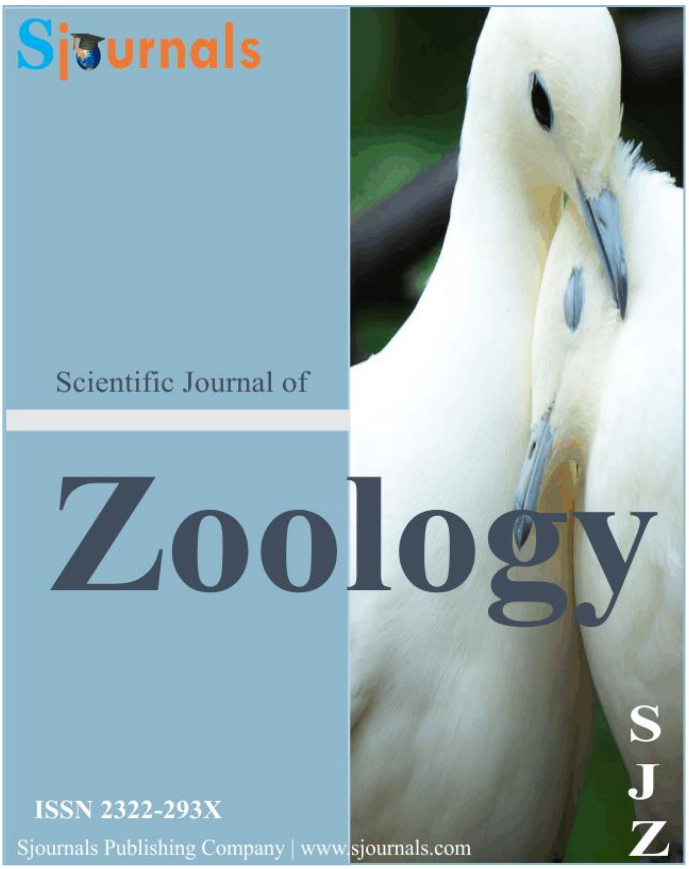

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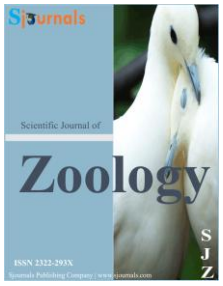

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Original article

Study of semen production of sire's Holstein breed

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ABSTRACT

The differences of sperm productivity of bulls of Holstein breed are found, and correlation and regression analysis between the main quantitative and qualitative indicators of sperm productivity of bulls is done. The morphological, biochemical and physiological indicators of sperm and blood of bulls are studied and their connection with reproductive capacity of the bulls of Holstein breed is found. Biochemical studies of enzyme activity of succinate dehydrogenase, lactate dehydrogenase, alkaline and acid phosphates in sperm of bulls are done and the relationship of enzyme activity with main indicators of sperm productivity is found. The morphological characteristics of sperm and blood of bulls of Holstein breed are studied, as well as their relationship with the main indicators of sperm production.

1. Introduction

Breeding efficiency in cattle depends on the intensity of use of sires (Cracky et al., 2005; Kosenko et al., 2005). The efficiency of manufacturers is closely connected with quantitative and qualitative indicators of semen (Cracky et al., 2005; Mussabekov et al., 2016). Sexual activity of the bulls, quantitative and qualitative indicators of sperm production associated with breed, line, age, genetic characteristics and reproductive abilities of animals, their conditions of detention and regime of use (Cracky et al., 2005; Mussabekov, 2016). In connection with the

widespread use of artificial insemination of animals the study of the enzymatic activity of semen is of particular importance, because the sperm before submitting it to the sexual organs of females exposed to the external environment in the process of production, dilution, cooling, freezing and storage. This suggests the need for a detailed study of these factors on the function of enzymes that ensure the flow and intensity of biochemical processes in the sperm and viability of sperm (Drought et al., 2000).

In long-term storage of semen for evaluation and selection of bulls special attention deserves the definition of biochemical parameters of semen, which closely correlate with the physiological characteristics and fertilizing ability of sperm (Cracky et al., 2008; Isanov, 1997). One of the important indicators for the objective evaluation of sperm quality is to determine the relationship between the living and dead sperm. A large number of live sperm is a necessary condition, although not a guarantee of the highest fertilizing capacity of gametes. That's why it is necessary to develop objective methods of evaluation of biological value of the sperm of bulls that would take into account the enzymatic activity of black-motley (n=91) suits (main quantitative and qualitative indicators of sperm producing, biochemical and morphological indicators of sperm), which belonged to the JSC "ASIL TYLIK".

Quantitative and qualitative indicators of sperm producing evaluated by conventional methods. The activity of lactate dehydrogenase was determined by Sevela-Towarak, the activity of succinate dehydrogenase – a by the method of Czuchry and Klevets (1978), activity of alkaline and acid phosphates – by the method of Bodansky. The number of live and dead spermatozoa was determined according by counting under the microscope differentially dyed 5 % solution of eosin germ cells. The concentration of hemoglobin, number of erythrocytes, leukocytes, and leukocyte sperm and morphological state of reproductive cells manufacturers that can be used to evaluate and predict the quality of the sperm.

2. Materials and methods

Investigated the reproductive ability of bulls Holsteins red- (n=37) and the formula by conventional methods. The research results were processed by the method of mathematical statistics by Planinsk (1969) and Merkur'eva (1970).

3. Results and discussion

Our results show that the bulls Holsteins red-colored suit (n=37) from the first to the fourth year of sex using ejaculation volume increased by 38.1 % (from 3.36±0.191 to 4.64±0.227 ml), sperm motility by 10.3 % (from 6.62±0.290 to 7.30±0.210 points), concentrations of sex cells by 22.9 % (from 1.18±0.077 to 1.45±0.058 billion/ml), number of sperm doses obtained from one ejaculate – by 32.3 % (133.79±12.808 to 176.64±19.781 PCs), and the number of rejected semen decreased from 26.68 to 15.68 %. Manufacturers of Holsteins black - and- petroupoly (n=91), respectively atipamezole increased ejaculation volume – 24.1 % (from 3.44±0.122 to 4.27±0.162 ml), motility of reproductive cells – 10.6 % (from 6.54±0.122 to 7.23±0.316 points), the sperm concentration is 18.9 % (from 1.11±0.031 to 1.32±0.126 billion/ml), number of sperm doses obtained from one ejaculate – 34.2 (126.18±5.793 to 169.30±9.253PCs.) and the number of rejected semen from 30.58 decreased to 17.30% (Table 1).

The results of correlation and regression analysis of the data revealed certain patterns of relationships between quantitative and qualitative indicators of sperm producing bulls of Holstein breed. The most close and statistically significant correlation found between volume of ejaculate and: The total number of germ cells in the ejaculate ($r=0.858$, $p<0.001$), total number of spermatozoa with rectilinear translational motion (CPD) ($r=0.820$, $p<0.001$) and number of harvested sperm doses ($r=0.706$, $p<0.05$); the sperm motility and total sperm count with BPD ($r=0.736$, $p<0.01$) and the number of rejected semen ($r=-0.891$, $p<0.001$); concentration: the total number of germ cells in the ejaculate ($r=0.757$, $p<0.01$), total sperm count with BPD ($r=0.726$, $p<0.05$); the total number of sperm cells in the ejaculate and number of sperm culled ($r=-0.684$, $p<0.05$) and the number of obtained sperm doses ($r=0.823$, $p<0.001$); the total number of germ cells with BPD and the number of rejected semen ($r=-0.750$, $p<0.05$) and number of harvested sperm doses ($r=0.772$, $p<0.01$).

When carrying out biochemical studies of plasma of sperm of bulls (Table 2) the following results were obtained: The activity of succinate dehydrogenase was 43.3±2.27 (lim=19-70) units act., lactate – 158.2±5.16 (lim=130-185), alkaline phosphatase – 63.8±2.81 (lim=43-86), acid phosphatase – 156.3±2.94 (lim=120-195) units act.

Table 1
Parameters of sperm producing sire's Holstein breed, M±m.

Parameters	Sexual use year	Holstein breed	
		Red-colored (n=37)	Black and motley (n=91)
The volume of ejaculate, ml	1	3.36±0.19	3.44±0.12
	2	3.91±0.26	4.19±0.16
	3	4.56±0.49	4.21±0.21
	4	4.64±0.22	4.27±0.16
Mobility of sperm, score	1	6.62±0.29	6.54±0.12
	2	6.82±0.44	6.64±0.10
	3	7.16±0.48	7.05±0.26
	4	7.30±0.21	7.23±0.31
Concentration of sperm, billion/ml	1	1.18±0.07	1.11±0.03
	2	1.32±0.08	1.20±0.03
	3	1.41±0.03	1.22±0.07
	4	1.45±0.05	1.32±0.12
The total number of sperm in the ejaculate, billion	1	3.98±0.39	3.82±0.21
	2	5.15±0.61	5.04±0.27
	3	6.48±0.80	5.18±0.44
	4	6.73±0.90	5.64±0.44
The total number of sperm with PPR, billion	1	2.63±0.32	2.49±0.15
	2	3.51±0.54	3.34±0.20
	3	4.62±0.73	3.63±0.31
	4	4.91±0.78	4.08±0.35
Culled sperm, %	1	26.68	30.58
	2	22.25	25.80
	3	18.02	21.51
	4	15.68	17.30
Obtained dozes with one of the ejaculate	1	133.79±12.8	126.18±5.7
	2	161.64±17.9	139.45±6.5
	3	168.76±16.9	144.01±10.8
	4	176.64±19.7	169.30±9.2
Culled dozes, %	1	24.65	24.42
	2	23.16	13.83
	3	16.87	13.42
	4	8.34	12.66

Table 2
The activity of enzymes sire's Holstein, M±m, units act.

Age of bulls	The number of bulls	Activity of the enzymes			
		SDG	LDG	Alkaline phosphotase	Acid phosphotase
Young (n=6)	6	40.7±3.25	156.7±6.18	59.5±3.04	148.6±3.14
Old (n=17)	17	45.9±1.28	159.7±4.14	68.0±2.57	164.0±2.73

Statistically significant correlation and mobility ($r=0.51$, $p<0.05$) and communication (Table 3) between the activity concentration of sperm ($r=0.62$, $p<0.01$); of succinate dehydrogenase and the concentration of the sexual content of acid phosphatase and cells ($r=0.61$, $p<0.01$); the activity of alkaline sperm motility ($r=0.77$, phosphatase $p<0.001$).

Table 3
The relationship between biochemical parameters of plasma of sperm and indicators of sperm producing, r±mr.

Parameters	Volume of ejaculate	Mobility of sperm	Concentration of sperm	Amount of sperm doze
Activity of SDG	0.17±0.26	0.29±0.25	0.61±0.21	0.29±0.25
Activity of LDG	-0.20±0.26	-0.10±0.26	-0.08±0.26	-0.18±0.26
Activity of Al.P	0.20±0.26	0.51±0.23	0.62±0.21	0.30±0.25
Activity of Ac.P	0.23±0.26	0.77±0.17	0.37±0.24	0.24±0.25

The strength of the influence of age on biochemical figures was insignificant and amounted to from 6.1 to 40.0% at p<0.05 (Table 4). When carrying out morphological the sperm samples found that the amount dead spermatozoa averaged 5.4±0.68 procentually (n=6) producers (lim=2-13) and 7.0±1.41% Mature (n=17) bulls (lim=2-14), and living germ cells, respectively 94.6±0.68 93.0±1.41% at p>0.05. Power of the again fluence on the number of live and dead sperms was % to 14.10 % (p>0.05).

Table 4
The strength of the influence of age of sire's on biochemical parameters of semen.

Parameters	$\eta^2_x \pm m_{\eta^2_x}$	F
Activity succinate dehydrogenase	0.06±0.472	0.12
Activity of lactate dehydrogenase	0.45±0.274	1.65
Activity of alkaline phosphatase	0.37±0.126	2.95
Activity of acidic phosphotase	0.40±0.119	3.39

According to the results of morphological and physiological studies of the blood (Table 5,6) it was found that indicators were within physiological norms. It should be noted that with age, bulls blood leukocytes and hemoglobin increased with statistically significant difference (p<0.05). A significant positive correlation between bull sperm concentration and hemoglobin (r=0.76, p<0.05), sperm activity and number of red blood cells erythrocyte (r=0.63, p<0.05) and leukocytes (r=0.73, p<0.05).

Table 5
Morphological and biochemical parameters of blood of sire's Holstein breed.

	Bulls producers	
Parameters	Young (n=5)	Old (n=5)
Number of erythrocytes, T/l	6.67±0.05	7.08±0.10
Number of leucocytes/l	8.20±0.07	8.64±0.16
Contents of hemoglobin, г/л	119.60±1.43	129.32±1.41

Table 6
Leucogram of sire's of Holstein breed.

	Bulls producers	
Parameters	Young (n=5)	Old (n=5)
Basophiles	0.14±0.03	0.13±0.02
Eosinophils	2.80±0.11	2.21±0.07
Neutrophils: stab	2.45±0.12	2.20±0.07
Segmented	13.76±0.3	21.03±0.3
Lymphocytes	76.74±0.36	71.37±0.39
Monocytes	4.11±0.20	3.06±0.12

It is known that fertility manufacturers is determined by the number received from their litter, which is directly dependent on fertilizing capacity sperm. Established that the level of impregnation capacity of heifers (n=680) from the first insemination made 72.18 ± 29.079 %.

4. Conclusion

✓ Indices of sperm producing bulls Holstein had an age differences. When conducting a correlation regression analysis between the main indicators of sperm producing most close correlation is established between the ejaculate volume and quantity harvested sperm doses (r=0.71), the concentration of sperm and number the obtained sperm doses (r = 0.53).

✓ The results of biochemical studies have found that, activity of the enzyme LDH in the seminal plasma average is based on age ranged from 40.7 to 45.9 units act., LDG – up to 156.7 159.7, alkaline phosphatase – from 59.5 to 68.0 and acid phosphatase – 148.6 from up to 164 units of the act.

✓ It is established that with age steers blood levels of erythrocytes, leukocytes and hemoglobin increased with statistically reliable difference ($p<0.05$). Also a positive correlation the relationship between the morphological composition of the blood and some indicators sperm producing bulls.

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