

Dietary Effect of Enzyme Mixture in Diet on Broiler Performance

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ABSTRACT— *Two hundred Cobb 500 chickens were used as a material in the study. Animals were divided into four groups, control and three experimental groups fed with three different levels of enzyme cocktail (0,05, 0,1 u 0,15%) for 42 days. Diets were formulated to meet nutrient requirements of this chicken category with no differences regarding the content of energy and proteins.*

At the end of the experiment body weight, weight gain, feed conversion ratio and total serum triglycerides level were measured.

As a result, it was concluded that the supplementation of an enzyme cocktail expressed no significant effects on production performances without matter of its concentration. Enzyme levels of 0,1 and 0,15 significantly increased triglyceride content in broilers blood serum.

Keywords— broiler, enzymes, bodyweight, weight gain, feed conversion, triglycerides

1. INTRODUCTION

Effects of enzymes incorporation into the feed mixtures include digestion of feed components that cannot be hydrolyzed by endogenous enzymes, removal of anti-nutritional factors and improvement in utilization of the feed [1, 5, 11, 21].

Various researchers reported that by application of enzymes, production performances can be improved [10, 11], while some other researchers did not confirm such results [13, 18, 19]. The nonstarch polysaccharides (NSP) a fraction of the soybean meal with reduced digestibility creates sticky and droppings and wet surroundings. [7], that leads to favorable conditions for diseases [15, 17]. Additionally, soybeans' nonstarch polysaccharides decrease the digestibility of other nutritive matter such as lipids, amino acids, and starch [9].

Many researchers concluded that use of dietary enzymes can improve digestion [3, 5] by alleviating the antinutritional effect, controlling gut microflora populations [4], and reducing the viscosity on intestinal tract content [16]. Generally, It can be concluded that effect of such additives depends on the level and feed components quality included into the mixture, level and type of enzymes, as well as on farm conditions [15].

2. MATERIAL AND METHODS

Two hundred Cobb 500 chickens were used as the material in the study. Animals were divided into four groups, control (K) and three experimental groups (T1, T2 and T3) fed with three different levels of an enzyme cocktail containing, a mixture of protease, cellulase, pentosanase, alpha galactosidase and amylase (0,05, 0,1 u 0,15%) for 21 days.

Diets were formulated to meet nutrient requirements of this chicken category with no differences regarding the content of energy and proteins (Table 1).

Table 1. Content of diet mixtures used in the experiment

Component	%
Corn	62,00
Soybean meal	19,00
Fish meal	6,00
Sunflower meal	9,00
Limestone	1,50
Dicalcium phosphate	1,00
Salt	0,50
Premix	1,00
Total	100
Crude proteins	21,52
Crude oil	4,21
Crude cellulose	2,77
ME(Mj/kr)	12,35

At the end of the experimental feeding period 10 blood samples from each group of chickens were taken for analysis of cholesterol and triglyceride. Blood samples were taken from the wing vein and transferred into non-anticoagulant centrifuge tubes and left for about 60 minutes and then centrifuged to separate serum. The triglycerides were analyzed by using automatic chemistry system (Vitros DT60 II, Vitros DTE II, DTSC II Chemistry System, Johnson and Johnson Clinical Diagnostics Inc., New York, USA).

The data were statistically analyzed by analysis of variance and testing by Tukey-Kramer Multiple Comparisons Test using software Graphpad Instat.

3. RESULTS AND DISCUSSION

In general, enzyme supplementation improved productive performance of birds fed corn-soybean based diets. At the end of the trial, birds fed the enzyme-supplemented diets expressed better productive results, but regarding the body weight of experimental chickens (Table 2) significant differences were not found ($P>0.05$). Values of body weights at three weeks of age ranged from 728 to 737.8 g.

Table 2. Body weight of experimental chickens after three weeks (g)

Group	\bar{x}	Sd	Se	C.V.	Index %
K	728.00	48.60	7.09	6.68	100.00
T1	732.00	47.36	6.77	6.47	100.55
T2	737.80	60.55	8.74	8.21	101.35
T3	735.40	54.23	7.75	7.37	101.02

Table 3. Daily weight gain of chickens during three weeks (g)

Group	\bar{x}	Sd	Se	C.V.	Index %
K	32.52	2.32	0.34	7.13	100.00
T1	32.70	2.27	0.32	6.93	100.55
T2	32.99	2.88	0.42	8.73	101.45
T3	32.86	2.60	0.37	7.91	101.05

The inclusion of the enzyme did not ($P>0.05$) affect the daily weight gains of experimental birds, no matter of enzyme concentration in diets (Table 3). Daily weight gains of experimental chickens stayed within a normal range with a small difference that is notable only between control and the group of chickens fed diet containing 0.1 % of enzyme cocktail.

Table 4. Feed conversion and mortality

Group	Feed conversion ratio (kg)	Mortality (%)
K	1.92	6,00
T1	1.88	2,00
T2	1.97	4,00
T3	1.87	2,00

Although better weight gain was obtained in T2 group, the worse feed conversion ratio coefficient was registered in that group of chickens 1.97 kg (Table 4), together with 4% mortality. The highest amount of enzyme cocktail decreased the amount of feed consumed per one kilogram of weight gain.

Table 5. Serum triglycerides level (mmol/l)

Group	\bar{x}	Sd	Se	C.V.	Index %
K	1.28	0.02	0.00	1.17	100.00
T1	1.31	0.02	0.01	1.45	102.34
T2	1.35**	0.01	0.00	0.96	105.47
T3	1.37**	0.04	0.01	2.77	107.03

** $P<0.01$

Inclusion of enzyme in broiler diets at three levels had no significant effect on performance of growing broiler chickens, which was in agreement with findings of other researchers [2, 6, 15]. Contrary to our results, Jackson et al [14] and Zhou et al, [22] found that enzymes significantly improve broiler performance. Similarly, Hajati et al [12] reported that enzymes improved performance when supplemented with corn-soybean diets but interestingly, increased significantly serum triglycerides level, which supports our results regarding that parameter (Table 5).

The same authors explains that exogenous enzymes may improve nutrient digestibility by supplying enzymes that the

chicks cannot produce enough and by saving nutrients and energy needed for synthesis of endogenous enzymes, which makes nutrients and energy free for other purposes.

This could explain increased level of triglycerides in our research, but still there are differences in regard to other parameters. Anyway, finally we accept the view of Café and his coworkers [8] who say that effect of additives depends on the level and feed components quality included into the mixture, level and type of enzymes, as well as on unique farm conditions [15].

4. CONCLUSIONS

The study showed that dietary addition of an enzymatic complex had no effect on broiler production abilities. Body weight gain, feed consumption and feed conversion ratio stayed unaffected by enzyme cocktail supplementation. However, serum triglycerides level was significantly increased, which suggests that birds fed the diets supplemented with enzymes obtained a greater amount of net energy from their diets.

Finally, more research is needed to support these findings, with precise analysis of feed components, together with an analysis of exact farm conditions.

5. REFERENCES

- [1] Annison, G., and M. Choct, 1991. Antinutritive activities of cereal non-starch polysaccharides in broiler diets and strategies for minimizing their effects. *World's Poultry Sci.* 47:232–242. z
- [2] Arash A. 2013. Effect of hemicell enzyme on the performance, growth parameter, some blood factors and ileal digestibility of broiler chickens fed corn/soybean-based diets. *Journal of Cell and Animal Biology* Vol. 7(7), pp. 85-91.
- [3] Bedford, M. 1996. The effect of enzymes on digestion. *J. Appl. Poult. Res.* 5:370–377.
- [4] Bedford, M. R. 1996. Interaction between ingested feed and the digestive system in poultry. *J. Appl. Poult. Res.* 5:86–95.
- [5] Bedford, M. R., and H. Schulze, 1998. Exogenous enzymes for pigs and Poultry (Review). *Nutr. Res. Rev.* 11:91-114.
- [6] Biswas T, Mandal L, Sarker SK. 1999. Studies of enzymes supplementation and herbal preparation at different levels of energy on the performance of broilers. *J. Interacademic* 3: 53-58.
- [7] Boling, S. D. , and J. D. Firman. 1997. Rendered by-products as soybean meal replacement in turkey rations. *J. Appl. Poult. Res.* 6:210–215.
- [8] Café M.B., Borges C.A., Frits C.A., Waldroup P.W. 2002. Avizyme improves performance of broilers fed corn-soybean meal-based diets. *J. Appl. Poultry Res.*, 2002, 11, 29-33.
- [9] Choct, M. , and G. Annison. 1992. Anti-nutritive effect of wheat pentosans in broiler chickens: Role of viscosity and gut microflora. *Br. Poult. Sci.* 33:821–834.
- [10] Cmiljanić R., Sretenović LJ., Trenković S., Marinkov G. 2001. Systems of poultry nutrition and their effect on production traits and quality of product. *Biotechnology in Animal Husbandry*, Vol.17 (5-6) 179-185.
- [11] Cowieson, A. J., M. R. Bedford, and V. Ravindran. 2010. Interactions between xylanase and glucanase in maize-soy-based diets for broilers. *Br. Poult. Sci.* 51:246–257
- [12] Hajati H. 2010. Effects of Enzyme Supplementation on Performance, Carcass characteristics, Carcass Composition and Some Blood Parameters of Broiler Chicken. *Am. J. Anim. Vet. Sci.* 5 (3): 221-227.
- [13] Iji, P.A., Khumalo, S. Slippers, R.M. Gous, (2003): Intestinal function and body growth of broiler chickens on diets based on maize at different temperatures and supplemented with a microbial enzyme. *Repr. Nutr. Dev.*, 43: 77-90.
- [14] Jackson ME, Geronian K, Knox A, McNab J, McCartney E (2004). A dose-response study with the feed enzyme β -mannanase in broilers provided with corn-soybean meal based diets in the absence of antibiotic. *Poult. Sci.* 83: 1992-1996.
- [15] Lalić N., Milošević B., Spasić Z., Jašović B. 2013. Efekti korišćenja enzima u tovu pilića na proizvodne rezultate. XVII Savetovanje o biotehnologiji. Zbornik radova, vol 18(20), 439-443.
- [16] Malathi, V. , and G. Devegowda. 2001. In vitro evaluation of nonstarch polysaccharide digestibility of feed ingredients by enzymes. *Poult. Sci.* 80:302–305.
- [17] Mayne, R. K. , R. W. Else, and P. M. Hocking. 2006. What causes foot pad dermatitis in growing turkeys? Pages: 33–35 in *Proc. 29th Tech. Turk. Conf.*, Macclesfield, Cheshire, UK. Turkeys, Leyburn, UK.
- [18] McNab, J.M., Bernard, K. 1997. The effect of proteases (Vegpro) on the true metabolisable energy (TMEn) and true digestibility of amino acids in soybean meal. *Poultry Science*, 76, 1, 133.
- [19] Perić L., Kovčín S., Stanačev V., Milošević N. 2002. Effect of enzymes on broiler chick performance. *Buletinul USAMV*, Vol. 57, 245-249, Cluj-Napoca, Romania.
- [20] Saleh F., Tahir M., Ohtsuka A., Hayashi K. 2005. A mixture pure cellulase, hemicellulase and pectinase improves broiler performance. *Brit. Poultry Sci.*, 2005, 46, 602-606.

- [21] Sheppy, C., 2001. The current feed enzyme market and likely trends. In: M. R. Bedford and G. G. Partridge. *Enzymes in Farm Animal Nutrition*. CABI Publishing, pp. 1- 10.
- [22] Zhou, Y., Z. Jiang, D. Lv, and T. Wang. 2009. Improved energyutilizing efficiency by enzyme preparation supplement in broiler diets with different metabolizable energy levels. *Poult. Sci.* 88:316–322.