

EFFECT OF ENZYMES ON PERFORMANCES OF BROILER CHICKENS **

L. Perić^{1*}, N. Milošević¹, M. Đukić-Stojčić¹, S. Bjedov¹, V. Rodić¹

¹Faculty of Agriculture, Novi Sad, 21000

Corresponding author:

*Lidija Perić; e-mail: lidija@polj.ns.ac.yu

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Abstract: Objective of this research was to investigate the effect of addition of enzyme complex to diets of different nutritive value on performance of broiler chickens. In this trial 1200 chickens of Cobb 500 hybrid divided into 4 treatments with 8 repetitions were used: 1. Positive control; 2. Positive control with addition of 0,02% of enzyme complex; 3. Negative control (contains 0,3 MJ of energy, 0,1% of accessible P and 0,1% Ca less compared to group 1); 4. Negative control with addition of 0,02% of enzyme complex. Application of enzyme preparation resulted in positive effects on gain and feed conversion, regardless if it was added to standard mixtures or mixtures of diminished nutritive value. Economical analysis of obtained results showed that improvement realized by application of enzyme preparation exceeds costs of its application.

Key words: enzymes, broilers, gain, conversion

Introduction

Adding of enzymes into mixtures for broiler nutrition is applied with purpose to increase the efficiency of production of poultry meat. This is especially interesting if enzymes are used which enable use of feeds of lower nutritive value. Numerous authors have established that by application of enzymes production performances can be improved up to 10% (*Bergh et al., 1999., Cowieson et al., 2000., Cmijanić et al., 2001*), whereas in some papers the positive effect of enzymes wasn't registered (*McNab and Bernard, 1997; Perić et al., 2002; Iji et al., 2003*). Obviously positive effect of these additives depends on the quantity and quality of feeds included into the mixture, used level of energy and type of enzymes, as well as fattening conditions (*Acamovic, 2001*). Results obtained recently, indicate that the best effect is realized by use

of two or more enzymes in food (*Silversides and Bedford, 1999; Chesson 2001., Wu et al. 2003*). Therefore, new combinations of enzymes are being constantly investigated, as well as their optimal doses, in order to realize positive financial effect by increase of feed utilization.

Objective of this research was to investigate the effect of addition of enzyme complex into mixtures of different nutritive value on performances of broiler chickens.

Material and methods

Trial was carried out on experimental farm of the Faculty of Agriculture in Novi Sad. In the trial 1200 chickens were included, divided according to method 4 groups x 8 repetitions. Each repetition consisted of floor box with 38 Cobb 500 hybrid chickens. During trial chickens were fed - *ad libitum*. In table 1 the composition of trial mixtures is presented.

Experimental treatments were formed in the following way:

1. (PK) Food not supplemented by enzymes – positive control
2. (PK+EK) Positive control with addition of 0,02% of enzyme complex
3. (NK) Food containing lower level of nutritious substances (by 0,3 MJ less energy, by 0,1% less accessible P and by 0,1% less Ca) – negative control
4. (NK+EK) Negative control with addition of 0,02% of enzyme complex.

Used enzyme supplement (Allzyme® SSF, Alltech, Inc) is natural preparation which contains enzyme complex (protease, amylase, β -glucanase, xylanase, pectinase, cellulase and phytase). Control of body weight and feed utilization was done once a week, and mortality was recorded daily. At the end of fattening production index was calculated according to formula:

$$\frac{\text{Body weight (g)} \times (100 - \text{mortality (\%)})}{\text{Conversion} \times \text{duration of trial (days)}} \times 100$$

Results were processed using MANOVA test, as well as LSD test in comparison of statistical significance of established differences between groups, using program STATISTIKA 6.

Tabela 1. Sastav hrane
Table 1. Feed composition

Komponente, % Feed ingredients,%	Starter/Starter (1-21 dan/day)		Grover/Grower (22-35 dana/days)		Finišer/Finisher (36-42 dana/days)	
	Pozitivna kontrola Positive control (PK)	Negativna kontrola Negative control (NK)	Pozitivna kontrola Positive control (PK)	Negativna kontrola Negative control (NK)	Pozitivna kontrola Positive control (PK)	Negativna kontrola Negative control (NK)
Kukuruz/Corn	47,5	50,6	53,0	56,3	59,3	62,7
Sojina sačma/ Soybean meal	27,0	28,0	20,6	19,5	20,0	20,6
Sojin griz/ Full fat soya	17,0	14,7	18,0	18,0	12,0	10,0
Ulje/ Oil	4,0	2,6	3,8	2,0	4,0	2,5
Kreda/ Chulk	1,7	1,6	1,7	1,7	1,7	1,6
Monokalcijum fosfat/ MCP	1,3	1,0	1,4	1,0	1,5	1,1
So/ Salt	0,3	0,3	0,3	0,3	0,3	0,3
Metionin/ Methionine	0,2	0,2	0,2	0,2	0,2	0,2
Premiks/ Premix	1,0	1,0	1,0	1,0	1,0	1,0
Hemijski sastav / Chemical composition						
Sirovi protein/ Crude protein (%)	22,0	21,78	19,98	19,76	18,18	17,79
ME MJ/kg	13	12,66	13,20	12,9	13,27	12,97
Lizin/Lysine (%)	1,30	1,28	1,15	1,12	1,0	0,98
Metionin/Methionine (%)	0,54	0,54	0,52	0,52	0,49	0,49
Kalcijum/ Calcium (%)	0,98	0,89	0,99	0,91	0,99	0,88
Ukupan P/ Total P (%)	0,68	0,60	0,68	0,59	0,68	0,59

Results and discussion

Average body weight of chickens showed significant differences between groups already in the first week of age, when chickens fed negative control had the lowest body weight and this effect remained until the end of trial. Addition of enzymes had considerable positive effect on gain when added to positive and negative control.

Tabela 2. Prosečna telesna masa pilića, g
Table 2. Average body weight of chickens, g

Uzrast Age	GRUPA / GROUP			
	PK	PK+EK	NK	NK+EK
1 nedelja / week	139 ± 5,24 ^B	142 ± 5,53 ^A	138 ± 4,41 ^B	145 ± 5,22 ^A
2 nedelje / weeks	405 ± 17,2 ^A	406 ± 17,8 ^A	389 ± 13,2 ^B	395 ± 11,7 ^B
3 nedelje / weeks	773 ± 68 ^{AB}	781 ± 76 ^A	739 ± 67 ^C	761 ± 58 ^B
4 nedelje / weeks	1211 ± 65 ^A	1220 ± 88 ^A	1171 ± 70 ^B	1197 ± 75 ^A
5 nedelja / weeks	1626 ± 120 ^A	1649 ± 139 ^A	1586 ± 126 ^B	1647 ± 112 ^A
6 nedelja / weeks	2073 ± 218 ^{BC}	2160 ± 238 ^A	2066 ± 218 ^C	2105 ± 246 ^B
Izvor varijabilnosti/ Source of variation	F vrednost / F value			
Hrana/Feed	4,877*			
Enzim/enzyme	30,816**			
Interakcija/Interaction	4,395*			

Vrednosti su prikazane kao $X \pm Sd$; Values are presented as $X \pm Sd$; * $P < 0,05$; ** $P < 0,01$

^{A-B}Srednje vrednosti sa različitim slovom razlikuju se signifikantno ($P < 0,05$)

^{A-B}Average value with different superscript differ significantly ($P < 0,05$)

Addition of enzyme preparation in this trial reflected also on efficiency of feed utilization. The best conversion was established in group PK+EK, whereas the enzyme preparation added to negative control also increased the level of feed utilization and brought it to the level of positive control group (PK).

Applied enzyme preparation had no effect on mortality of chickens in the trial. The lowest mortality was established in positive control, but in all groups it was below 5%, which is considered as technologically acceptable. Calculated production index indicated that the best result was realized by addition of enzymes in the group called positive control, which means that by addition of enzymes production performances can be improved even if standard mixtures are used. In group where contents of energy, calcium and phosphorus were diminished, enzyme supplement enabled realization of results at the level of positive control.

Tabela 3. Proizvodni parametri i cena hrane po kg žive mase
Table 3. Production parameters and cost of feed per kg of body weight

Parametar Parameter	GRUPA/ GROUP			
	PK	PK+EK	NK	NK+EK
Završna telesna masa / Final body weight, kg	2073	2160	2066	2105
Konverzija hrane/ Feed conversion	1,96	1,93	1,99	1,96
Mortalitet / Mortality rate, %	2,3	4,0	3,3	4,0
Proizvodni indeks / Productivity index	246	256	239	245
Odnos cena hrane /Relative cost of feed,%	100,0 0	101,29	96,88	98,17
Cena hrane po kg žive mase/ Cost of feed per kg of body weight (Eur/kg)	0,722	0,715	0,702	0,696

In regard to positive economical effect, it is obvious that increase of cost of feed occurring because of the addition of enzyme complex, was annulled through increase of body weight of chickens and improved feed conversion. In this way, cost of food expressed per kg of live weight of produced chickens was lower in groups where enzymes were added (PK+EK and NK+EK) compared to positive and negative control.

Positive effect of addition of enzymes on gain of chickens was established also by *Charlton (1997)*, *Scutte and Pereira (1998)* and *Chesson (2001)*. Sated authors, however, emphasize that by application of enzymes positive results are achieved, especially in very young chickens, whereas in older categories these positive effects are less expressed. Contrary to these results, *Perić et al. (2002)* did not record positive effect of enzyme addition in mixtures with lower level of energy and protein. *McNab and Bernard (1997)* established that addition of enzyme mixture Vegpro increased amino acids digestibility coefficient by approx. 9%, but expected positive effect on broiler performance in some of their trials did not occur. Stated results confirm the attitude that application of enzymes in nutrition of fattening chickens is complex question and it depends on numerous factors which are not all always under our control.

Conclusion

By applying enzyme preparation positive effects on gain and feed conversion were realized, whether it was added to standard mixtures or mixtures of diminished nutritive value. Economical analysis of obtained results showed

that improvements induced by enzyme preparation exceed the costs of its application, which enables its wide use in production.

Efekat enzima na rezultate tova brojlerskih pilića

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Rezime

Cilj ovog istraživanja je bio da ispita efekat dodavanja kompleksa enzima u smeše različite nutritivne vrednosti na performanse brojlerskih pilića. U ogled je uključeno 1200 pilića hibrida Cobb 500 koji su raspoređeni u 4 tretmana sa 8 ponavljanja: 1. Pozitivna kontrola 2. Pozitivna kontrola uz dodatak 0,02% enzimskog kompleksa 3. Negativna kontrola (sadrži 0,3 MJ energije, 0,1% usvojivog P i 0,1% Ca manje u odnosu na grupu 1) 4. Negativna kontrola uz dodatak 0,02% enzimskog kompleksa. Primenom enzimskog preparata ostvareni su pozitivni efekti na prirast i konverziju hrane, bilo da se on dodaje u standardne smeše ili u smeše smanjene nutritivne vrednosti. Ekonomska analiza dobijenih rezultata je pokazala da poboljšanja koja enzimski preparat donosi prevazilaze troškove njegove primene

Ključne reči: enzimi, brojleri, prirast, konverzija

References

- ACAMOVIC, T. (2001): Enzymes for poultry. *World's Poultry Science Journal*, 57, 225-242.
- CHESSON A. (2001): Non-starch poly-saccharide degrading enzymes in poultry diets. Influence of ingredients on selection of activities, *World's Poultry Science Journal*, Vol. 57, No3, 251-263.
- CMILJANIĆ R., SRETENVIČ LJ., TRENKOVSKI 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.
- COWIESON, A.J., ACAMOVIC, T., BEDFORD, M.R. (2000): Enzyme supplementation of diets containing *Camelina sativa* meal for poultry. *British Poultry Science* 41: 689-690
- 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.

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- 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 (Abst.)
- PERIĆ L., KOVČIN S., STANAČEV V., MILOŠEVIĆ N.(2002): Effect of enzymes on broiler chick performance. *Buletinul USAMV*, Vol. 57, 245-249, Cluj-Napoca, Romania.
- SCHUTTE, J.B., PEREIRA, S. (1998) Effect of an Enzyme preparation (Vegpro) on broiler chick performance. In: *Alltech's European Middle Eastern & African Lecture Tour*, pp. 95-102
- SILVERSIDES, F.G., BEDFORD, M.R. (1999) Effect of pelleting temperature on the recovery and efficacy of a xylanase enzyme in wheat-based diets. *Poultry science* 78: 1184-1190
- WU, Y.B., V. RAVINDRAN AND W.H. HENDRIKS, (2003): Effects of microbial phytase produced by solid-state fermentation, on the performance and nutrient utilization of broilers fed maize- and wheat-based diets. *Br. Poult. Sci.*, 44: 710-718.