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The influence of biologically active preparations on the reproductive qualities of sows

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The work concerns the study of the reproductive qualities of sows that received, in addition to the main diet, a biologically active preparation (LB-AAP) synthesized from brewer's yeast waste. For this purpose, two groups of sows were formed, experimental and control ones containing 5 sows in each group. The preparation was administered in addition to the main diet 30 days before farrowing and 10 days after farrowing at 10 ml for each sow. It has been found out that the enrichment of rations for pregnant sows with a biologically active preparation (LB-AAP) allows an increase in the number of born piglets by 0.4 more than in the control group. There were 0.8–0.31 stillborn piglets in the experimental group or 1.0 less compared to the control group. Enrichment of the diets of sows 30 days before farrowing with a biologically active agent had a positive effect on the live weight of the litter at birth and on the 21st day. The average live weight of piglets in the litter of the experimental group was 0.85 kg higher than the average live weight of piglets in the litter of the control group. The average live weight of one piglet at birth in the experimental group was 1.7 kg, and in the control group was 1.4 kg, which is 0.3 kg less. Hematological and biochemical blood tests were studied at the beginning and at the end of the experiment, as well as the amino acid, macro and microelement composition of the preparation.

Key words: piglets, live weight, LB-AAP-preparation, blood, amino acids, macro- and microelements

The reproductive qualities of sows are significantly influenced by the level and completeness of feeding. Many scientists believe that the feeding of sows should be differentiated in accordance with their physiological state [3]. The influence of the nutritional value of feeding on the reproductive qualities of sows has not been sufficiently studied.

The use of biologically active preparations is a modern and effective way to stimulate the functional reserves of the body, allowing to increase the productivity of animals [4, 7].

When choosing biologically active preparations, the determining factor is primarily environmental safety and economic efficiency. These requirements are met by biologically active preparations obtained from the waste of beer, wine and other yeast.

The reproductive qualities of sows largely depend on a balanced diet. Therefore, in obtaining, maintaining and raising healthy piglets, full-fledged feeding of sows during gestation and lactation periods plays an important role. But the main feed used in feeding pigs does not satisfy their need for certain substances, therefore it is necessary to introduce various sources of biologically active substances into their diet [1, 8, 5, 10, 6].

The researches by [2, 9] showed that the addition of biologically active substances to the main diet can stimulate the growth of animals and intensify physiological processes in the body.

At the same time, in a number of countries with highly developed pig breeding, approaches to the peculiarities of feeding sows differ. In feeding pregnant sows, it is proposed to distinguish five stages, differing in the amount of feed given to the animals, others suggest differentiating the feeding of sows by three periods of gestation, but without dramatically changing the composition of the feed mixture. Judging by the existing recommendations, the norms of protein and amino acid nutrition of these animals differ very much.

The purpose of our work was to study the biochemical parameters and biological properties of preparations synthesized from brewer's yeast waste for reproductive and productive qualities of sows.

Materials and Methods

The experimental work was carried out on the reproducer of the pig-breeding complex "Agroseminvest" Ltd. (Burlacheni village, Cahul region, the Republic of Moldova) and in the biology laboratory of embryos reproduction and transplantation of the Moldavian Scientific and Practical Institute of Biotechnology in Animal Husbandry and Veterinary Medicine of the Republic of Moldova. In laboratory conditions, biologically active preparations were synthesized from brewer's yeast — *LB-h* mg/100 ml, *LB-AAP* mg/100 ml, *LB-MP* mg/100 ml, *LB-GL* mg/g. The amino acid, macro and microelement composition of these preparations was investigated. In production experiments, the preparation *LB-AAP* was tested.

The experiments used pregnant sows one month before the expected farrowing. Two groups of sows were formed — experimental and control, five sows in each group. Each sow of the experimental group in addition to the main diet 30 days before farrowing and 10 days after farrowing received 10 ml of preparation (*LB-AAP*), developed by the Institute of Microbiology and Biotechnology of the Republic of Moldova.

At the beginning and at the end of the experiment, blood samples were taken to study the hematological and biochemical composition. In the postnatal period the average number of piglets born in each litter, their average live weight, as well as the average live weight of the nest on the 21st day were studied.

Results and Discussion

To implement the tasks set at the first stage, the amino acid composition in the obtained preparations was studied. The data presented in table 1 indicate that the preparation *LB-AAP* was the richest in amino acids.

The following studies were aimed at studying the content of macro and microelement composition obtained from brewer's yeast waste. The experimental data are presented in table 2. The analysis of these data shows that the highest indicators of macroelement and microelement composition were also shown by the preparation *LB-AAP*.

The intensive use of high-value breeding animals in order to obtain the highest-value offspring depends on the physical condition of the animal's body. For this purpose, we studied the hematological and biochemical parameters of the blood. The experimental data are shown in table 3.

Table 1. Amino acid composition of the preparation

Amino acids	Preparation			
	LB-h, mg/100 ml	*LB-AAP*, mg/100 ml	*LB-MP*, mg/100 ml	*LB-GL*, mg/g
Cysteic acid	1.73	12.2	0.37	–
Aspartic acid	16.31	368.5	4.77	1.93
Threonine	11.62	375	5.47	0.42
Serine	6.60	304.3	2.23	0.22
Glutamic acid	81.66	1214.3	13.19	4.03
Proline	32.58	559.2	6.68	3.17
Glycine	21.33	529.2	3.68	1.86
Alanin	17.28	488.7	2.84	1.12
Valine	9.27	306.3	3.32	1.38
Cysteine	1.20	22.6	0.11	0.08
Methionine	1.44	23.7	0.11	0.09
Isoleucine	5.72	301.9	1.88	0.73
Leucine	17.25	688.5	4.07	2.16
Tyrosine	7.87	35.6	0.30	0.23
Phenylalanine	9.81	308	2.62	0.93
Lysine	9.01	368	3.82	1.11
Histidine	4.14	59	0.78	0.22
Arginine	6.81	268.8	1.57	0.79
γ-aminobutyric acid	5.02	70.3	0.52	0.04
Ornithine	0.89	75.7	1.99	–
Σ nonessential amino acids	184.82	3522.4	33.80	12.65
Σ essential amino acids	75.05	2699.2	23.64	7.83
Σ immunoactive amino acids	148.95	3150	32.45	9.23
Σ glycogenic amino acids	82.40	2372.1	22.32	6.94
Σ ketogenic amino acids	49.64	1702	12.68	5.17
Σ proteinogenic amino acids	259.87	6221.6	57.43	20.48
Σ amino acids containing S	4.36	58.4	0.60	0.17

Table 2. Macro- and microelments composition in preparations (M±m)

Macro- / microelement	Preparation			
	LB-h, mg/100 ml	*LB-AAP*, mg/100 ml	*LB-MP*, mg/100 ml	*LB-GL*, mg/g
Macroelements, mg/ml				
K	1.2± ±0.001	≥2	0.1± ±0.004	0.05± ±0.004
P	0.4± ±0.009	3.8± ±0.007	0.8± ±0.04	1.4± ±0.06
Na	0.09± ±0.0007	1.8± ±0.02	3.4± ±0.1	1.3± ±0.005
Mg	0.06± ±0.0009	0.2± ±0.001	0.02± ±0.001	0.1± ±0.002
Ca	0.01± ±0.0001	0.01± ±0.007	0.005± ±0.0004	0.4± ±0.006
Microelements, мсg / ml				
Fe	3.3± ±0.007	2.8± ±0.001	0.01± ±0.0005	0.3± ±0.002
Al	1.6± ±0.001	3.3± ±0.02	18.0± ±0.07	0.3± ±0.002
Mn	0.07± ±0.0001	1.0± ±0.003	0.06± ±0.003	0.003± ±0.0001
Cu	0.06± ±0.003	0.3± ±0.003	0.1± ±0.01	0.009± ±0.0002
Cr	0.04± ±0.001	0.08± ±0.002	0.1± ±0.01	0.003± ±0.0001
Mo	0.02± ±0.001	0.08± ±0.001	0.03± ±0.003	0.004± ±0.0001
Ni	0.01± ±0.0003	0.2± ±0.002	0.02± ±0.0002	0.005± ±0.0002
Co	0.003± ±0.0002	0.02± ±0.0005	0.004± ±0.0003	–
Zn	–	1.3± ±0.004	0.03± ±0.003	0.06± ±0.002
Se	–	–	0.03± ±0.008	–
Sr	0.1± ±0.005	0.2± ±0.002	0.1± ±0.005	0.004± ±0.0004
Pb	–	–	–	–
Tl	–	0.002± ±0.0009	0.02± ±0.0005	–
Ag	0.01± ±0.007	0.02± ±0.001	0.03± ±0.002	–
Ba	–	–	0.04± ±0.001	0.002± ±0.0001
Bi	0.02± ±0.005	0.008± ±0.00001	0.01± ±0.0002	–
Hg	0.01± ±0.007	0.02± ±0.003	0.04± ±0.001	–
Sb	0.02± ±0.001	0.008± ±0.0006	0.01± ±0.003	–
Li	0.01± ±0.0003	0.01± ±0.0001	–	–

Table 3. Hematological analysis of the blood of sows (M±m)

Indicators	Groups			
	Experimental (n=5)		Control (n=5)	
	Stage of the experiment			
	Beginning	End	Beginning	End
Leukocytes, 10^9/l	13.66± ±1.91	18.6± ±0.23	15.27± ±1.98	18± ±1.52
Lymphocytes, 10^9/l	7.53± ±0.68	6.16± ±0.15	7.83± ±0.50	5.8± ±0.10
Erythrocytes, 10^{12}/l	8.23± ±1.43	6.06± ±0.24	6.97± ±0.13	6.65± ±0.19
Hemoglobin, g/l	198± ±26.21	121.25± ±4.25	165.25± ±32.01	126± ±4.42
Platelets, 10^9/l	122.4± ±42.86	280.4± ±40.55	166.8± ±43.86	215± ±41.08
Erythrocyte sedimentation rate, mm/hour	13.2± ±5.16	7.4± ±4.10	10.8± ±5.21	4.6± ±1.52

The data presented in tables 3 and 4 show that both at the beginning of the experiment and at the end of the experiment, all the studied blood parameters are within physiological norms. It should be noted that the level of platelets increased in both the experimental and control groups.

Table 4. Biochemical analysis of the blood of sows (M±m)

Indicators	Groups			
	Experimental (n=5)		Control (n=5)	
	Stage of the experiment			
	Beginning	End	Beginning	End
Albumin, g/l	41.60± ±2.39	40.10± ±2.08	42.53± ±2.78	35.63± ±1.46
ALT-AMP, U/l	62.33± ±3.18	38.33± ±4.31	103.33± ±9.93	58.00± ±3.12
Calcium, mmol/l	3.39± ±0.02	2.56± ±0.05	2.47± ±0.05	3.46± ±0.04
Cholesterol, mmol/l	2.30± ±0.18	1.94± ±0.11	2.15± ±0.14	1.94± ±0.33
Glucose, mmol/l	3.60± ±0.13	4.42± ±0.17	4.43± ±0.28	3.77± ±0.44
Magnesium, mmol/l	0.73± ±0.02	1.02± ±0.01	0.64± ±0.02	1.46± ±0.02
Trigliceride, mmol/l	0.31± ±0.05	0.05± ±0.04	0.54± ±0.06	0.23± ±0.05
Urea, mmol/l	5.30± ±0.43	3.68± ±0.50	5.43± ±0.49	3.96± ±0.58

It was also found out that the level of triglycerides, the main source of energy in the body, was reduced by more than two times in comparison with the level established at the beginning of the experiment. As for the dynamics of glucose levels, it should be noted that although this indicator has increased, it remains within the physiological limits. The level of erythrocytes and hemoglobin is within normal limits, the erythrocyte sedimentation rate decreased and amounted to 7.4±4.1 ml/hour. This is an indicator of inflammatory processes, since the level of leukocytes and the data of the leukocyte formula are within the normal range. In this case, an increase in erythrocyte sedimentation rate is associated with high cholesterol levels. The data are statistically not significant.

The influence of biologically active preparations on the reproductive functions of sows was studied. The experimental data on the number of piglets obtained from sows are presented in table 5.

Table 5. Number of alive piglets, stillbirths and survivors on the 21st day according to feed ration

Litter nr.	Control group (CG), n				Experimental group (EG), n			
	At birth		In 21 days		At birth		In 21 days	
	alive	dead	alive	dead	alive	dead	alive	dead
1	11	2	11	0	15	3	15	0
2	9	2	9	0	7	2	7	0
3	11	0	10	1	16	3	16	0
4	12	3	12	0	4	1	4	0
5	11	6	10	1	14	0	14	0
Average	10.8± ±0.5	2.6± ±0.9	10.4± ±0.4	2	11.2± ±1.96	1.8± ±0.6	11.2± ±1.96	0

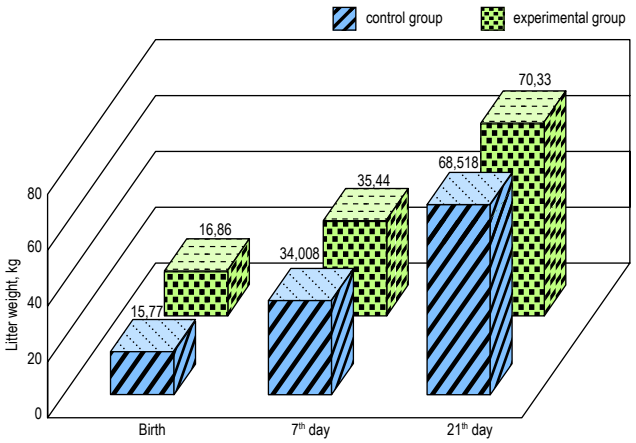

Fig. Litter weight at birth, on the 7th and 21st days depending on the ration

The data presented in table 5 show that the number of piglets born in the experimental group averaged 11.2 or 0.4 more than the average of the control group. The number of stillborn piglets obtained in the experimental group averaged 1.8±0.6 or 0.8 less than in the control group.

The data presented in fig. show that enriching the diets of sows 30 days before farrowing and 10 days after farrowing with *LB-AAP* has a positive effect on the average live weight of piglets on the 21st day after farrowing, and the data are statistically inauthentic The average live weight of piglets on the 21st day in the experimental group was 1.812 kg higher than in the control group.

Conclusions

1. Of the studied preparations, the highest indicators of the content of amino acids (Glutamic acid — 1214.3 mg/100 ml; Leucine — 688.5 mg/100 ml; Proline — 559.2 mg/100 ml, etc.), macroelements (K — ≥2 mg/ml; P — 3.8 mg/ml; Na — 1.8 mg/ml), and microelements (Fe — 2.8 mg/ml; Al — 3.3 mg/ml; Mn — 1.0 mg/ml) were registered in the preparation *LB-AAP*.

2. Introduction to the main diet of sows 30 days before farrowing and 10 days after farrowing of a biologically active preparation *LB-AAP* made it possible to obtain the highest fertility rates of live piglets (11.2±1.96), to reduce the number of stillborn piglets (0.8), increase the litter live weight at 21 days by (1.81 kg) in the experimental group compared with the control.

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Вплив біологічно активних препаратів на репродуктивні якості свиноматок

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Робота присвячена вивченню репродуктивних якостей свиноматок, які, крім основної дієти, отримували біологічно активний препарат (LB-AAP), синтезований з пивних дріжджових відходів. З цією метою сформували дві групи свиноматок — експериментальну та контрольну по 5 тварин у кожній групі. Препарат вводили по 10 мл на додаток до основної дієти свиноматок за 30 днів до опоросу і через 10 днів після опоросу. Таке введення дозволяє збільшити потомство на 0,4 поросяти порівняно з контрольною групою. В експериментальній групі було 0,8–0,31 мертвонароджених поросят проти 1,0 у контролі. Збагачення дієт свиноматок за 30 днів до опоросу біологічно активним агентом позитивно вплинуло на живу масу гнізда при народженні і на 21-й день. Середня жива маса поросят у гнізді експериментальної групи на 0,85 кг перевищувала живу масу поросят у гнізді контрольної групи. Середня жива маса одного поросяти при народженні в експериментальній групі становила 1,7 кг, а в контрольній групі — 1,4 кг, що на 0,3 кг менше. На початку і наприкінці експерименту було досліджено гематологічні та біохімічні показники крові, а також амінокислотний склад, макро- та мікрелементну композицію препарату.

Ключові слова: поросята, жива маса, LB-AAP-препарат, кров, амінокислоти, макро- та мікроелементи

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