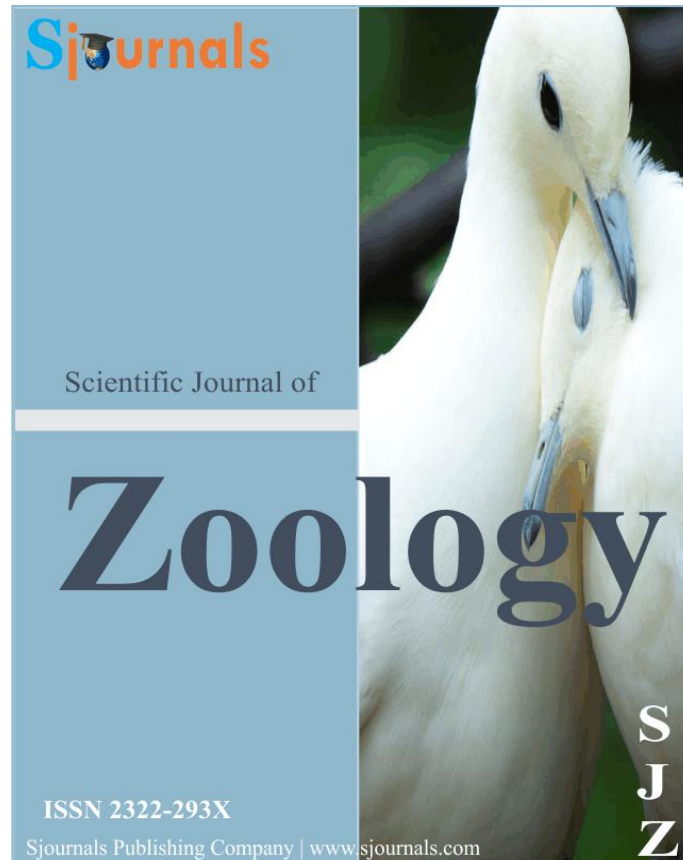


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Original article

Correlation between qualitative indicators of Holstein sire's semen

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ABSTRACT

The differences of sperm performance parameters of sires related to their age and determined, regression analysis between the main quantitative and qualitative indicators of sperm performance of bulls of high producing dairy breeds and indicators of sperm was carried out. Analysis of indicators of sperm performance of sires of Holstein breed showed that with age the average volume of semen increased by 19 %, sperm motility by 1.3 %, concentration of sex cells by 8.7 %, amount of semen doses obtained 25 %, and the number of rejected semen doses decreased by 8.0 %. Also with the age parameters of bulls' sex cells increased by 17 %, resistance by 4.7 %, survival of spermatozoa by 11.5 %.

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1. Introduction

Reproductive ability is one of the most important economic and breeding characteristics of bulls. The sperm from males characterized by a large variety of gametes that are affected by genotypic and para typical factors. The study of quantitative and qualitative indicators of sperm producing producers has not only theoretical but also practical value, which gives the opportunity to develop organizational and technical measures for the rational use of the bulls (Drought, 1999; Fedorovich, 2003). Significant increase in the role of bulls in practice breeding caused the necessity of increase of efficiency of their selection and use (Fedorov, 2004).

Studies of Kosenko (2005), Siracki (1992), and others Fedorov (2004) proved the differences of quality indicators of the ejaculate and the viability of sperm from sires. In this regard, great importance is the development of methods to assess the physiological status of germ cells.

In-depth knowledge on the physiology of germ cells of animals determine the factors influencing the quality of sperm, provide the evaluation, selection and accelerated accumulation of highly productive genetic material (Mussabekov, 2016). It is therefore necessary to develop objective methods of evaluation of biological value of the sperm of bulls that would take into account the physiological parameters of sires sperm that can be used to evaluate and predict the quality of the sperm. The purpose of the research is to determine the features of sperm producing bulls of highly productive dairy breeds and to assess the reproductive ability, morphological and physiological parameters of semen producers.

2. Materials and methods

Studied the main quantitative and qualitative indicators of sperm producing 12 Holstein bulls based on different para typical factors (Republican Center of livestock breeding JSC "ASIL TYLIK." Akmola region, Kazakhstan). Quantitative and qualitative indicators of sperm producing was assessed according to standard techniques, we took into account such indicators: volume of ejaculate, motility, concentration, total number and number of spermatozoa with rectilinear translational movement, the number of sperm doses obtained from one ejaculate and the percentage of culled sperm doses.

Respiratory rate was determined polar graphically, the resistance of sperm cells by adding 1% solution of sodium chloride, the number of live and dead sperm by counting under the microscope differentially dyed 5% solution of eosin germ cells, the survival rate of the sperm in hours at $t=38^{\circ}\text{C}$ after thawing. The research results were processed by the method of mathematical statistics by Plokhinsky (1969) and Merkureva (1970).

3. Results and discussion

In the analysis of indicators of sperm producing (Table 1) found that with age, quantitative and qualitative indicators of semen has changed. So, bulls of Holstein black-and-white color for the second year of use, the average volume of ejaculate increased by 0.7 ml ($p<0.001$), the mobility of sex cells by 0.1 score, the sperm concentration is 0.12 billion/ml ($p<0.05$), the number of harvested sperm doses by 41.1 PCs ($p<0.001$) and the percentage of culled doses decreased by 10.6 % ($p<0.01$). The producers of the Holstein breed a red and white suit that difference was, respectively, 0.5 ml, of 0.01 points at 0.13 billion/ml, 11.4 PCs and 5.5% with statistically significant difference.

According to the results of correlation and regression analysis the most close and statistically significant correlation was observed between ejaculate volume, motility and concentration of spermatozoa and the number of prepared sperm doses ($p<0.001$).

Table 1
Indicators of sperm producing bulls Holstein bulls, $M\pm m$.

Indicators	Holstein breed			
	1st year of use		2nd year of use	
	Black and white (n=9)	Red and white (n=3)	Black and white (n=9)	Red and white (n=3)
The volume of ejaculate, ml	3.4±0.12	3.4±0.19	4.2±0.16	3.9±0.26
Sperm motility, points	7.5±0.12	7.6±0.29	7.6±0.11	7.6±0.44
The concentration of sperm, billion/ml	1.1±0.03	1.2±0.08	1.2±0.04	1.3±0.08
The total number of sperm in the ejaculate, billion	3.9±0.22	4.0±0.39	5.2±0.28	5.2±0.61
The total number of sperm with PPD, billion	2.8±0.16	3.1±0.32	3.8±0.21	3.8±0.54
Obtained doses, PCs.	92.9±5.62	114.7±12.07	134.0±6.80	126.1±22.1
Culled doses, %	24.4±2.98	24.6±3.06	13.8±1.49	19.2±2.53

Were also conducted, determining the physiological and morphological parameters of sperm survival, resistance, number of the living and of the respiration rate of spermatozoa (Table 2).

Table 2

Physiological and morphological parameters of sperm of bulls of Holstein (n=29), M±m.

Age of bulls	Sperm			
	Native			Thawed
	Respiration of sperm, ng-atom O ₂ /0.1 ml	Resistance of spermatozoa, thousand units	The number of live spermatozoa, %	The survival of the sperm
Up to 2 years of age	5.4±0.35	26.02±1.42	91.2±0.75	5.1±0.42
2 to 3 years	5.9±0.33	26.35±2.45	91.7±0.73	5.3±0.34
3 to 4 years	6.3±0.35	26.68±1.58	92.2±1.48	5.6±0.47
Over 4 years	6.3±0.47	27.25±2.91	91.8±0.56	5.8±0.36

It is established that with age the rate of respiration of spermatozoa increased the intensity of the bulls aged 4 years and older has grown 1.2 times, or 17 % compared with manufacturers up to 2 years of age. Also with the age of bulls increased slightly the rate of resistance of spermatozoa, which increased respectively by 1.18 thousand units, or 4.7 %.

The number of spermatozoa was increased to 4 years of age the bulls, and then gradually decreased, although the difference between the different age groups of bulls was not statistically significant. It is also established that with age the bulls and increased the survival rate of sperm in comparison with bulls under 2 years of age, it increased at 2-3 years sires of 3.9 %, 3-4 years 9.8 %, 4-year-old and older by 11.37 %.

Table 3 shows the correlation between the main quantitative and qualitative, and physiological indicators of bulls' sperm of Holstein breed, statistically significant of which was the correlation relationships between the intensity of respiration of spermatozoa and ejaculate volume and sperm motility; the number of live sperm and mobility, and the concentration of germ cells; between survival and concentration of sperm ($p < 0.05$).

Table 3

Correlation between the main quantitative and qualitative, and physiological indicators of bulls' sperm of Holstein breed, $r \pm m$.

Indicators	Indicators			
	Respiration of sperm, ng-atom O ₂ /0.1 ml	Resistance of spermatozoa, thousand units	The number of live spermatozoa, %	The survival of the sperm
The volume of ejaculate	0.38±0.178	0.09±0.191	0.34±0.181	0.27±0.185
Sperm motility	0.35±0.180	0.28±0.184	0.38±0.178	0.34±0.181
The concentration of sperm	0.33±0.181	0.29±0.184	0.43±0.174	0.36±0.179
The number of sperm doses	0.31±0.182	0.07±0.192	0.21±0.188	0.33±0.182

4. Conclusion

- ✓ Analysis of indicators of sperm producing bulls of Holstein breed have shown that with age, the average ejaculation volume increased by 19 %, sperm motility by 1.3 %, the concentration of germ cells by 8.7 %, the total number of sperm in the ejaculate 31 %, the number of sperm with a straight-forward movement by 29 %, the number of the received sperm doses by 25 %, while the number of culled sperm doses decreased by 8.0 %.
- ✓ There was not established statistically significant difference between bulls of Holstein breed producers of black and white and red and white suit for the main qualitative and quantitative indicators of sperm producing.
- ✓ Physiological parameters of sperm bulls also increased with the age of manufacturers: the breathing of sperm 17 %, resistance of germ cells by 4.7 %, the survival rate of sperm 11.5 % and was associated with the age of bulls and the performance of sperm producing (correlation coefficients ranged from 0.07 to 0.43).

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