



Original Contribution

EFFECT OF THE ADDITION OF AUTOLYZED BREWER'S YEAST IN THE DIET OF SOWS OF THE EAST BALKAN BREED ON SOME HAEMATOLOGICAL AND BIOCHEMICAL INDICATORS: PRELIMINARY RESULTS

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ABSTRACT

The experiment was carried out with 10 sows reared at the SCA - Sredets. The pigs were divided into two groups: control (n=5) and experimental (n=5), equalized according to age and body weight. Each pig received 3 kg of feed per day comprising of barley and wheat in a ratio of 70:30%. Experimental pigs received additionally 3% autolyzed brewer's yeast per 100 kg of feed. A body weight and blood indicators were recorded at the beginning and the end of the trial. During the experimental period the body weights increased from 111,360 kg to 131,860 kg and from 111,280 kg to 135,740 kg, for the control and experimental group, respectively. In treated pigs, the values of CHOL and TRG decreased by 17.24% ($P < 0.05$). The inclusion of autolyzed brewer's yeast in the diet of sows had a positive effect on their weight development associated with a rising trend in body weight at the end of the trial. We speculate that this additive may improve the physical health of the animals by impacting their lipid metabolism, yet future investigations with a larger number of pigs can further clarify this question.

Key words: pigs, brewer's yeast, growth, blood indicators

INTRODUCTION

Aboriginal breeds of all animal species attract the interest of researchers with respect to the preservation of useful genetic variance and the production of high quality ecological products. Such a breed is the East Balkan Pig breed (EBPB), whose natural area of distribution is the East Balkan mountain range, Strandzha and Sakar. The first data about it was published by Khlebarov (1). According to Petrov (2), the feral-like, straight-eared East Balkan domestic pig is the prototype of the Mediterranean turf pig and originated from the wild *Sus scrofa scrofa*. It has a phylogenetically determined ability to utilize various trophic sources with a low nutritional value. Its reproduction is reliable, and the offspring survival rate is high (3).

A breeding herd of pigs from the autochthonous EBPB is reared and maintained in the Scientific

Center of Agriculture (SCA) - Sredets with the aim of preserving it as a national genetic reserve. The herd is the nucleus of the breed and provides high-quality breeding material. So far this is the only Bulgarian aboriginal (indigenous) pig breed preserved in our country. A peculiarity of this type of pigs is their rearing technology, which is free grazing. Pigs of EBPB are the only ones for which pasture breeding is allowed only on certain territories in the regions of Burgas, Shumen and Varna. They are extremely adapted to the local climatic conditions, have a strong constitution and resistance to diseases. The pigs are not vaccinated and are fed with organic feed, produced by the SCA. This defines them as suitable for biological production and obtaining ecologically clean production. Due to the specific way of feeding the EBPB, studies on the influence of nutritional factors applied in conventional pig farming are almost absent or have been conducted partially (4-7). The results obtained for live weight and growth intensity show that the applied supplements have a positive effect.

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Brewer's yeast is one of them and is used in the traditional breeding of Iberian pigs, which, like the EBPB, are fattened with acorns and grass through the *dehesa* system. Adding yeast to the feed helps to avoid stress, especially in summer when there is not much green grass. In many cases, in the production of pet food, dry autolyzed brewer's yeast is used, which has a positive effect on the full absorption of vitamins, minerals, and proteins. Until now, studies on the influence of brewer's yeast on productive indicators in pigs of the EBPB have not been carried out, which gives us a reason to conduct the experiment. Blood parameters can give a clear picture of the influence of different husbandry systems, feeding practices, seasonal and climatic changes on the health status of the animals.

Jha et al. (8) reported that approximately 70% of immunity is associated with the health of the gastrointestinal tract. According to Berg (9) the reduction of the general systemic inflammation of the body is provoked by the reduction of inflammation in the intestine. Yeast has a potential immunostimulatory effect to reduce

leukocyte and bacterial concentrations in the gastrointestinal tract (8).

Live brewer's yeast prevents binding of pathogenic bacteria to host epithelial cells (10-12).

The purpose of the present study was to determine the effect of brewer's yeast supplemented to the ration of the East Balkan pigs on their growth and some haematological and biochemical indicators of the blood.

MATERIAL AND METHODS

An experiment was carried out with 10 non-lactating sows housed at the SCA - Sredets. The animals were divided into two groups control (n=5) and experimental (n=5), equalized according to age and body weight. The duration of the experiment was 77 days. The daily ration was in agreement with the category of animals - 3 kg of feed per animal per day comprising of barley and wheat in a ratio of 70:30%, with 3% brewer's yeast included to the ration of the experimental group. The composition of the grain feed is presented in **Table 1**. The contents of the grain feed were analyzed in the Feed Laboratory at Agricultural Institute – Shumen

Table 1. Composition of the grain feeds

Contents	Wheat	Barley
Dry matter, %	87,51	84,61
Initial moisture		
Crude protein, %	10,64	9,08
Crude fats, %	2,04	1,98
Crude fibers, %	2,26	4,48
Calcium, %	0,139	0,187
Phosphorus, %	0,218	0,271
Absolute dry matter		
Crude protein, %	12,59	10,73
Crude fats, %	2,33	2,34
Crude fibers, %	2,67	5,29
Calcium, %	0,164	0,221
Phosphorus, %	0,258	0,320

The chemical composition of the feed samples was determined according to the methods adopted by the Agricultural Institute – Shumen (13). Protein was determined by the Kjeldahl method, crude fats - by using the Soxhle extraction apparatus, and fibers - by the Weende method. Calcium was determined by the oxalate method, and phosphorus - by the molybdate method of Gerike and Kurmis.

At the beginning and end of the experiment the following indicators were controlled: body weight of animals and blood parameters (Hemoglobin; Red Blood Cell; Hematocrit; White Blood Cells; Mean Corpuscular Hemoglobin Concentration; Mean Corpuscular Hemoglobin; Mean Cell Volume; Red Blood Cell Distribution Width; Platelets; Mean Platelet Volume; Blood Urea Nitrogen; Cholesterol and Triglycerides).

Blood samples were taken from the ocular sinus of the pigs by a licensed veterinarian. Blood samples were tested in a licensed laboratory with a Medonic CA 620 machine.

The results were processed using the statistical program Statistics 6.0. Utilizing the descriptive statistics, the mean and standard deviation were determined for each indicator. Comparative analysis was performed using a non-parametric method for comparing means from independent samples, using the Student's t test. Differences were considered significant at $P < 0.05$.

RESULTS AND DISCUSSION

The obtained values for crude protein in barley (9.08%), wheat (10.64%) and the rest of the indicators from the grain feeds analysis were close to those reported in our previous research (14).

The inclusion of brewer's yeast in the ration of sows had a positive effect on their growth. Animals from the experimental group had a higher body weight, compared to pigs from the control group at the end of the experiment (135.74 kg versus 131.86 kg). According to Danchev (3), the animals from the East Balkan pig breed have a phylogenetically determined ability to utilize natural feed with low nutritional value. In studies with fattening pigs,

Palova, (15) found that the feeding of balanced combined feed had a significant effect on the weight development of the animals. In this regard, it was reported that the added brewer's yeast, as a good source of protein, had a positive effect on the sows' body weight in the present experiment.

An important factor in maintaining the productivity of animals were the hereditary factors and the ability of the organism to come into balance with the conditions of the surrounding environment, depending on the way of rearing and feeding. Its development is related to complex biological interactions that take place as a result of the oxidation processes in the blood and affect its composition (16). Despite its relative constancy, blood is a dynamic system in the body. The main reasons for this were the physiological state of the body, the way of feeding, growing, etc. (17, 18). Knowing the nature and movement of biochemical indicators of the blood makes it possible to assess the condition of the individual (19). The study of haematological indicators makes it possible, on the one hand, to reveal the physiologic-biochemical determinism of one or other traits, and on the other hand, the use of interior indicators to predict productivity (20). The obtained results of the blood tests are presented in **Table 2**.

Table 2. Blood haematological and biochemical indicators

Haematological indicators	C	C ₁	B	B ₁
HGB (g/L)	137,6±2,32	135,2±3,99	135,0 ±3,36	142,2±2,78
RBC (T/L)	7,23±0,14	7,28±0,24	6,89 ±0,24	7,40±0,15
HCT (L/L)	0,43±0,006	0,45 ±0,01	0,42 ±0,01 ^a	0,46±0,01 ^a
WBC (G/L)	15,58±2,04	14,58±0,86	14,66±0,51	14,14±0,68
MCHC (g/l)	320,2±1,83 ^d	303,8±2,35 ^d	318,6±1,94 ^c	308,0 ±1,0 ^c
MCH (pg)	19,06±0,49	18,6±0,51	19,6±0,23	19,24±0,36
MCV (fL)	59,58±1,29	61,24±1,43	61,6±1,01	61,92±0,97
RDW (%)	17,34±0,15	16,92±0,18	16,72±0,62	17,42±0,46
PLT (G/L)	187,2±16,58	216,8±23,65	243,8±11,32	203,4±35,46
MPV (fL)	8,7±0,36	8,68±0,37	8,72±0,14	8,38±0,47
Biochemical indicators				
BUN (mmol/L)	3,35±0,39	4,75±0,69	4,17±0,35	4,38±0,40
CHOL (mmol/L)	2,41 ±0,11	2,37±0,13	2,61±0,14 ^a	2,16±0,11 ^a
TRG (mmol/L)	1,37±0,19 ^a	0,84±0,08 ^a	0,89±0,21	0,73 ±0,09
a - p≤0,05; b - p≤0,01; cd - p≤0,001 C – control group – beginning of trial C ₁ – control group – end of trial	B – trialgroup (3% brewer's yeast) – beginning of trial B ₁ – trialgroup (3% brewer's yeast) – end of trial			

Legend: Haemoglobin - HGB; Red Blood Cell - RBC; Hematocrit - HCT; White Blood Cells – WBC; Mean Corpuscular Hemoglobin Concentration - MCHC; Mean Corpuscular Hemoglobin - MCH; Mean Cell Volume -MCV; Red Blood Cell Distribution Width - RDW-CV; Platelets – PLT; Mean Platelet Volume – MPV; Blood Urea Nitrogen – BUN; Cholesterol - CHOL; Triglycerides - TRG

Leukocytes can be used as an indicator to determine the immune status of animals and their adaptive capabilities. They take part in the mechanism of immunity by forming antibodies and atrephons that stimulate the growth of tissues and the recovery of the body. The lower values of leukocytes in animals from both groups at the end of the experimental period (lasting 77 days) indicates good adaptive capabilities of sows to environmental factors.

Haemoglobin values increased by 5.33% in the experimental group and by 5.18%, compared to the control group, which is a good indicator of the health status of the pigs. Regarding the MCHC indicator values, MCV, and MCH, no significant demonstrable differences were observed between the pigs of the two groups, and the values were within the reference norms. The values at the end of the experimental period for platelets were 216.8 G/l for the control versus 203.4 for the experimental and were within the reference limits.

The level of urea (BUN) was higher by 5.03% (4.38 mmol/l in the II group at the end of the experiment compared to 4.17 mmol/l at the beginning). An increase in serum urea nitrogen in pigs fed with brewer's yeast was also obtained by other authors (21, 22). The increased urea level was due to the higher live weight reported at the end of the experiment. Meanwhile, the yeast hydrolysate could increase the serum urea nitrogen in growing pigs, a trend we observed in the present experiment.

Zhang et al. (23) reported that serum urea nitrogen was increased while creatinine and total protein were not influenced in the pigs fed a graded brewer's yeast hydrolysate.

A similar result relating to the increase of the plasma of serum urea nitrogen due to a diet containing hydrolyzed yeast in weaned pigs has been reported by Waititu et al. (24).

The indicator of lipid metabolism - cholesterol was significantly lower in pigs from the experimental group that received autolyzed brewer's yeast. In pigs of group II, cholesterol values were lower by 17.24 %, $P < 0.05$ (2.61 and 2.16 mmol) within the group. Triglyceride values were also lower – by 18.34% and 13.10% (respectively within the group and compared to the control group). According to Daly et al (25), the addition of yeast to pig feed significantly increases *Lactobacillus* populations, augments lactate concentration in lactic acid bacteria,

leading to an optimization of lipid metabolism. The lower values of lipid indicators result from the normalization of intestinal integrity and better digestion and resorption of lipoids.

CONCLUSIONS

The supplementation of autolyzed brewer's yeast to the ration of East Balkan Pigs had a positive effect on their growth. There was a trend for higher body weight in pigs receiving autolyzed brewer's yeast, compared to animals without inclusion of this additive in the ration (135.74 kg vs. 131.86 kg). Feeding of autolyzed brewer's yeast led to a drop in CHOL with 17.24% ($P < 0.05$). Brewer's yeast could improve physical health of the animals, but the elucidation of the intricate mechanisms for optimization of the lipid metabolism requires future investigations with a large number of pigs.

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