

Changes in indicators of semen productivity of bulls in the conditions of Uzbekistan depending on age

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Abstract. The article presents a comprehensive exploration of scientific and practical research focused on assessing alterations in both quantitative and qualitative aspects of sperm production in imported breeding bulls used as sperm donors, in comparison to the local Bushuev breed raised in Uzbekistan. The investigation spans from the age of 3 years, signifying the attainment of full physiological maturation in these bulls. Central to the research are the results detailing shifts in key sperm production indicators. The article goes beyond quantitative measures and delves into various facets of sperm productivity. Alongside these findings, the article addresses pertinent factors related to breed-specific traits. These encompass aspects such as the proportion of sperm culling, the yield of sperm doses, the duration of the bulls' tenure in the primary herd, and other relevant considerations. By conducting this comprehensive study, the article provides a deeper understanding of how sperm production evolves in both imported breeding bulls and the native Bushuev breed after reaching full physiological maturity at the age of 3 years. The analysis of quantitative and qualitative aspects, coupled with insights into breed-specific characteristics, contributes to informed decision-making in the realm of cattle breeding and management practices. Ultimately, this research enhances our understanding of reproductive efficiency and guides efforts to optimize breeding programs for sustainable livestock production.

Keywords. Cattle, breeding bulls, breed, semen, spermatozoon, ejaculate, mobility, concentration, sperm dose.

1 Introduction

It is known from the data on the production of seed products from breeding bulls in cattle breeding that, in accordance with general biological laws, most of the breeding bulls lose their sexual activity 2-3 years after being physiological, and the indicators of seed productivity decrease in terms of quantity and quality. However, this process takes place differently in imported bulls of different breeds due to their specific adaptive characteristics [1-3]. Researching this situation in the conditions of Uzbekistan and, according to its results, organizing seed production with a separate approach to each breed, carrying out large-scale selection and breeding works in the country with the help of artificial

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insemination, improving the herd of cattle in a short time, and ultimately, milk, meat and other livestock products increasing production indicators is an important and urgent issue. For this purpose, the use of domestic breeding bulls brought to Uzbekistan from foreign countries, especially European countries with sharply different climates, as sperm donors at the state enterprise "Oznaschilik", their seed productivity at different ages was studied.

It is known that physiologically trained young breeding bulls give young bulls larger and better quality semen. This condition is associated with an increase in body weight as a result of physiological processes in the body, and the complete formation of sexual organs [1-3].

However, it is also known that the highest indicators of the total number of ejaculates and spermatozoa appear at different ages of bulls of different breeds. According to most scientists who have studied the process of spermatogenesis, it is appropriate to divide spermatogenesis into 3 periods:

- the first, the period of the formation of the first sexual function (from 18-20 months to 4 years), characterized by an increase in the volume of the ejaculate and the concentration of spermatozoa;

- the second, the period characterized by the maintenance of the same level of stability of the quantitative and qualitative indicators of sperm productivity during a certain period (4-10 years);

- the third period, due to the decline of sexual function (after 10 years), a decrease in the quantity and quality of sperm production is observed [4].

However, different researchers have different opinions about the optimal age for obtaining semen from breeding bulls. For example, Yu.V. According to Anbaza (2018), quality seed output from 2-3-year-old breeding bulls is less than that of later ages, which means that their sexual function is still being formed [5].

According to other scientists, the activity of spermatozoa reaches its maximum level at the age of 2-3 years of bulls, and the level of fertilization reaches a high level at the age of 3-4 and remains until the age of 10-12 years, and the concentration of spermatozoa is high at the age of 7-10 years, regardless of the breed, usually begins to decrease. For example, the number of sperm in the ejaculate increases up to 9 years in Simmental bulls, and up to 10 years in Holstein bulls [6-8].

According to Khokhrin and Davletkildina, sperm volume increases until the age of 6, and then decreases until the age of 9-10 [9]. According to other scientists, bulls of the black-olive breed produced 3.5-4 ml of semen in one spurt at the age of 1-2 years, 4.5-5.5 ml at the age of 4-6 years, 8 and 4.5-5 ml in young adults. However, as their age increased, the number of spermatozoa in the ejaculate decreased by 4-6% [10]. Chetvertakova E.V. in the Krasnoyarsk region of Russia. as a result of the research conducted by, the seed productivity of breeding bulls began to decrease after the age of 6 [11].

This opinion is also expressed by other scientists, who associate the increase of seed productivity indicators up to 5-6 years of breeding bulls with their physiological development [12]. As a result of the observations of some scientists, the rate of use of breeding bulls can be increased up to 31.4% at the age of 3 years [13].

The increase in the volume of the ejaculate of breeding bulls is the greatest in their 3-5 years, this change is 25-30% more than in the previous age period, and it remains the same for a long time [14].

It should be noted that, according to the scientists who have studied the use of breeding bulls in quantity and quality and as long as possible, the use of breeding bulls depends not only on their age, it also depends on their health, usage regime and maintenance conditions [15, 16]. The purpose of the study is to determine the age of optimal use of sperm donor breeding bulls under the conditions of Uzbekistan.

2 Materials and methods

The object of the research is breeding bulls belonging to Holstein, Angler, Bushuev, Schwitz and Simmental breeds kept at the state enterprise "Uzhnaslchilik". In this case, from the time when the bulls were physiologically complete, that is, from the age of 2 to the age of 6, the feeding, storage, seed collection regimes were carried out in bulls that were cared for under the same conditions. During the experiment, according to the results of the evaluation of seed productivity, measures were taken to remove the herd, and the duration of productivity was also recorded during the experiment. The analyzes were compared to bulls belonging to the local Bushuev breed.

Such as semen productivity of breeding spermatozoa bulls: ejaculate volume (ml), sperm concentration (billion/ml) and total number of sperms (billion/ejac) were determined.

The qualitative and quantitative evaluation of sperm products, the International Council for Standardization, Metrology and Certification (MGS) of the Commonwealth of Nations was approved on 01.07.2015 "Instruments. Freshly obtained, undiluted semen of bulls", GOST - 23745-2014 - in accordance with clause 6, clauses 6.3 and 6.4 of the technical conditions of the international standard: ejaculate volume (ml), concentration of spermatozoa (billion/ml) and number of spermatozoa (billion /chin) was detected. Automatic "AndroVision" automatic "AndroVision" equipped with CASA system of the German "MINITUB" corporation, which includes a measuring tube for determining sperm volume, sperm concentration and number of sperm in sperm, and electronic microscope and counting camera for evaluating motility equipment was used.

The data obtained as a result of the research were processed using Mf Office, EXCEL software biometric processed.

3 Results and discussion

The smallest volume of semen obtained per bull during 4 years was 74.4 ± 0.18 ml in the group of bulls belonging to the Angler breed compared to the control group. $R > 0.99$ was less, while Simmental bulls had 145.4 ± 0.14 ml ($R > 0.95$), and Schwitz bulls had more 33.4 ± 0.11 ml ($R > 0.95$).

Table 1. Volume of semen according to the cattle age.

Indicators	Breeds	Age			
		III	IV	V	VI
Number of bulls by breed	Holstein	5	5	4	2
	Angler	5	5	4	3
	Bushuev	5	5	5	4
	Schwitz	5	5	4	3
	Simmental	5	5	4	2
Average total sperm from 1 head, ml	Holstein	451±0.14	481.6±0.16	410.8±0.19	258.4±0.14
	Angler	360±0.21	405.6±0.14	336±0.22	250.8±0.25
	Bushuev	350±0.26	395.2±0.21	374.4±0.28	307.2±0.30

	Schwitz	364±0.18	405±0.20	374.4±0.18	316.8±0.13
	Simmental	421.2±0.20	459.2±0.18	375±0.16	316.8±0.14
Average concentration, billion ml	Holstein	1.08±0.077	1.22±0.052	1.12±0.034	0.84±0.070
	Angler	1.2±0.052	1.60±0.048	1.36±0.028	1.3±0.036
	Bushuev	1.2±0.025	1.25±0.032	1.18±0.035	0.86±0.045
	Schwitz	1.10±0.045	1.32±0.028	1.22±0.028	0.9±0.072
	Simmental	1.06±0.056	1.32±0.036	1.22±0.045	0.9±0.027
The percentage of invalid sperm,%	Holstein	26,20	22.60	25,30	26,20
	Angler	22,27	19,21	21.51	22,27
	Bushuev	21,22	18.31	20.49	21,22
	Schwitz	21.75	18.76	21.00	21.75
	Simmental	22.53	19.44	21.76	22.53
Total sperm motility, score	Holstein	7.2±0.323	7.4±0.245	7.3±0.125	7.2±0.223
	Angler	7.7±0.220	7.9±0.198	7.9±0.184	7.8±0.230
	Bushuev	7.9±0.260	8.1±0.258	8.0±0.225	8.0±0.266
	Schwitz	7.4±0.321	7.6±0.330	7.5±0.254	7.4±0.210
	Simmental	7.6±0.168	7.8±0.180	7.7±0.265	7.7±0.212
On average, spermatozoa prepared from 1 head, thousand	Holstein	29.9±0.2	37.8±24.1	28.6±16.8	13.3±17.1
	Angler	27.9±10.2	43.6±17.8	29.8±9.8	21.1±14.1
	Bushuev	27.5±21.3	33.6±26.8	29.2±22.8	17.3±26.8
	Schwitz	26.1±10.4	36.1±9.8	30.07±13.5	18.5±11.8
	Simmental	28.8±19.5	40.6±15.7	29.8±16.5	18.4±22.8

The concentration of spermatozoa in 1 ml of semen compared to the control group was 0.243 ± 0.002 billion pieces ($R > 0.95$) in Angler bulls, 0.013 ± 0.002 billion pieces ($R > 0.98$) in Schwitz bulls, 0.002 ± 0.001 billion in Simmental bulls. pieces ($R > 0.95$) was more, and in Holstein bulls it was 0.06 ± 0.002 billion pieces ($R > 0.98$) less.

In terms of total sperm motility, the control group outperformed all imported bulls by 0.7 points over the Holstein breed, 0.5 points over the Swiss breed, 0.3 points over the Simmental breed, and 0.15 points over the Angler breed. At the same time, the percentage of unfit sperm from the total volume of sperm in the control group was 21% per year on average for 4 years, compared to them in Holstein bulls 4.7%, Simmental - 1.3%, Angler breed 1.0% and 0.5% more in the bulls of the Swiss breed, the highest rejection rate was 26% in the Holstein breed, followed by Simmental -21.6%, Angler - 21.3% and 20.8% in the Swiss breed bulls. organized.

Depending on the above indicators, the total sperm doses received from 1 bull during 4 years were 14.8 thousand more than the control group from Angler bulls, 9.9 thousand from

Simmental bulls, 2.02 thousand from Holstein bulls and 3.1 thousand doses from Swiss bulls. The seed is taken.

When the results of Bushuev bulls in the control group were analyzed separately, the number of prepared spermatozoa was lower than the general average level for all indicators.

In the main herd used for seed production, breeding bulls of the local Bushuev breed undoubtedly have an advantage in terms of preservation, 80% of them, 60% of the Angler and Schwitz breeds, and only 40% of the Holstein and Simmental breeds are the main herd from which products are obtained up to 6 years of age. preserved in the composition.

Table 2. Volume of semen according to the cattle age of Bushuev breed.

Indicators	Breed groups	Age				
		III	IV	V	VI	Total
Average number of ejaculates from 1 head	Holstein	82	86	79	68	315.0
	Angler	72	78	70	66	286.0
	Bushuev	70	76	72	64	282.0
	Schwitz	70	75	72	66	283.0
	Simmental	78	82	75	66	301.0
Average total sperm from 1 head, ml	Holstein	451.0	481.6	410.8	258.4	1601.8
	Angler	360.0	405.6	336.0	250.8	1352.4
	Bushuev	350.0	395.2	374.4	307.2	1426.8
	Schwitz	364.0	405.0	374.4	316.8	1460.2
	Simmental	421.2	459.2	375.0	316.8	1572.2

4 Conclusions and recommendations

1. In the conditions of Uzbekistan, for the use of breeding bulls brought from abroad, the optimal period of economic use of bulls is the period of their 3-4 years of age, during which it is possible to prepare seed of maximum size and quality from them;

2. Seed productivity of breeding bulls brought to Uzbekistan from abroad, mainly from Europe, fully meets the requirements in terms of quantity and quality, however, the duration of obtaining high-quality products from them is relatively short, that is, for various reasons, it was observed that they leave the main herd before the age of 6 years. In particular, breeding bulls belonging to highly cultured breeds such as Holstein and Simmental in the experiment are observed to leave the main herd until the age of 6 years.

3. Breeding bulls of the Bushuev breed do not lag behind imported breeding bulls in most indicators of semen productivity, however, due to their relatively small live weight, fewer spermatozoa were prepared from them in exchange for the volume and number of ejaculates;

4. The quality of the seed product processed by the method of cryopreservation of breeding bulls belonging to the Bushuev breed does not differ from the quality of the seeds of other widely used breeds, and the use of the modern cryopreservation method can achieve high results in preserving the genetic resources of this breed and increasing its population ;

5. Depending on the urgency of the issue of increasing the population of Bushuev cattle, in the conditions of Uzbekistan, in contrast to the breeding bulls brought from abroad, it is possible to prepare high-quality seed from these local breeding bulls even after their 6 years of age, based on a light loading of each bull according to a separate plan;

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