SHORT NOTE

EFFECTS OF ENZYME AND FEEDING SYSTEM ON TURKEY PERFORMANCE

EFECTO DEL USO DE UNA ENZIMA Y SISTEMA DE ALIMENTACIÓN SOBRE PRODUCTIVIDAD EN PAVOS

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ADDITIONAL KEYWORDS

Body weight. Carcass weight. Corn-soybean diets.

PALABRAS CLAVE ADICIONALES

Peso corporal. Peso canal. Dietas maíz-pasta soya.

SUMMARY

The aim of the present study was to evaluate an enzyme preparation with protease, amylase, cellulase, beta-galactosidase and pentosanase activity on productive and carcass performance of turkeys under a confined or semi-confined system. Eight hundred White Diamond turkeys (nine weeks old, 5084 g body weight) were randomly assigned to a 2 x 2 factorial arrangement: factor system (confined and semi-confined) and enzyme (0 and 0.1% as DM of total diet) four treatments, 5 replicas per treatment. Weight gain (WG), live weight (LW), feed intake (FI), forage intake (FGI), and carcass yield (CY) were recorded weekly for eight weeks. Turkeys under semi-confined system had higher final body weight, total gain, average daily gain, hot and cold carcass weight as well as less feed conversion than those under confined system. Hot and cold dressing was similar in turkeys under both systems. Enzyme increased final body weight, total gain, average daily gain, hot and cold carcass weight as well as reduced feed conversion ratio in turkeys under semi-confined system. Feed intake, hot and cold carcass dressing was not affected by enzymes. Enzyme preparation had a beneficial effect on growth and carcass performance of turkeys in a semi-confined system.

RESUMEN

Se evaluó el efecto de una enzima (proteasas, amilasas, celulolasas y galactosidasas) sobre la productividad y calidad de la canal en pavos en confinamiento y semi-confinamiento en la etapa de finalización. Un diseño completamente al azar con arreglo factorial 2 x 2 fue utilizado con 800 pavos White Diamond (nueve semanas de edad, 5084 g peso vivo) a los tratamientos: sistema (confinamiento y semi-confinamiento) y enzima (0 y 0,1% como % DM total de la dieta) para un total de cuatro tratamientos, 5 replicas por tratamiento, 40 pavos por réplica. La ganancia de peso (WG), peso vivo (LW), consumo de alimento (FI), consumo de forraje (FGI) y la calidad de la canal (CY) fueron registrados semanalmente por ocho semanas. Los pavos bajo el sistema de semi-confinamiento tuvieron mayor peso final, ganancia de peso total, ganancia de peso diaria, peso de la canal caliente

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y fría, así como menor conversión alimenticia que los pavos en el sistema de confinamiento. El porcentaje de la canal fría y caliente fue similar en los pavos en ambos sistemas. La enzima incrementó el peso corporal final, ganancia de peso total, ganancia diaria promedio, peso de la canal caliente y fría, así como también disminuyó la conversión alimenticia en pavos bajo el sistema de semi-confinamiento. El consumo de alimento y el porcentaje de la canal caliente y fría no fueron afectados por las enzimas. La enzima tuvo un efecto benéfico en las características de crecimiento y calidad de la canal en pavos bajo el sistema de semi-confinamiento.

INTRODUCTION

The majority of the high value protein ingredients utilized in alimentary rations for birds are from vegetable origin, they contain a large quantity of anti-nutritional factors as tannins, phytate, lectins, etc. (North and Bell, 1993; Lesson and Summers, 1997). Furthermore the carbohydrate fraction of these ingredients (i.e. soybean meal) consists mainly of non-starch polysaccharides (NSP) which are resistant to the digestive enzymes of turkeys (Bach, 2001). Many studies have reported the beneficial use of enzymes preparation containing a mix of proteases, cellulose, xilanase, glucanase and phytase in the broiler feeding, as a result of the improved nutrient digestion and absorption; live weight, daily gain, and most of the performance traits are improved (Bedford and Morgan, 1996). The objective of the present study was to determine the effects of exogenous enzymes on productive and carcass parameters of finishing turkeys on confined or semi-confined systems.

MATERIALS AND METHODS

Eight hundred White Diamond turkeys (nine weeks old, 5084 g average body weight) were used. Treatments: confined without enzyme (T1), confined with enzyme 0.1% (T2), semi-confined without enzyme (T3); and semi-confined with enzyme 0.1% (T4). Distributed in 20 pens; 40 turkeys/pen, 5 replicas/treatment. Birds under confined and semi-confined had free access to diets based in corn and soybean meal **(table I)**

Table I. *Ingredients and chemical composition of diets.* (Composición química de los ingredientes de las dietas).

Ingredient	-ENZ	+ENZ
Corn grain ground	605.67	605.57
Soybean meal (48% CP)	342.48	342.48
Vegetable oil	21.05	21.05
Iodized salt	3.93	3.93
Ground limestone	8.29	8.29
Dicalcium phosphate	8.95	8.95
DL-Methionine (98%)	0.79	0.79
L-Lysine HCL (98%)	2.25	2.25
L-Threonine	0.09	0.09
Vitamin premix[1]	5.00	5.00
Trace mineral mix[2]	1.00	1.00
Enzyme	0.00	0.10
Coban-60[3]	0.50	0.50
Total	1000.00	1000.00
Nutrient content[4]		
ME, kcal/kg	3060.00	3060.00
CP, %	22.44	22.44
Met, %	0.48	0.48
TSSA, %	0.86	0.86
Lys, %	1.39	1.39
Thr, %	0.86	0.86

ENZ= without enzyme; +ENZ with enzyme.

[1]Provides per kg of diet: vitamin A (from vitamin A acetate 16520 IU; cholecalciferol 7158 IU; vitamin E (from dl-alphatocopheryl acetate) 50 IU; vitamin B_{12} 0.022 mg; rivoflavin 13.75 mg; niacin 109 mg; pantothenic acid 30 mg; menadione (from menadione dimethylpyrimidinol) 3.8 mg; folic acid 2.2 mg; choline 1040 mg; thiamin (from thiamin mononitrate) 3.3 mg; pyridoxine (from pyridoxine HCL) 5.5 mg; d-biotin 0.181 mg; ethoxyquin 125 mg; Se 0.2 mg.

[2]Provides per kg of diet: Mn (from $MnSO_4.H_2O$) 100 mg; Zn (from $ZnSO_4.7H_2O$) 100 mg; Fe (from $FeSO_4.7H_2O$) 50 mg; Cu (from $CuSO_4.5H_20$) 10 mg; I (from $Ca(IO_3)_2.H_2O$) 1 mg.

[3]Elanco Animal Health division of Eli Lilly & Co., Indianapolis, IN 46825.

[4]Calculated from NRC (1997).

according to NRC (1997). Confined birds were kept all the time in the pen. Semi-grazing birds had daily access for 4 h to grassland in meadows with a botanical composition as follow: 30% oat, 30% barley, 30% alfalfa and 10% of native plants (*Amaranthus spp.*, *Cnidoscolus multilobus*, *Argemone platyceras*, *Mauve palviflora*, *Datura spp.*, *Melamposium divaricatum* and *Boerhaavia erect*). Samples of the grassland and diets **(table I)** were analyzed for dry mater (DM), crude protein (CP), ash, crude fiber (AOAC, 1990), and metabolizable energy. Values of lysine, methionine, calcium and phosphorus were calculated using MIXIT. Grassland had 20% DM, 16.38% CP and 24.84% FC in DM basis. Enzymes (Allzyme-Vegpro, Alltech Inc, KY. USA) was added at 0.1% on DM of total diet). According to Alltech, this enzyme preparation has protease, amylase, cellulase, beta-galactosidase and pentosanase activity. In a weekly basis for eight weeks, body weight and feed intake was recorded from each pen. Then, daily weight gain and feed conversion (feed:gain) were calculated. After the experiment was done poults were slaughtered in an authorized abattoir. Carcass characteristics were evaluated after 8 weeks of trial. Hot carcass weight was taken the same day of slaughter, then carcass was kept at 4°C, cold weight was recorded 24 hours after. Using those values, percentages of hot and cold carcass dressing were calculated. Data were analyzed using a Mixed Procedure of SAS (1999) within a factorial design (enzyme x feeding system). Treatments were fixed in model and pen was considered as a random effect. Initial body weight was tested as a covariate but it was not included in the model ($p>0.05$). Data over time were analyzed using repeated measure of SAS (1999) to test time x treatment interaction. When the interaction of the main effects (system x enzyme) was significant ($p<0.05$), LSMEANS was carried out to identify to the different averages. Differences were set at $p<0.05$.

Table II. *Daily overall growth performance of turkeys confined or semi-grazing and supplemented with a enzyme preparation*[a].
(Desarrollo productivo y de la canal de pavos bajo dos sistemas de alimentación y adición de enzima).

	Confined		Semi-confined		SEM	Significance[1]		
	-ENZ	+ENZ	-ENZ	+ENZ		System	Enzyme	Interaction
Initial BW, g	5,296	5,005	5,133	4,904	350.1	NS	NS	NS
Final BW, g	9,363	10,338	11,300	11,333	450.1	***	*	***
Total gain, g	4,067	5,333	6,167	6,429	341.9	***	*	**
Average daily gain, g	73	95	110	115	3.1	***	**	**
Intake, g DM	317	325	318	325	18.3	NS	NS	NS
Gain:Feed	4.3	3.4	2.9	2.8	0.9	***	*	*
Hot carcass weight, g	7,154	7,578	8,218	8,845	661.2	***	***	NS
Cold carcass weight, g	6,657	7,950	8,735	8,772	620.6	***	*	**
Hot carcass dressing, %	76.4	73.3	72.7	78.0	6.4	NS	NS	NS
Cold carcass dressing, %	71.1	76.9	77.3	77.4	6.0	NS	NS	NS

-ENZ= without enzyme; +ENZ= with enzyme.
[1]System: confined and semi-confined; enzyme: 0 and 0.01 %; interaction: system x enzyme; NS= not significant; *p<0.05; **p<0.01; ***p<0.001.

RESULTS

The DM intake was not affected by feeding system or enzyme addition. Turkeys under semi-confined system without or with enzyme had higher final body weight ($p<0.001$), total gain ($p<0.001$), average daily weight gain ($p<0.001$), hot and cold carcass weight ($p<0.001$) as well as less feed conversion ratio ($p<0.001$) than those under confined system **(table II)**. Hot and cold dressing percentages were similar in turkeys under both systems. Enzyme addition in turkeys under confined or semi-confined system improved total gain ($p<0.05$), average daily weight gain ($p<0.01$), feed conversion ratio ($p<0.05$), hot and cold carcass weight ($p<0.001$ and $p<0.05$ respectively). There was an interaction of feeding system x enzyme ($p>0.05$) for growth performance traits.

DISCUSSION

In this experiment was observed that live weight and daily live weight were increased with the use of the enzyme, showing a better response in animals on semi-grazing system, than those without the enzyme. Santos *et al.* (2004) tested the effect of an enzyme on turkey fed wheat based diets, and found that the enzyme supplementation improved growth performance and energy utilization of turkeys. In regard of feed intake in our study there was more forage consumption in turkeys with the use of the enzyme; feed intake in confinement was similar with or without the enzyme. There were no differences in carcass yield in turkeys either on feeding system or enzyme addition. The semi-confined system had poorly response to the enzyme addition, maybe for the presence of bacterial cellulolitic flora in the cecal sacs, like wild turkeys that mainly graze to obtain their feed (Bedford and Morgan, 1996). In conclusion the enzyme preparation had a beneficial effect on growth and carcass performance of turkeys in a semi-confined system.

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