-producers with artificial insemination reduced the fertility of the ewes from primary insemination by 15.7% compared to the normal seed.

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МАЛ АЗЫҒЫНЫҢ ҚҰРАМЫНДАҒЫ НИТРАТ-НИТРИТТІ ЭКОЛОГИЯЛЫҚ ЛАСТАУШЫЛАРДЫҢ ҚОШҚАРЛАРДЫҢ ЖЫНЫСТЫҚ БЕЛСЕНДІЛІГІНЕ ЖӘНЕ ҰРЫҚТЫҢ САПАСЫНА ТИГІЗЕТІН ӘСЕРІ

Аннотация. Оңтүстік Қазақстан өңірінде минералды тыңайтқыштарды қолданып өсірілген көк жоньша, азықтық қызылша, асқабақ, сәбіз, мақта күнжарасы т.б. мал азықтары жануарларды экологиялық токсикозға жиі душар етеді. Қазақстан қаракөл шаруашылығында рациондағы экологиялық токсиканттар қосқарлардың жыныстық белсенділігіне және ұрықтың сапасына тигізетін әсерін зерттеп, нитрат-нитритті қосындылардың шекті мөлшерлері (ШМ) анықталды.

Түйін сөздер: нитрат, нитрит, рацион, экологиялық бағалау, ұрықтың сапасы, қосқарлардың жыныстық белсенділігі, нитрат және нитриттің шекті мөлшері.

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ВЛИЯНИЕ НИТРАТНО-НИТРИТНЫХ ЭКОЛОГИЧЕСКИХ ЗАГРЯЗНИТЕЛЕЙ КОРМОВ НА ПОЛОВУЮ АКТИВНОСТЬ И КАЧЕСТВО СЕМЕНИ БАРАНОВ-ПРОИЗВОДИТЕЛЕЙ КАРАКУЛЬСКОЙ ПОРОДЫ

Аннотация. На юге Казахстана часто встречаются экологические токсикозы животных при скормливании им зеленой люцерны, кормовой свеклы, тыквы, моркови, хлопчатникового шрота и других кормов, выращенные с применением минеральных удобрений, особенно азотные. В каракулеводстве Республики Казахстан впервые изучено влияние экологических токсикантов на воспроизводительные функции баранов-производителей и установлены предельно допустимые концентрации (ПДК) нитратно-нитритных соединений в рационах каракульских овец.

Ключевые слова: нитраты, нитриты, рационы, экологическая оценка, качество семени, половая активность баранов, ПДК нитратов и нитритов.

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