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SOME PRODUCTIVE AND IMMUNITARY EFFECTS OF GLUCANS EXTRACTED FROM *CLAVICEPS PURPUREA* IN BROILER CHICKENS

GH. SOLCAN, C. SOLCAN, A. ANTON,
D. MOCANU, A. BLEJUŞCĂ, M. MUSTEAŢĂ
Universitatea de Ştiinţe Agricole şi Medicină Veterinară, Iaşi

Abstract. The impact of the standard diet supplemented with glucans extracted from Claviceps purpurea on some productive and immune parameters was studied on a 28 days experiment performed on 30 broiler chickens beginning from the 25th day of life. The chicks were breed in semi-intensive conditions, being randomly arranged in three equal groups, according to their body weight. They were fed with specific commercial food, balanced in nutrient principles, each day the glucanic extracts being added in a dosage of 20 mg/kg of body weight for the group E1 and 40 mg/kg of body weight for group E2; the extracts were mixed with the food, after being diluted in distillated water, 10%. At the end of the experiment, the control group reached a weight gain of 644 g. The group E1 (with 20 mg of glucanic extract/kg) reached a weight gain of 696 g, this fact representing a significant difference in comparison with the control group (+ 52 g). The group E 2 (with 40 mg of glucanic extract/kg) reached a weight gain of 728 g, also a significant difference in comparison with the control group (+ 84 g). The specific fodder consumption was of 2,11 kg fodder/kg b. w. in group E2, slightly higher in group E1, that is 2,21 kg fodder/kg b. w., the fodder consumption for the control group being of 2,40 kg fodder/kg b. w., significantly higher than that for the groups E1 and E2. The biochemical blood exam revealed a significant reduction of serum triglycerides in the experimental groups. Histological exam revealed a significant increase of lymphoid populations associated with digestive tract mucosa in the experimental groups.

Key words: Chickens, Claviceps purpurea, Glucans, Productive and immune effects.

INTRODUCTION

Glucans are polymers of glucose, being major structural components of cell's wall in fungi, yeasts, bacteria, cereals etc. Beta-glucans with 1,3- and 1,6-glycosidic binds have also many pharmacological properties involved in immune and unspecific protection of plants and animals (S. Bell, V. Goldman, B. Bistrian et. al., 1999; T. Yadomae, 2000). The impact of the standard diet, supplemented with glucans extracted from Claviceps purpurea, on some productive and immune parameters in broiler chickens was studied.

MATERIAL AND METHODS

The 28 days experiment was performed on 30 broiler chickens beginning from the 25th day of life. The chicks were bred in semi-intensive conditions (M. Usturoi, G. Păduraru, 2005; O. Vacaru, 2005) of natural light and ventilation (identical microclimate conditions), on saw-dust litter, being randomly arranged in three equal groups, according to their body weight. They were fed with specific commercial food, balanced in nutrient principles (P. Halga, 2000), (tab. 1).

The glucanic extracts (furnished by Biological Research Institute, Iaşi) were added daily in the food, 10% diluted in distillated water, as follows:

group E1 – 20 mg/kg body weight;

group E2 - 40 mg/kg body weight.

The chickens were weighed periodically (every week), and measurements of their total weight, their weight gain and the specific fodder consumption were performed.

At the end of the experiment, the chicks were slaughtered and hematological, biochemical blood exams and histological exam of the internal organs (liver, kidneys, spleen, Fabricius' bursa, thymus, segments of the digestive tube) were performed. The histological exams were performed after their fixation in formaldehyde of 10%, Bouin liquid, paraffin embedding and after sectioning it to 5 μm, then

stained from Giemsa, HEA, HEV and PAS methods. The histological structure of the internal organs and the presence of the lymphoid infiltrations were evaluated.

The biochemical exam of the blood serum determined (with EOS 880 plus spectrophotometer analyzer) the following parameters: ALT – alanine aminotransferase, TP – serum total protein, BUN – blood urea nitrogen, ALB – albumin, CRTN – creatinine, TGL – triglyceride, UA – uric acid.

Table 1

Composition of the fodder administered to the chickens

Total Protein	%	20,30
Fat	%	4,40
Mineral salts	%	6,30
Cellulose	%	4,10
Calcium	%	0,84
Sodium	%	0,16
Vitamin A (retinol – E672)	UI/kg	12.300,00
Vitamin D3 (calciferol – E671)	UI/Kg	2.910,00
Vitamin E (alpha-tocopherol)	mg/kg	79,10
Copper (copper II sulphate E4)	Mg/kg	18,00
Metionine	%	0,54
Metionine + Cystine	%	0,92
Humidity	%	11,30
Robenidine Hydrochloride (E758)	mg/kg	33,00

RESULTS AND DISCUSIONS

The evolution of the body weight during the experiment is shown in table 2.

Table 2

The evolution of the weight gain and of the specific fodder consumption

Group	Initial weight, t_0 Group average, g	Week 1, g	Weight gain, g	Week 2, g	Weight gain, g	Week 3, g	Weight gain, g	Week 4, g	Total weight gain, g	Difference from the control group	Specific consumption
E**1**	1392	1550	**158**	1706	**156**	1850	**144**	2088	**696**	**+ 52**	**2,21**
E**2**	1452	1660	**208**	1814	**154**	2015	**201**	2180	**728**	**+ 84**	**2,11**
Control	1532	1568	**36**	1735	**167**	1930	**195**	2176	**644**	**0**	**2,40**

The results from table 2 show that all the experimental groups reached higher weight gains than the control group.

The group E1 (treated with 20 mg of glucanic extract/kg body weight) reached a weight gain of 696 g, this representing a significant difference in comparison with the control group (+ 52 g). The group E 2 (receiving 40 mg of glucanic extract/kg body weight) reached a weight gain of 728 g, also a significant difference in comparison with the control group (+ 84 g). At the end of the experiment, the control group reached a weight gain of 644 g.

There were no morbidity or mortality losses throughout the experiment, which proves the fact that the administered extracts had a positive effect on the chickens' health.

The hematological blood exams registered parameters within the physiological limits (Aiello Susan, E. Mays, 1998; Pavel G., Chelaru A., 2001) without significant differences between the control group and the experimental ones. The biochemical blood exam revealed a significant reduction of serum triglycerides in the experimental groups (tab. 3).

Table 3

The Results of the Biochemical Blood Analysis

Group	ALT	TP	BUN	ALB	CRTN	TGL	UA
UM	UI/L	g/dl	mg/dl	g/dl	mg/dl	mg/dl	mg/dl
E1	12,71	3,985	24,44	2,055	0,659	156,1	7,441
E2	12,12	3,881	22,69	2,161	0,648	152,9	7,981
Control	14,45	3,839	18,63	2,072	0,878	175,9	8,013

Legend: ALT – alanine aminotransferase, TP – serum total protein, BUN – blood urea nitrogen, ALB – albumin, CRTN – creatinine, TGL – triglyceride, UA – uric acid.

The quantity of fodder administered was weighed every day, being the same for all groups. At the end of the experiment the average fodder consumption was of 1540 g for each chicken, and the difference in the specific consumption was felt only at the level of the different weight gain.

The specific fodder consumption was of 2,11 kg fodder/kg b. w. gain in group E2, slightly higher in group E1, that is 2,21 kg fodder/kg b. w. gain, the fodder consumption for the control group being of 2,40 kg fodder/kg gain, significantly higher than that for the groups E1 and E2.

The histological structure of internal organs show a significant increase of lymphoid populations associated with digestive tract mucosa in the experimental groups (fig. 1, 2, 3, 4).

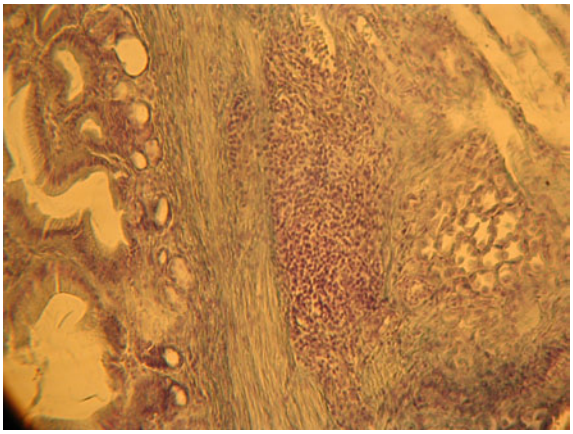

Fig. 1. Proventriculus of chickens, 42 days old (E2 group). Periglandular lymphoid agglomeration. Giemsa stain; x 100

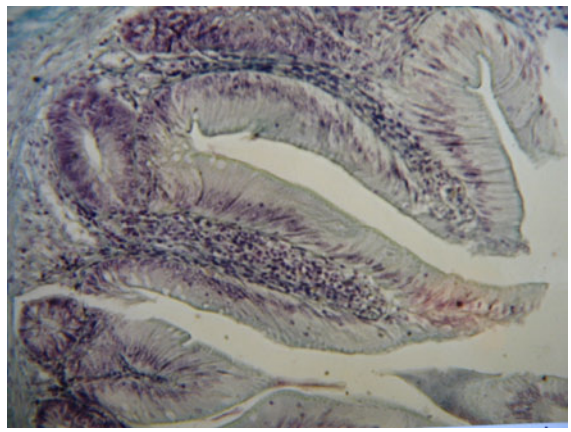

Fig. 2. Duodenum of chickens, 42 days old (E1 group). Periglandular, intraepithelial and into the vilosities axes diffuse lymphoid infiltrations. HEV stain; x100

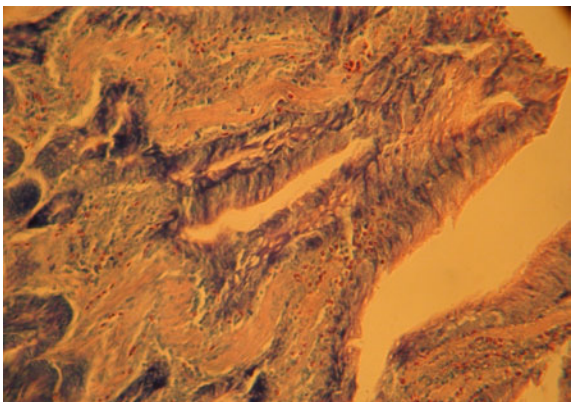

Fig. 3 Jejunum of chickens, 42 days old (E2 group). Lymphoid infiltrations in lamina propria of mucosa. Giemsa stain; x 100;

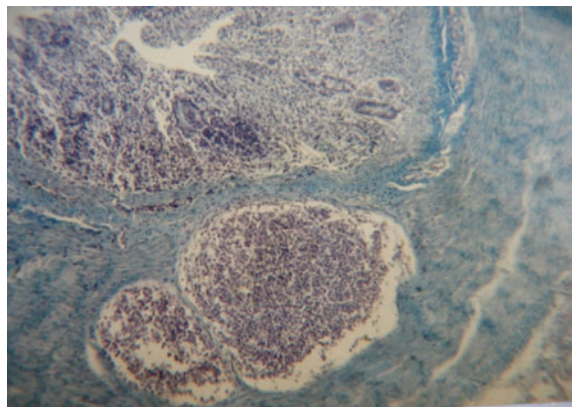

Fig. 4. Cecum of chickens, 42 days old (E1 group). Lymphoepithelial agglomerations in lamina propria of mucosa, covered with cubic simple epithelium. Lymphoid folicles in submucosa (E1 group). Giemsa stain; x 100

CONCLUSIONS

1. The glucanic extracts administered to the broiler chicks had a favorable effect on the weight gain and on the specific consumption. The group E1 (treated with 20 mg of glucanic extract/kg body weight) reached a weight gain of 696 g, this representing a significant difference in comparison with the control group (+ 52 g). The group E 2 (receiving 40 mg of glucanic extract/kg body weight) reached a weight gain of 728 g, also a significant difference in comparison with the control group (+ 84 g).

2. The specific fodder consumption was of 2,11 kg fodder/kg b.w. gain in the group E2, slightly higher in the group E1, that is 2,21 kg fodder/ kg gain, the fodder consumption for the control group being of 2,40 kg fodder/kg gain, significantly higher than that for the groups E1 and E2.

3. The biochemical blood parameters were situated within the physiological limits in all groups, but a significant reduction of serum triglycerides in the experimental groups was observed.

4. Histological exam revealed a significant increase of lymphoid populations associated with digestive tract mucosa in the experimental groups.

REFERENCE

1. Aiello, Susan, E.; Mays, Asa - The Merck Veterinary Manual, 1998, 8-th ed., Merck Co, Whitehouse Station, USA, p. 96.

2. Bell, S.; Goldman, V. M.; Bistrian, B.R. et al. Effect of beta-glucan from oats and yeast on serum lipids. Crit. Rev. Food. Sci. Nutr., 1999, 39 (2), p. 189-202.

3. Bruneton, J. Plante toxiques. Vegetaux dangereux pour l'homme et les animaux. Lavoisier Tec. Doc., Paris, 1996, p. 88-92.

4. Halga, P. Animal Nutrition, 2000. Ed. Coressi, Iaşi, p. 53.

5. Pavel, G.; Chelaru, A. Animal Physiology, 2001, Ed. Venus, Iaşi, p. 68-88.

6. Usturoi, M. G.; Păduraru, G. Bird grow technology, 2005. Ed. Alfa, Iaşi, p. 123-128.

7. Vacaru, O. I. Avicultural tratat, 2000-2005,Vol. I-III, Ed. Ceres, Bucureşti, p. 88-94.

8. Young, B.; Heath, J. W. Functional Histology. 2000. Fourth Ed., Churchill Livingstone; Sydney, p. 144.

9.Whiteman, C. E.; Bickford, A. A. Avian Diseases Manual, 1989, 3rd ed., p. 56-77.

10.Yadomae, T. Structure and biological activities of fungal â-1,3-glucans. 2000, 120, p. 413-431.

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