

# Replacement of canola meal for soybean meal in female broiler diets with and without enzyme supplementation

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Three hundred and sixty female broiler chicks (Ross 308) were used in an experiment starting from 6 days of age and ending at 49 days of age. Experimental treatments were 5 substitution levels of canola meal (CM) for soybean meal (SBM) (0, 25, 50, 75 and 100%) with or without enzyme supplementation. Enzyme mixture (Endofeed®) contained  $\beta$ -glucanase and xylanase activities and was added at 400g per ton of diet. Data were analyzed in a completely randomized design in a 2\*5 factorial arrangement. The results showed that body weight gain and feed intake were significantly ( $P<0.05$ ) affected by substitution level during the starting period but not during the growing and whole periods. The effect of enzyme and interaction of substitution level and enzyme supplementation were not significant during the entire experiment. The complete (100%) replacement of CM for SBM resulted in the best feed conversion ratio (FCR). Carcass yield and percentages of breast and liver were not significantly affected by main effects and their interaction. However, abdominal fat deposition was reduced by inclusion of CM instead of SBM ( $P<0.05$ ). Plasma alkaline phosphatase activity and T3 and T4 hormone concentrations were not affected by main effects and their interaction.

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**Keywords:** broiler; soybean meal; canola meal; exogenous enzymes

## Introduction

Canola meal (CM) is a good source of protein with high quality, availability and favorable price and can be replaced for soybean meal (SBM). However, optimal utilization of this feed ingredient is often influenced by its high content of non starch polysaccharides (17.9 in CM vs 14.5% in SBM)(Meng et al., 2005). Different non starch polysaccharide hydrolyzing enzymes have been supplemented to poultry diets containing CM but the bird responses were inconsistent due to differences in the type of enzyme used, combinations of enzyme activities, the inclusion level of enzyme mixtures and the substitution level of CM in the diet.

In the present experiment, the effects of inclusion of  $\beta$ -glucanase and xylanase at different substitution levels of CM instead of SBM in broiler diets were studied.

## Material and methods

Three hundreds and sixty female broilers (Ross 308) were selected from a population of 1000 chicks. They were randomly divided in 30 groups of 10 birds and assigned to 10 treatments so that 3 groups (replicates) were allotted to each treatment. Treatments were applied in a 5\*2 factorial arrangement of treatments so that 5 levels of protein substitution (0, 25, 50, 75 and 100%) were studied at two levels (0 and 400ppm) of enzyme supplementation. Enzyme

mixture contained  $\beta$ - glucanase and xylanase activities. Dietary specifications were adopted from NRC (1994). Birds were reared on the floor pens.

The experiment was started from 6 and ended at 49 days of age. Performance data were recorded during the experiment. At 42d, blood samples were obtained from 3 birds per pen (9 birds per treatment) to measure the plasma alkaline phosphatase activity and circulatory T3 and T4 concentrations. At the end of experiment, 3 birds from each replicate (floor pen) were selected and killed for processing. Data were analyzed in a completely randomized design in a 5\*2 factorial layout.

## Results and discussion

Table 1 presents the results pertaining growth performance and carcass characteristics. The results appeared herein are interactions and main effects were only used for discussion. Body weight gain and feed intake were significantly decreased in the starting period by increase in the level of CM in the diet. However, these reductions were restored in later periods so that there were no significant differences among the treatments in whole period. Feed conversion ratio (FCR) was not influenced by substitution level and enzyme supplementation. The best FCR was obtained at complete (100%) substitution of CM in the diet.

Carcass characteristics including carcass yield, breast yield, and relative weight of liver were not influenced by substitution level, enzyme application or their interaction. However, abdominal fat pad was significantly decreased by elevating the level of CM in the diet. This finding is consistent with the results of Venalainen et al. (2003). Hydrolysis of glucosinolate products may accounts for decrease in abdominal fat deposition (Karunajewa et al., 1990).

**Table 1 The effects of experimental diets on broiler performance and carcass characteristics during 6-49d**

substitution	enzyme	Gain(g)	Feed intake(g)	FCR	Carcass yield(%)	Breast yield(%)	Liver(%)	AFD(%)
0	0	2087.5	4436.7	2.13	63.5	36.3	3.70	3.93
0	400	2231.1	4716.6	2.10	63.0	35.2	3.83	4.06
25	0	2190.4	4635.7	2.13	64.4	36.8	3.43	3.36
25	400	2157.2	4555.3	2.13	66.0	36.0	3.23	3.23
50	0	2102.8	4524.4	2.16	64.6	36.4	3.80	2.93
50	400	2165.8	4546.7	2.10	65.2	37.7	3.40	2.80
75	0	2151.9	4433.0	2.06	64.1	35.5	3.63	3.36
75	400	2054.8	4202.1	2.06	65.2	37.1	3.60	2.60
100	0	2082.7	4243.0	2.03	63.5	35.9	3.93	2.80
100	400	2190.2	4472.9	2.03	64.7	37.5	3.73	2.83
SEM		68.5	150.7	0.039	5.25	1.06	0.204	0.41

**Table 2 The effects of experimental diets on physiological criteria of broilers measured on 42d.**

Substitution level	enzyme	Plasma T4 (µg/ml)	Plasma T3 (ng/ml)	Plasma alkaline phosphatase (IU/L)
0	0	1.11	195.7	3576.7
0	400	1.20	170.7	5175.0
25	0	1.10	181.7	4775.7
25	400	1.13	135.0	3816.7
50	0	1.06	258.0	4901.7
50	400	0.90	204.3	3221.6
75	0	1.06	153.3	4757.6
75	400	1.40	158.7	5456.7
100	0	1.30	156.0	4388.3
100	400	1.00	159.3	3880.0
SEM		0.084	16.68	1134.8

Table 2 presents the physiological criteria of birds fed the experimental diets. Birds on high canola meal diets had higher plasma T4 and lower T3 concentrations though the effects were not significant. Enzyme supplementation did not influence circulatory thyroid hormone concentrations as well. T3 hormone is produced by enzymatic deiodination of T4 in peripheral organs, mainly liver (Decuypere et al., 2005). It seems that feeding high levels of CM hinder this deiodination perhaps through the inhibition of hepatic deiodinase enzyme in presence of glucosinolate products. Consequently, circulatory T4 level remained a little higher whereas T3 level dropped in birds received high CM.

Plasma alkaline phosphatase activity did not influence by inclusion of CM in the diet and enzyme supplementation.

In conclusion, CM can be replaced for SBM in broiler diets without adverse effects on growth performance, carcass characteristics and physiological function.

## References

- DECUYPERE, E., VAS AS, P., VAN DER GEYTEN, S., and DARRAS, V. M.** (2005) Thyroid hormone availability and activity in avian species: A review. *Domestic Animal Endocrinology* **29**: 63-77.
- KARUNJEWAL, H., IJABUJI, E. G., and REECE, R. L.** (1990) Effect of dietary level of rapeseed meal and polyethyleneglycole on the performance of male broilers. *Poultry Science* **31**: 345-555.
- MENG, X., SLOMINSKI, B. A., NYACHOTI, C. M., CAMPBELL, L. D., and GUENTER, W.** (2005) Degradation of cell wall polysaccharides by combinations of carbohydrase enzymes and their effect on nutrient utilization and broiler chicken performance. *Poultry Science* **84**: 37-47.
- NATIONAL RESEARCH COUNCIL** (1994) Nutrient requirements for poultry. 9 Rev. Ed. National Academy Press. USA.
- VENALAINEN, E., VALAJA, S., PERTTILA, S., and TUPASELA, T.** (2003) Feeding strategies for broilers in organic production. *Proceedings of 14<sup>th</sup> European Poultry Nutrition Conference* Pp. 70-71.