The Pharma Innovation Journal 2022; SP-11(11): 2335-2339

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; SP-11(11): 2335-2339

www.thepharmajournal.com
Received: 26-09-2022
Accepted: 30-10-2022

R Kavitha
Animal Feed Analytical and Quality Assurance Laboratory, Veterinary College and Research Institute, Namakkal, Tamil Nadu, India

D Chandrasekaran
Animal Feed Analytical and Quality Assurance Laboratory, Veterinary College and Research Institute, Namakkal, Tamil Nadu, India

K Rajendran
Animal Feed Analytical and Quality Assurance Laboratory, Veterinary College and Research Institute, Namakkal, Tamil Nadu, India

Corresponding Author:
R Kavitha
Animal Feed Analytical and Quality Assurance Laboratory, Veterinary College and Research Institute, Namakkal, Tamil Nadu, India

Effect of enzyme addition on slaughter studies of broilers fed with corn-soya based diet

R Kavitha, D Chandrasekaran and K Rajendran

Abstract
A biological trial in broilers was conducted for a period of 42 days with six treatments 30 birds each. T_1 as control, T_2: control + 250 g /ton NSP enzyme, T_3: control + 500 g/ton NSP enzyme, T_4:1000 g /ton NSP enzyme, T5 - T2: 0.8 percent reduction of metabolizable energy and 0.4 percent reduction of protein T_6 - T3: 1.6 percent reduction of metabolizable energy and 0.6 percent reduction of protein. T_7 - T4: 3.4 percent reduction of metabolizable energy and 1.1 percent reduction of protein. T_8 - Control + Phytase enzyme (300 IU/Kg of feed), 14.6 percent reduction of available phosphorus. T_9 - Control + Phytase enzyme (600 IU/Kg of feed), 30 percent reduction of available phosphorus. Significantly (p<0.05) higher and lower dressing percentage was observed in T_3 and T_9. There was no significant difference in organs weight between enzyme added groups and control group. A significant increase (p<0.05) in the length of small intestine and caecum length was observed in T_9 compared to the control. Colo-rectum length did not differ significantly between enzyme added groups and control group.

Keywords: Enzyme, carcass characteristics, growth of internal organs and small intestine

Introduction
Adding Non-Starch Polysaccharides (NSP) degrading enzymes in poultry diets has increased considerably in recent years. However, the effects of exogenous enzymes can be variable and are dependent on a large number of factors such as the age of the bird and the quality and type of diet (Bedford 2000) [2]. Further in case of corn-soybean diet, they are rich in phytic acid which is not available for poultry and phytate phosphorus is excreted as undigested material along with excreta. This is not only leads to waste of resource, but also increases the environmental pollution. Phytase is enzymes which degrades the phytate phosphorous in the vegetable material and make it available in the gut. According to Simons *et al*., (1990) [4] techniques have been developed to produce microbial phytase for the diets of simple-stomached animals and improve the efficiency of phytase-P. Nagata *et al*. (2011) [3] has reported that phytase can improve the growth performance and nutrient utilization of broilers. in this connection the present study was formulated to study the effect of enzyme addition on slaughter studies in broilers fed on corn-soybean meal diets.

Materials and Methods
A biological trial in broilers was conducted for a period of 42 days with six treatments 30 birds each. T_1 as control, T_2: control + 250 g /ton NSP enzyme, T_3: control + 500 g/ton NSP enzyme, T_4: 1000 g /ton NSP enzyme, T_5 - T2: 0.8 percent reduction of metabolizable energy and 0.4 percent reduction of protein T_6 - T3: 1.6 percent reduction of metabolizable energy and 0.6 percent reduction of protein. T_7 - T_4: 3.4 percent reduction of metabolizable energy and 1.1 percent reduction of protein. T_8 - Control + Phytase enzyme (300 IU/Kg of feed), 14.6 percent reduction of available phosphorus. T_9 - Control + Phytase enzyme (600 IU/Kg of feed), 30 percent reduction of available phosphorus. Chicks were given a free choice access to diets and tap water for 42 days. The chicks were fed the experimental diets (Table 1, 2 and 3) throughout the experimental period. At the end of six week of age, six male birds from each experimental group were selected randomly and slaughtered for estimating digesta viscosity, ileal digestibility and histo morphological studies of small intestine. The dressing percentage, the weights of gizzard, liver, heart, pancreas, and intestinal length were measured and recorded. The data collected on various parameters were statistically analyzed as per the method of Snedecor and Cochran (1989) [5].

Results and Discussion

Carcass studies

The carcass characteristics in terms of dressing percentage, weights of gizzard, liver, heart and pancreas are presented in Table 4.

Table 1: Ingredients and nutrient composition of broiler pre starter diet (% DM)

Ingredients (%)	Treatments								
	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9
Maize	44.50	44.63	44.63	44.63	45.59	46.55	48.47	45.16	45.69
Soya	41.25	41.22	41.22	41.22	40.86	40.50	39.78	41.08	40.93
Fish meal	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
Rice bran oil	5.40	5.36	5.36	5.36	4.78	4.20	3.04	5.13	4.90
Dicalcium phosphate	1.25	1.25	1.25	1.25	1.09	1.05	1.27	1.16	0.26
Calcite	0.83	0.83	0.83	0.83	0.94	0.93	0.61	0.76	1.49
Lysine (g/100 kg)	49.29	49.75	49.75	49.75	57.68	65.60	81.47	52.47	55.19
DL methionine (g/100 kg)	230.00	230.00	230.00	230.00	231.00	231.00	232.00	230.00	230.00
Salt (g/100 kg)	258.47	337.00	337.00	337.00	336.66	336.30	335.64	336.76	336.53
Sodium bicarbonate (g/100 kg)	206.73	64.91	64.91	64.91	64.81	64.70	64.51	64.91	64.91
NSP enzyme (g/100 kg)	0.00	25.00	50.00	100.00	25.00	50.00	100.00	0.00	0.00
Phytase (g/100 kg)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.50	13.00
Additives and supplements (g/100 kg)	630.00	630.00	630.00	630.00	630.00	630.00	630.00	630.00	630.00
Nutrients (%)	**Treatments**								
	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9
Dry matter	93.08	92.9	93.3	93.56	93.35	93.19	93.99	93.05	93.85
Crude protein	23.01	23.00	23.01	23.01	22.87	22.75	22.99	22.95	22.95
Crude fibre	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25
NDF	10.77	10.5	10.54	11.11	10.79	10.84	11.49	11.27	11.27
ADF	1.92	1.89	1.94	1.87	1.9	1.98	1.93	1.94	1.93
Hemicellulose	8.84	8.64	9.17	8.91	8.94	9.51	9.33	9.26	9.12
Cellulose	1.78	1.82	1.85	1.81	1.82	1.84	1.79	1.85	1.84
Lignin	0.14	0.15	0.14	0.15	0.16	0.15	0.14	0.14	0.14
Ether extract	6.50	6.93	6.92	6.86	6.36	6.01	6.21	6.76	6.29
Total ash	8.51	8.87	8.16	8.92	8.93	8.25	8.31	8.42	8.12
NFE*	57.73	56.9	57.66	56.96	57.59	58.74	58.24	57.62	58.39
Acid insoluble ash	2.31	2.4	2.55	2.51	2.55	2.11	2.15	2.15	2.18
Calcium	1.01	1.01	1.01	1.01	0.99	0.98	1.01	1.01	1.01
Available phosphorus	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.42	0.34
Lysine*	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30
Methionine*	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58
Cystine + Methionine*	0.93	0.94	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Metabolizable energy*(kcal/kg)	3050	3050	3050	3050	3027	3001	2948	3043	3039

Mineral mixture added at the level per kg feed supplied manganese-81 mg, zinc 78 mg, iron-30 mg, iodine- 3 mg, and copper –3 mg and cobalt – 1.5 mg

Vitamin AB_2D_3K added at the level per kg feed supplied vitamin A-16500 IU, B2-10 mg, D3-3200 IU and vitamin K-2 mg.

Vitamin B complex added at the level per kg feed supplied, thiamine 2.8 mg, pyridoxine 5.6 mg, Niacin 42 mg, cyanocobalamine 28 mcg, vitamin E 28 mg, calcium D pantothenate 28 mg and folic acid 2.8 mg, calcium 30.1 mg

Coccidiostat added at the level per kg feed supplied 125 mg of Di-nitro-ortho-toluamide.

Antibiotic (Oxy tetracycline) 0.5 g was added per kg of feed. *Calculated values

Table 2: Ingredients and nutrient composition of broiler starter diet (% DM)

Ingredients (%)	Treatments								
	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9
Maize (kg)	48.84	48.84	48.84	48.84	49.80	50.76	52.68	49.37	49.90
Soya (kg)	36.60	36.60	36.60	36.60	36.25	35.89	35.17	36.46	36.32
Fish meal (kg)	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
Rice bran oil (kg)	5.77	5.77	5.77	5.77	5.19	4.61	3.45	5.54	5.31
Dicalcium phosphate (kg)	1.00	1.00	1.00	1.00	0.83	0.67	0.35	0.50	0.00
Calcite (kg)	1.03	1.03	1.03	1.03	1.14	1.25	1.47	1.37	1.70
Lysine (g/100 kg)	118.00	118.00	118.00	118.00	126.77	134.70	150.56	121.56	124.28
DL methionine (g/100 kg)	234.00	234.00	234.00	234.00	235.03	235.40	236.00	234.35	234.04
Salt (g/100 kg)	338.03	338.03	338.03	338.03	337.69	337.36	336.68	337.80	337.57
Sodium bicarbonate (g/100 kg)	38.58	38.58	38.58	38.58	38.48	38.38	38.19	39.00	38.59
NSP enzyme (g/100 kg)	0.00	25.00	50.00	100.00	25.00	50.00	100.00	0.00	0.00
Phytase (g/100 kg)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.50	13.00
Additives and supplements (g/100 kg)	630.00	630.00	630.00	630.00	630.00	630.00	630.00	630.00	630.00
Nutrients (%)	**Treatments**								
	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9
Dry matter	92.30	90.80	93.94	93.06	92.89	92.54	93.10	92.65	92.23

Crude protein	21.49	21.50	21.49	21.49	21.45	21.38	21.26	21.5	21.46
Crude fibre	4.05	4.05	4.05	4.05	4.05	4.05	4.05	4.05	4.05
NDF	11.42	11.2	11.02	11.01	11.31	11.42	11.16	11.17	11.03
ADF	1.49	1.57	1.59	1.61	1.55	1.61	1.54	1.54	1.48
Hemicellulose	9.41	9.41	9.69	9.58	9.81	9.81	9.41	9.49	9.58
Cellulose	1.22	1.25	1.27	1.29	1.28	1.12	1.28	1.28	1.28
Lignin	0.24	0.34	0.34	0.34	0.35	0.34	0.34	0.34	0.34
Ether extract	6.96	6.96	6.96	6.96	6.65	6.60	6.44	6.51	6.31
Total ash	8.21	8.63	8.52	8.25	8.45	8.61	8.51	8.31	8.21
NFE*	59.29	58.9	58.98	59.25	59.4	59.36	59.74	59.63	59.97
Acid insoluble ash	2.41	2.41	2.58	2.52	2.57	2.14	2.12	2.12	2.14
Calcium	0.99	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Available phosphorus	0.45	0.45	0.45	0.45	0.42	0.41	0.35	0.37	0.29
Lysine*	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
Methionine*	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56
Cystine + Methionine*	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Metabolizable energy*(kcal/kg)	3125	3125	3125	3125	3101	3075	3030	3118	3113

Mineral mixture added at the level per kg feed supplied manganese- 81 mg, zinc 78 mg, iron-30 mg, iodine- 3 mg, and copper –3 mg and cobalt – 1.5 mg.
Vitamin AB_2D_3K added at the level per kg feed supplied vitamin A-16500 IU, B2-10 mg, D3-3200 IU and vitamin K-2 mg.
Vitamin B complex added at the level per kg feed supplied, thiamine 2.8 mg, pyridoxine 5.6 mg, Niacin 42 mg, cyanocobalamine 28 mcg, vitamin E 28 mg, calcium D pantothenate 28 mg and folic acid 2.8 mg, calcium 30.1 mg.
Coccidiostat added at the level per kg feed supplied 125 mg of Di-nitro-ortho-toluamide.
Antibiotic (Oxy tetracycline) 0.5 g was added per kg of feed. *Calculated values

Table 3: Ingredients and nutrient composition of broiler finisher diet (% DM)

Ingredients (%)	**Treatments**								
	T_1	**T_2**	**T_3**	**T_4**	**T_5**	**T_6**	**T_7**	**T_8**	**T_9**
Maize	51.31	51.08	51.08	51.08	52.03	52.97	54.87	51.84	52.36
Soya	32.68	32.73	32.73	32.73	32.37	32.01	31.30	32.53	32.39
Fish meal	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
Rice bran oil	7.37	7.45	7.45	7.45	6.87	6.30	5.14	7.14	6.91
Dicalcium phosphate	1.05	1.37	1.37	1.37	1.21	1.10	0.73	0.60	0.05
Calcite	1.03	0.81	0.81	0.81	0.92	1.00	1.25	1.36	1.69
Lysine (g/100 kg)	76.85	76.07	76.00	76.07	83.96	91.86	107.64	79.56	82.27
DL methionine (g/100 kg)	91.16	91.42	91.42	91.42	91.80	92.17	92.93	90.85	90.54
Salt (g/100 kg)	318.04	318.56	318.56	318.56	311.80	305.12	291.67	315.92	313.81
Sodium bicarbonate (g/100 kg)	51.46	50.71	50.71	50.71	62.15	73.58	96.45	54.87	58.29
NSP enzyme (g/100 kg)	0.00	25.00	50.00	100.00	25.00	50.00	100.00	0.00	0.00
Phytase (g/100 kg)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.50	13.00
Additives and supplements (g/100 kg)	630.00	630	630	630	630	630	630	630	630
Nutrients (%)	**Treatments**								
	T_1	**T_2**	**T_3**	**T_4**	**T_5**	**T_6**	**T_7**	**T_8**	**T_9**
Dry matter	93.01	93.40	93.17	93.6	93.82	93.35	93.68	93.78	93.24
Crude protein	20.00	20.00	20.00	20.0	19.94	19.87	19.75	19.96	19.98
Crude fibre	3.85	3.85	3.85	3.85	3.85	3.85	3.85	3.85	3.85
NDF	10.32	10.41	10.42	10.52	11.95	12.31	12.05	12.04	12.09
ADF	1.61	1.72	1.74	1.82	1.92	1.68	1.75	1.76	1.89
Hemicellulose	9.51	9.55	9.75	9.95	9.96	9.91	10.21	10.05	9.95
Cellulose	1.84	1.85	1.94	1.95	1.99	2.14	2.06	2.13	2.01
Lignin	0.42	0.42	0.45	0.41	0.53	0.49	0.48	0.51	0.51
Ether extract	9.18	9.75	9.68	9.12	8.95	8.16	8.25	8.74	8.32
Total ash	8.34	8.62	8.51	8.74	8.61	8.53	8.72	8.46	8.21
NFE*	58.63	57.8	57.96	58.29	58.65	59.59	59.43	58.99	59.64
Acid insoluble ash	2.51	2.5	2.61	2.54	2.61	2.14	2.16	2.15	2.15
Calcium	0.99	0.99	0.99	0.99	0.98	0.99	1.01	1.02	1.01
Available phosphorus	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.37	0.30
Lysine*	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12
Methionine*	0.40	0.41	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Cystine + Methionine*	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
Metabolizable energy*(kcal/kg)	3250	3250	3250	3250	3226	3200	3146	3238	3239

Mineral mixture added at the level per kg feed supplied manganese-81 mg, zinc 78 mg, iron-30 mg, iodine- 3 mg, and copper –3 mg and cobalt – 1.5 mg
Vitamin AB_2D_3K added at the level per kg feed supplied vitamin A-16500 IU, B2-10 mg, D3-3200 IU and vitamin K-2 mg.
Vitamin B complex added at the level per kg feed supplied, thiamine 2.8 mg, pyridoxine 5.6 mg, Niacin 42 mg, cyanocobalamine 28 mcg, vitamin E 28 mg, calcium D pantothenate 28 mg and folic acid 2.8 mg, calcium 30.1 mg
Coccidiostat added at the level added per kg feed supplied 125 mg of Di-nitro-ortho-toluamide.
Antibiotic (Oxy tetracycline) 0.5 g was added per kg of feed. *Calculated values

Table 4: Effect of different levels of enzymes addition on carcass characteristics in broilers

Treatments	Dressing percentage*	Gizzard (g)/kg of live weight	Liver (g)/kg of live weight	Heart (g)/kg of live weight	Pancreas (g)/kg of live weight
T_1	75.48^{b}±0.91	16.44±0.41	19.84±1.07	3.72±0.40	1.90±0.14
T_2	74.65^{b}±1.21	16.04±0.44	20.50±1.60	4.02±0.16	2.10±0.15
T_3	78.24^{a}±0.50	15.40±0.30	20.56±0.77	4.09±0.20	1.85±0.12
T_4	74.30^{b}±0.48	14.85±0.46	17.03±0.71	3.78±0.25	1.78±0.07
T_5	75.14^{b}±0.70	15.01±0.53	19.47±1.95	3.80±0.24	1.93±0.22
T_6	74.90^{b}±0.79	15.56±1.00	20.34±1.04	4.05±0.10	1.68±0.15
T_7	75.11$^{b±}$0.70	14.77±0.62	18.32±1.10	4.00±0.18	1.63±0.18
T_8	75.14^{b}±0.79	15.24±0.38	18.87±0.79	4.18±0.25	1.78±0.14
T_9	71.45^{c}±1.82	15.41±0.89	21.38±2.83	4.24±0.26	2.09±0.04

Each value is a mean of six observations.*Means with atleast one common superscript in a column do not differ significantly (p<0.05)

Table 5: Effect of different levels of enzymes addition on intestinal length in broiler chickens

Treatments	Small intestine length (cm/kg body wt)*	Caecum length (cm/kg body wt)*	Colo–rectum length (cm/kg body wt)
T_1	88.59^{b}±3.87	17.91^{abc}±0.86	4.34±0.52
T_2	90.87$^{ab±}$2.47	16.90^{bc}±0.67	3.94±0.40
T_3	89.15^{b}±3.95	15.53^{bc}±0.71	3.96±0.30
T_4	85.11^{b}±3.12	17.46^{abc}±0.23	4.26±0.23
T_5	86.73^{b}±3.15	15.78^{bc}±0.82	4.25±0.41
T_6	87.79^{b}±3.80	18.35^{ab}±1.08	4.65±0.29
T_7	85.68^{b}±2.53	17.15^{abc}±1.04	4.01±0.23
T_8	89.90^{ab}±3.34	18.25^{ab}±0.82	4.33±0.25
T_9	100.03^{a}±4.57	19.63$^{a±}$0.67	4.17±0.40

Each value is a mean of six observations.
* Means with atleast one common superscript in a column do not differ significantly (p<0.05)

Dressing percentage

Dressing percentage of different treatment groups was 75.48 (T_1), 74.65 (T_2), 78.24 (T_3), 74.30 (T_4), 75.14 (T_5), 74.90 (T_6), 75.11 (T_7), 75.14 (T_8) and 71.45 (T_9). No consistent pattern could be observed in the dressing percentage in the various treatment groups, even though T_3 recorded a significantly (p<0.05) higher dressing percentage, T_9 recorded a significantly lower dressing percentage compared to the control. Balamurugan (2004) [1] observed no significant difference in dressing percentage of broilers fed with enzymes supplemented corn soya based broiler diet.

Organs weight

The mean weight (g/kg of live weight) of gizzard, liver, heart and pancreas of the birds fed diets T_1 to T_9 are presented in Table 4. No significant difference in organs weight was observed between the control and enzyme added groups. Similarly Balamurugan (2004) [1] observed no significant difference in the weight of giblets due to supplementation of NSP degrading enzymes alone or in combination with phytase to corn soya based broiler diet.

Intestinal length

The mean length of different segments of intestine is presented in the Table 5.Variation was observed in the mean length (cm/kg body weight) of small intestine between the different treatment groups. A significant (p<0.05) increase in the length of small intestine was observed in T_9 (100.03) compared to the control (88.59). A numerical increase in the length of the small intestine was observed in T_2, T_3 and T_8 groups and a decrease in length was observed in T_4, T_5, T_6 and T_7 groups compared to T_1.Similar to small intestine length the mean length (cm/kg body weight) of caecum also varied among the treatment groups, though T_9 recorded a significantly (p<0.05) increased length compared to T_2 and T_3, the increase was not significant when compared to the control.

Colo-rectum length did not differ significantly between enzyme added groups and control group. Similarly, Balamurugan (2004) [1] in his trial with broilers, fed with corn soya diet, though observed decreased length in the entire enzyme added groups, the differences were not significant. But Wang *et al.*, (2005) [6] observed a linear decrease in the length of ileum with the increase in the level of enzyme in the wheat based diet of broilers.

Conclusion

In conclusion, significantly (p<0.05) higher and lower dressing percentage was observed in T_3 and T_9. There was no significant difference in organs weight between enzyme added groups and control group. A significant increase (p<0.05) in the length of small intestine and caecum length was observed in T_9 compared to the control. Colo-rectum length did not differ significantly between enzyme added groups and control group. From the research, it can be concluded that the supplementation of enzyme to corn –soya based diet did not affect the slaughter parameters.

References

1. Balamurugan R. Performance and intestinal response of broiler chickens fed on multi enzyme supplemented diet. M.V.Sc., thesis, submitted to Tamil Nadu Veterinary and Animal Sciences University, Chennai; 2004.
2. Bedford MR. Exogenous enzymes in monogastric nutrition-their current value and future benefits. Anim. Feed Sci. Technol. 2000;86:1-13.
3. Nagata AK, Rodrigues PB, Alvarenga RR. Energy and protein levels in diets containing phytase for broilers from 22 to 42 days of ages: Performance and nutrient excretion. Revista Brasileira de Zootecnia. 2011;40:1718-1724.
4. Simons PCM, Versteegh HAJ, Jongbloed AW. Improvement of phosphorus availability by microbial phytase in broilers and pigs. British Journal of Nutrition.

1990;64:525-540.
5. Snedecor GW, Cochran WG. Statistical Methods, 8th edn. Iowa State University Press, Ames, Iowa; c1989.
6. Wang ZR, Qiao SY, Lu WQ, Li DF. Effects of enzyme supplementation on performance, nutrient digestibility, gastrointestinal morphology, and volatile fatty acid profiles in the hindgut of broilers fed wheat-based diets. Poult. Sci. 2005;84:875-881.