



Reproductive Indicators of Stud Bulls and Bull Calves of the Kazakh White Breed of Various Genotypes

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Abstract | The high level of cattle herd reproduction equally depends on the reproductive capacity of both females and males. One of the main ways of increasing animals' productivity is qualitative herd transformation. Increasing livestock productivity in the country requires large-scale breeding based on the extensive use of genetic methods of evaluating the breeding value of the animals and the intensive use of high-value breeding males. Scientists have found that in animals, indicators of the reproductive ability are inherited, which makes regulated breeding possible. The work was performed at a peasant farm in the West Kazakhstan region of the Republic of Kazakhstan. The study was focused on stud bulls and bull calves of the Kazakh white breed of various genotypes. Reproductive indicators were studied, such as ejaculate volume, ml; activity, score; concentration of sperm cells in one ml, bln/ml; and the number of sperm cells in ejaculate, bln.

Keywords | Beef cattle breeding, Kazakh white-headed breed, Stud lines, Reproductive qualities, Ejaculate volume, Sperm cells activity, Concentration, Number of sperm cells

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INTRODUCTION

Global trends show that in the countries with the developed agrarian sector, the share of livestock breeding products takes a large part of agricultural production, and, as a rule, intensive animal breeding plays a major role in the industry development.

However, in our country, along with the improvements, national programs of agriculture development, crisis phenomena remain in livestock breeding, which results in a reduction of the livestock population, increasing the dependence on imported meat and milk, reduced productivity, and deterioration of the breeding qualities of animals.

Analyzing the achievements of domestic and foreign science accumulated over the last 15–20 years in studying the problems of cattle reproduction, and rating them, it

should be noted that today the etiological and pathogenetic essence of cattle breeding has been disclosed, effective diagnostic methods have been developed, and scientific advice has been given. However, these developments help solve the problems of treatment and active prevention of infertility mainly in females (cows, bred heifers, and heifers); as to the problem of infertility in stud bulls, these problems have been very poorly studied and described in the literature (Kombarova, 2007).

The decreased livestock population, deterioration of reproduction, and decreased amount of artificial insemination narrowed the scope of breeding valuable genotypes of the stud bulls that improved domestic breeds with high adaptability to the local climatic conditions. Import of cattle to unprepared economies results in the fact that after 2–3 years the animals are withdrawn from the herd (Ernst, 1982).

Reproductive efficiency largely depends on the stress resistance and the adaptive abilities of the animals, which have specific and individual characteristics of adaptivity to the varying environmental conditions (Dvalishvili et al., 2005).

Adaptation shows the degree of environmental compliance to the biological needs of animals, and their biological needs are manifested in productivity, health and reproductive capacity (Subbotin, 1980).

Considering the improvement of the breeds and breed zoning, one should admit impracticality of the ongoing mass absorption crossing of the breed adapted to the specific local climatic conditions, where they lose the valuable adaptive qualities of the source cattle breeds, and the duration of commercial use of cattle reduces (Nasibov, 2004).

Currently, there is a need to study the dynamics of spermatological indicators of the semen of stud bulls, and to determine the importance of stud bulls' origin within each breed, as well as to study the possibility of predicting their sperm productivity.

Currently, young bulls are selected by their origin, exterior, and development. Since stud bulls greatly influence the herd and the breed in general, it is necessary to assess bulls by the indicators of their reproductive ability. In this regard, there is a growing need in checking the quality of stud bulls' sperm, as it will help to identify stud bulls and bull calves with low reproductive ability.

MATERIALS AND METHODS

The work was performed at the Khafiz peasant farm in the West Kazakhstan region of the Republic of Kazakhstan. The study was focused on stud bulls and bull calves of the Kazakh white breed of various genotypes. Sperm production was assessed according to GOST 23745-79. Fresh nondiluted sperm of bulls. Specification and test methods by the following parameters: ejaculate volume, ml; activity, points; concentration of sperm cells in one ml, bln/ml; and the number of sperm cells in ejaculate, bln.

Digital materials were processed using biometric methods (Merkuryeva, 1970).

RESULTS

Organization of rational animal reproduction has an important economic value in beef cattle breeding management.

With the introduction of sperm deep-freezing method, the wide use of high-value bulls assessed by the quality of the offspring from a large population of females becomes possible.

Reproductive qualities of bulls are determined by many factors, including the seasons. The most important indicators of bulls' reproductive qualities are semen quality indicators (Table 1).

In the recent years, at the Khafiz peasant farm, artificial insemination has been used for herd reproduction with the use of frozen semen from the stud bulls assessed by the quality of the offspring, along with free mating during "cleanup" of unfertilized cows and heifers. In this regard, strict requirements that are characterized by sperm amount and quality, are applied to the reproductive ability of stud bulls. With that, it is important to know the seasonal changes in the reproductive functions of the bulls.

Studying the quantitative and qualitative indicators of the sperm showed that with relatively similar amounts of ejaculate in the winter and in the summer of stud bulls of all genotypes, the amounts were the highest in stud bulls of the Landysh 9879 stud line- 4.0 to 4.8 ml, respectively. The number of sperm cells in ejaculate is an important indicator that characterizes the overall level of sperm production in stud bulls, and largely determines the number of doses for insemination that can be obtained.

The obtained data show that the greatest number of sperm cells in the winter was found in the ejaculate of bulls of stud line Landysh 9879 (4.0), and in the summer of stud lines Cactus 7969 (4.2 bln), Landysh 9879 (4.3 bln) and Korol 13682 (4.7 bln) (Table 2).

Studying the qualitative indicators of sperm production by stud bulls and bull calves of various genotypes showed that sperm saturation with gametes differed, depending on the season. For instance, the highest concentration of sperm cells in the winter was observed in bulls of stud line Landysh 9879 (1.2 bln/ml), and in bull calves of stud line Cactus 7969 (1.3 bln/ml); in the summer in stud bulls Korol 13682 (1.06 bln/ml) and in bull calves Maylan 13851 and Korol 13682 (1.0 – 1.0 bln/ml). The concentration of sperm cells in all stud bulls and bull calves decreased in the summer.

The activity of gametes was one of the main indicators used for assessing the sperm production of agricultural animals; also, directly before insemination, it characterizes sperm suitability for fertilizing the ovicell.

The studies have shown that the activity (motility) of spermatozoa in fresh sperm of the stud bulls and bull calves is different in different seasons in various genotypes. In the bulls, except for the descendants of stud line Cactus 7969, the highest sperm cells activity was observed in the winter (8.1 bln), and in the bull calves in the summer (8.0 bln). In bull calves of stud line Cactus 7969, the activity of sperm cells in the winter was the highest, compared to their

Table 1: Quality indicators of sperm from stud bulls of various genotypes.

Stud lines	Amount of ejaculate, ml		Activity, points		Concentration bln/ml		The number of sperm cells in ejaculate, bln	
	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer
Cactus 7969	-	-	-	-	-	-	-	-
Landysh 9879	3.9	4.8	7.9	7.9	1.2	0.9	4.68	4.32
Maylan 13851	3.7	4.4	7.8	7.9	1.1	1.0	4.07	4.4
Korol 13682	3.8±0.21	4.8±0.07	7.9±0.26	7.7±0.28	1.0±0.04	1.06±0.08	4.13±0.32	5.1±0.32

Table 2: Quality indicators of sperm from bull calves of various genotypes.

Stud lines	Amount of ejaculate, ml		Activity, points		Concentration bln/ml		The number of sperm cells in ejaculate, bln	
	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer
Cactus 7969	4.0 ± 0.1	4.8 ± 0.06	8.1 ± 0.2	8.0 ± 0.08	1.3 ± 0.1	0.8 ± 0.02	5.1 ± 0.4	4.2 ± 0.1
Landysh 9879	3.8 ± 0.1	4.6 ± 0.1	7.7 ± 0.2	8.1 ± 0.1	1.06 ± 0.09	0.9 ± 0.02	4.0 ± 0.3	4.3 ± 0.1
Maylan 13851	4.0 ± 0.1	4.4 ± 0.1	7.5 ± 0.1	7.9 ± 0.2	1.24 ± 0.09	1.0 ± 0.02	4.9 ± 0.1	4.4 ± 0.5
Korol 13682	3.9 ± 0.1	4.5 ± 0.1	7.7 ± 0.08	8.2 ± 0.1	1.2 ± 0.09	1.0 ± 0.03	4.6 ± 0.3	4.7 ± 0.2

peers of other genotypes, and in the summer, the activity of sperm cells of bull calves of stud line Korol 13682 was the highest (4.7 bln).

CONCLUSION

The quantitative and qualitative indicators of reproductive functions of stud bulls and bull calves differed depending on the line affiliation and the season.

The greatest number of sperm cells in the winter was detected in the ejaculate of stud bulls of stud line Landysh 9879, in the summer of stud lines Landysh 9879 and Korol 13682; in bull calves, in the winter of stud lines Cactus 7969 and Maylan 13851, and in the summer of stud line Cactus 7969.

The concentration of sperm cells in stud bulls and bull calves decreased in the summer.

In most descendants of the stud bulls of the studied genotypes, the highest activity of sperm cells was observed in the winter, while for the bull calves in the summer. The best sperm quality was observed in bull calves of stud line Cactus 7969. The above quantitative and qualitative indicators of the reproductive functions of the stud bulls and bull calves should be considered in choosing them for a herd of the Kazakh white-headed cattle.

AUTHORS CONTRIBUTION

All authors contributed equally.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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