

## DIETARY ENZYME SUPPLEMENTATION ON BROILER PERFORMANCE FROM 1 UP TO 42 DAYS OF AGE

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### ABSTRACT

Poultry feed industry has been searching for efficient enzymes to improve feed utilization. A performance trial was conducted to evaluate the effect of an endo-1,4- $\beta$ -arabinoxylanase and endo-1,4- $\beta$ -glucanase containing enzyme formulation (NSPE) in combination with various dosages of a fungal 3- phytase (Phy) in order to show in male Cobb broiler a nutritional value of the enzyme combination. Broiler were housed in floor pens from day 1 up to 42 of age and submitted to four treatments: T1 = Control diet; T2 = Negative Control (reduced by 130 kcal of AMEn; 0,10% Ca and 0,13% P avail); T3 = T2 with 50 g/T of NSPE and 500 FTU/kg Phy; T4 = T2 with 100 g/T of NSPE and 1000 FTU/kg Phy. Corn/soybean meal based mash feed was offered *ad libitum* by four phase feeding regime. After 42 days no difference was observed for feed intake ( $P > 0,12$ ). T3 and T4 were not significantly different from T1 for body weight and body weight gain, but were significantly superior to T2. Feed conversion ratio of T2 was significantly worse compared to T1, T3 and T4. Supplementation of the combinations of NSPE and fungal 3-phytase to broiler feed was able to compensate completely the nutritional deficiency of the negative control (T2).

**KEYWORDS:** Bird, NSP enzymes, performance, fungal 3-phytase

### INTRODUCTION

Approximately 90% of brazilian poultry diets are vegetable ingredients, basically corn and soybean meal. Phytic acid represents the major part of the phosphorus content present in such raw materials (Tejedor et al. 2001). Amongst others the interaction between phytic acid and proteins seems to one important reason for the reduced digestibility of protein and other nutrients compared to low phytate levels containing diets (Sebastian et al. 1997).

Poultry industries have been using enzymes to improve nutrient digestibility and increase the energy value of diets. Phytase in poultry diets have provided an increase in bioavailability of calcium and phosphorus, increase in protein digestibility and increase of metabolizable energy, which is beneficial reducing the excretion of those nutrients to the environment (Avila et al., 2010).

An important part of the carbohydrates that reach the intestine of birds are Non Starch Polysaccharides (NSPs). NSPs are not digested due to the presence of  $\beta$ -glycosidic bonds between the NSP building monosaccharides what makes them resistant from degradation by intrinsic digestive enzymes (TORRES, 2003). Supplementd NSP hydrolyzing enzymes are able to split the large NSP molecules whereby the viscosity of the digesta is reduced and digestibility as well as animal performance is consequently improved (FURLAN et al., 1997).

The objective of this study was to evaluate the combined effect of different dosages of a NSP enzymes formulation and a fungal 3-phytase on broiler performance from day 1 up to 42 of age assuming a nutritional benefit for the feed formulation.

## MATERIAL AND METHODS

A performance trial was conducted to evaluate the effect of NSP enzymes blends (NSP = endo-1,4- $\beta$ -xylanase (EC 3.2.1.8) + endo-1,4- $\beta$ -glucanase (EC 3.2.1.4) derived from *Talaromyces emersonii*) in combination with a fungal 3-phytase (EC 3.1.3.8) derived from *Aspergillus ficuum*. Day old Cobb male broiler were housed in floor pens and submitted to four treatments: T1 = Control diet; T2 = Negative Control (- 130 kcal of AMEn; - 0,10% Ca and - 0,13% P avail); T3 = T2 with 50 g/T of NSPE and 500 FTU/kg Phy; T4 = T2 with 100 g/T of NSPE and 1000 FTU/kg Phy. Diets were formulated to contain the same amount of raw material originated from vegetables. AME, Ca and P levels were attended adjusting the content of soy oil, limestone and dical-phosphate and a non-nutritive filler (Caolin). The nutritional profile is presented in Table 1. A completely randomized block arrangement was used, were block corresponded to day-old chick weight, with 10 replicates and 33 birds/replicate. Feed intake (FI), body weight (BW), body weight gain (BWG) and feed conversion ratio (FCR) were recorded. Data were submitted to statistical analysis (ANOVA), GLM, SAS™ (2008). Block (day old chick weight) and treatment effect were tested, comparing means by Tukey Test, 5%.

Table 1. Nutritional profile of experimental diets.

Nutrient	Pre-Starter	Starter	Grower	Finisher
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	T1	T2, T3, T4	T1	T2, T3, T4	T1	T2, T3, T4	T1	T2, T3, T4
AMEn, kcal/kg	2930	2800	2980	2850	3050	2920	3100	2970
Crude Protein, %	22.9	22.9	20.33	20.33	19.23	19.23	18.43	18.43
Calcium, %	0.72	0.62	0.67	0.57	0.61	0.51	0.51	0.41
Total Phosp., %	0.71	0.58	0.67	0.54	0.62	0.49	0.56	0.43
Avail. Phosp., %	0.45	0.32	0.42	0.29	0.38	0.25	0.32	0.19
Dig. Lys., %	1.30	1.30	1.18	1.18	1.04	1.04	0.97	0.97
Dig. Met+Cis., %	0.85	0.85	0.85	0.85	0.76	0.76	0.71	0.71
Dig. Threo., %	0.85	0.85	0.74	0.74	0.68	0.68	0.63	0.63

## RESULTS AND DISCUSSION

Performance data are presented in Table 2. After 42 days no difference was observed for feed intake ( $P > 0.12$ ) between all treatments. T2 showed significantly lower performance regarding to FCR compared to T1 whereas reduction of body weight gain and body weight was numerically. T3 and T4 were significantly superior to T2 regarding to all parameters except of T4 for body weight. The worse FCR of T2 in relation to all additional treatments was a consequence of lower body weight gain, as a response to the lower nutritional profile of the diet (T2). However, the fact that T3 and T4 did not differ statically from T1 indicates that the nutritional deficiency of the diets were compensated by the enzyme effect. In present study the higher phytase inclusion compared to the lower one (T3 vs T4) indicates that 500 FTU/kg were already able to balance out completely the P and Ca reduction.

Table 2. Feed intake (FI) [kg/bird], body weight (BW) [kg/bird], body weight gain (BWG)[kg/bird]and feed conversion ratio (FCR)[kg/kg] of male Cobb broiler fed from day 1 up to 42 of age.

Treatment	FI	BW	BWG	FCR
1	4,320±0,032	2,576±0,018 AB	2,516±0,015 AB	1,770±0,008 B
2	4,368±0,040	2,533±0,033 B	2,469±0,027 B	1,828±0,009 A
3	4,432±0,048	2,620±0,029 A	2,559±0,028 A	1,789±0,008 B
4	4,403±0,039	2,610±0,029 AB	2,562±0,029 A	1,764±0,017 B
Prob > F	0,1281	0,0320	0,0218	0,0001
CV, %	2,32	2,62	2,82	1,59

Means followed by distinct letter in the columns were statistically different by Tukey Test ( $p \leq 0.05$ ).

## CONCLUSION

The reduction of 130 kcal, 0.10% calcium and 0.13% available phosphorus in corn-soy based broiler diet did negatively affect broiler performance during the trial period (day 1 up to

42 of age). However the supplementation of 50 g/T of a NSP enzymes formulation combined with 500 FTU or 100 g/T of NSP enzymes associated with 1000 FTU, both a fungal 3-phytase compensated completely the nutritional suppression. Combination of the enzymes show interesting potential for optimized feed cost formulation. Further investigations are needed to evaluate more dose combinations.

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