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DIETARY SUPPLEMENTATION OF PROBIOTICS AND ENZYMES ON SLAUGHTER TRAITS AND MEAT COMPOSITION IN BROILER RABBITS*

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ABSTRACT

An experiment was conducted to study the influence of housing system and dietary supplementation of probiotics and enzymes on slaughter traits and meat composition in broiler rabbits. A total of 144 weaned rabbits were divided into 2 groups of 72 each and housed under conventional cage system and backyard system. The rabbits in each housing system were divided into 4 groups of 18 each and diets were supplemented with probiotics, enzymes and both. Six rabbits from each group were slaughtered at 16 weeks of age for the study. Significantly higher pre-slaughter weight, dressed weight, fore and mid cut weights and inedible offal's were recorded by rabbits housed in cages. Among rabbits housed in cages, only weight of hind cut and length of caecum were significantly higher in rabbits fed rations supplemented with either probiotics or enzymes or both. In backyard system, pre-slaughter weight, dressed weight, dressing percentage, fore cut weight, mid cut weight, head and feet weight, offal weights and length of caecum were significantly different among rabbits fed with diets supplemented with probiotics and or enzymes. Meat protein and fat percentage were significantly high in rabbits housed in cages. The protein content was significantly high in the rabbits fed rations supplemented with probiotics and both probiotics and enzymes, while the fat content was significantly high in the rabbits fed with control ration in cage reared rabbits. In backyard system, rabbits fed control ration recorded significantly lower protein and higher fat content compared to the rations supplemented with either probiotics and or enzymes..

Key words: Backyard, Enzymes, Meat Composition, Probiotics, Rabbit, Slaughter

As an alternative to broiler chicken rearing, rabbit for meat is gaining momentum nowadays. In fact backyard rabbitries are best suited for our country to increase the per capita income and per capita animal protein availability. In view of the higher initial capital investment in providing cage system of housing, the proposed study is aimed to evaluate the effect of raising rabbits under back yard system.

The use of micro-organism as feed additives (probiotics) is currently widely promoted as an "alternative" to antibiotic growth promoters. Similarly the use of Fibrolytic, proteolytic and

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lipolytic enzymes to improve the digestibility of nutrients is being explored. The aim of the proposed experiment was to study the effect of inclusion of probiotics and enzymes on performance of broiler rabbits in two different housing systems.

MATERIALS AND METHODS

A total of 144 weaned rabbits (28 days) belonging to 3 breeds viz. New Zealand White, Grey Giant and Flemish Giant, maintained at the "Rabbit Production for Meat" scheme of the Department of Animal Genetics and Breeding, College of Veterinary Science, Hyderabad were divided into two groups and were reared in conventional cage system and backyard rearing system, until 16 weeks of age. Each group was subdivided into 4 groups each consisting of 18 rabbits. The three breeds were equally represented in all the groups. Rations supplemented with probiotics and enzymes were fed to three groups of rabbits while one group was fed control ration.

Housing and management: Bunnies under cage system of rearing were housed in galvanized iron wire net cages arranged in rows on an iron frame at a height of about 2.5 feet from the floor. Each bunny was provided a cage floor area of 1 square foot. Cages were equipped with automatic waterers and earthen pots were used as feeders. The asbestos roof of the rabbitry was covered with a thin layer of paddy straw, which was wetted with overhead water sprinklers during hot periods of the day. Gunny cloth curtains were hung around the sheds to protect the animals from extreme temperatures. For backyard system, a thatched roof shed with gravel floor and chain link wire mesh walls was erected and rabbits were provided floor space of about 2 square feet per bunny. Concentrate feed and fresh and clean drinking water were made available *ad- libitum* by using earthen bowls.

Experimental rations and feeding: The four experimental rations were T1:control ration without any supplement; T2: T1 + Kemzyme HF @ 500 gms/Ton of feed; T3 :T1 + Probiotic (*Saccharomyces boulardi* 50% and *Pediococcus acidilacticii 50%,* 10^9 CFU/gm of feed and T4 : T1 + Probiotic + Enzyme at above levels. Kemzyme HF contained Cellulase (>1,00,00,000), Xylanase (>26,00,000), Pectinase (>2,50,000), ß-glucanase (>10,00,000), Ü-Amylase (>7,00,000), Protease (>6,00,000) and Lipase added kemin Units per kg product.

The concentrate feed mixture contained Maize (50%), Groundnut cake (24%), Wheat bran (25%) and Mineral mixture (1%). Coccidiostat and Vitamins A, D, E and C were added to the feed mixture at recommended levels. Feed and water were made available *ad-libitum* to all the experimental animals. About 200 gms of Lucerne green fodder was offered to each rabbit daily.

Six representative rabbits from each group were slaughtered at 16 weeks of age [6]. Fore cut consisted of the front portion of the carcass up to 7^{th} thoracic vertebra. Mid cut was from 7^{th} thoracic to 7^{th} lumbar vertebrae. Hind cut formed the rest of the carcass. Dressing percentage was expressed as the ratio of hot carcass weight to pre-slaughter weight expressed in percentage.

Samples of *Longissimus dorsi* muscle of slaughtered rabbits were collected after slaughter and proximate composition of the meat samples estimated as per standard procedures. The protein content of the muscle was estimated. Cholesterol was estimated from the ether extract by using diagnostic Kit procured form Qualigens Fine Chemicals, Mumbai.

RESULTS AND DISCUSSION

Slaughter traits : Significantly higher pre-slaughter weight, dressed weight, fore and mid cut weights and the weight of inedible offals were recorded by the rabbits housed in cages than those housed under backyard system (Table 1). The overall mean pre-slaughter weight, dressed weight, dressing percentage, fore, mid and hind cut weights, weights of head and feet, pelt, edible

and inedible offals and the length of caecum are presented in Table 1. Significantly higher weights for various carcass traits were reported in cage reared rabbits when compared to deep litter/ backyard/hutch reared rabbits by several authors[12,13]. The dressing percentage in the present experiment did not vary significantly among the housing systems. Housing system had no effect on dressing out percentage and viscera proportion when rabbits were housed in wired cages and open air pasture pens[14]. The dressing percentage obtained in the present study was comparable with published reports which ranged between 48.77 and 59.7[11,15,17].

Significant influence of dietary supplementation of probiotics and enzymes was observed in most of the carcass traits of rabbits reared under backyard system (pre-slaughter weight, dressed weight, dressing percentage, fore cut weight, mid cut weight, head and feet weight, offal weights and length of caecum) while the effect was significant only on the weight of hind cut and the length of caecum in cage reared rabbits. The significant increase in hind cut weight observed in backyard reared rabbits could be due to higher physical activity[17]. In general, supplementation of probiotics and enzymes had a positive effect on digestibility of nutrients and growth which reflected in the higher pre slaughter weight and consequent carcass traits as was also observed in rabbits [1] and in broiler chickens. Higher carcass recovery percentage with supplementation of enzymes and yeast was also reported elsewhere[19].

The increase in the caecal length on supplementation of diets with probiotics and enzymes could be explained by the increase in the efficiency of crude fibre degradation which could be due to stimulatory effect of probiotics on specific microbes responsible for fibre degradation. Similar findings were also reported in the literature[1].

Meat Composition traits

The meat protein and fat percentage were significantly influenced by housing system with both the protein and fat content being more in the rabbits housed in cages than those housed under backyard system while the remaining proximate principles did not differ among the rabbits housed under the two systems of housing.

The overall mean per cent dry matter, total ash, protein, fat and cholesterol(mg%) contents of rabbit meat as obtained in the present investigation are presented in Table 2. Fat percentage in meat was significantly higher in caged rabbits than those housed in hutches as observed in the present investigation [4]. However, contradictory findings are also reported [18].

In general, the protein content of meat in cage and backyard reared rabbits was significantly higher in rabbits supplemented with both probiotics and enzymes. However, in cage reared rabbits, rations T2 and T3 also caused a significant increase in the protein content when compared to control diet. The fat content of meat was significantly higher in control rabbits in cage system of housing when compared to rabbits fed diets supplemented with probiotics and enzymes. The positive effect of probiotics was attributed to improved digestibility of DM and cellular tissues [7]. However, some reported that the chemical composition of meat was not affected by probiotics supplementation in NZW rabbits [5].

The overall mean dry matter, total ash, protein and fat contents of rabbit meat as obtained in the present investigation were 20.66 + 0.08, 1.29 + 0.01, 21.29 + 0.12 and 4.05 + 0.02, respectively. The results of the present study were comparable with the published reports wherein the dry matter, total ash, protein and fat content ranged from 20.4 to 28.5; 1.17 to 1.46; 19.2 to 23.3 and 0.9 to 6.8, respectively [9,10,16].

Table 1.Means of slaughter traits in rabbits as affected by experimental rations

Trait	Overall		T1		T2		T3		T4	
	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.
Cage system										
Pre-slaughter weight (g)	2014.29	44.09	1944.33	112.66	1988.67	58.71	2104.50	95.32	2019.67	76.73
Dressed weight (g)	994.40	23.70	952.13	61.03	969.53	35.59	1056.58	51.80	999.36	36.26
Dressing percentage	49.32	0.23	48.90	0.55	48.72	0.61	50.17	0.31	49.50	0.22
Fore cut weight (g)	296.25	9.78	311.17	18.41	273.83	23.87	311.50	18.74	288.50	16.42
Mid cut weight (g)	230.63	6.59	253.67	18.45	212.83	6.57	242.67	17.00	213.33	13.18
Hind cut weight (g)	467.29	10.10	386.33^{b}	25.35	482.86^{a}	10.53	502.42^{a}	22.16	497.53^{a}	19.66
Head & Feet weight (g)	255.08	6.17	247.33	12.21	257.67	12.69	267.83	11.21	247.50	13.17
Pelt weight (g)	202.38	5.72	185.17	6.16	205.33	14.57	213.50	12.24	205.50	11.07
Edible offals weight (g)	68.75	0.93	68.67	2.22	68.33	0.95	72.83	2.21	65.17	1.75
Inedible offals weight (g)	374.25	9.60	382.67	12.10	388.83	21.83	372.17	26.80	353.33	11.57
Length of caecum (cm)	48.75	0.42	45.83	0.83	48.33	0.71	51.17	0.95	49.67	0.88
Backyard system										
Pre-slaughter weight (g)	1842.08	44.52	1707.33^{b}	33.16	1924.00^{ab}	98.06	2035.83^{a}	112.62	1701.17^{b}	91.19
Dressed weight (g)	912.05	23.79	824.08^{b}	16.97	947.70^{ab}	57.09	1031.95^{a}	59.69	844.47^{b}	44.15
Dressing percentage	49.44	0.26	48.28^{b}	0.59	49.17^{ab}	0.70	50.67^{a}	0.33	49.67^{ab}	0.33
Fore cut weight (g)	264.38	7.73	226.50^{b}	6.93	254.83^{b}	18.80	330.83^{a}	18.16	245.33^{b}	14.95
Mid cut weight (g)	200.71	4.70	200.83^{ab}	3.75	202.33^{ab}	4.22	224.17^{a}	16.94	175.50^{b}	5.91
Hind cut weight (g)	446.97	13.64	396.74	9.67	490.54	37.01	476.95	30.42	423.64	24.22
Head & Feet weight (g)	251.83	6.69	221.50^{c}	8.11	267.83^{ab}	13.43	288.50^{a}	18.34	229.50^{bc}	11.54
Pelt weight (g)	194.04	4.86	183.50	6.77	205.33	14.57	208.33	10.21	179.00	3.97
Edible offals weight (g)	66.96	0.85	59.17^{c}	0.60	70.33^{ab}	1.23	72.33^{a}	1.93	66.00^{b}	2.44
Inedible offals weight (g)	346.71	8.38	304.83^{b}	9.25	374.67^{a}	14.79	376.67^{a}	23.64	330.67^{ab}	16.11
Length of caecum (cm)	49.38	0.41	46.67^{b}	0.71	48.50^{b}	0.67	51.17^{a}	0.91	51.17^{a}	0.95

Means with similar superscript in each row under each rearing system do not differ significantly ($P \leq 0.05$)

Table 2. Means of meat composition in broiler rabbits as affected by experimental rations

Trait	Overall		T1		T2		T3		T4	
	Mean	S.E	Mean	S.E	Mean	S.E	Mean	S.E	Mean	S.E
Cage system										
Dry Matter (%)	20.69	0.12	20.52	0.29	20.58	0.30	20.88	0.17	20.78	0.17
Total Ash (%)	1.29	0.02	1.23	0.12	1.32	0.02	1.33	0.05	1.28	0.03
Protein(%)	21.64	0.09	20.83^{c}	0.25	21.35^{b}	0.08	22.07^{a}	0.16	22.30^{a}	0.16
Fat(%)	4.19	0.03	4.33^{a}	0.08	4.15^{bc}	0.04	4.05^{c}	0.03	4.23^{b}	0.06
Cholesterol(mg %)	0.10	0.00	0.10	0.00	0.10	0.00	0.09	0.00	0.10	0.00
Backyard system										
Dry Matter (%)	20.64	0.12	20.50	0.27	20.73	0.34	20.75	0.16	20.57	0.16
Total Ash (%)	1.29	0.02	1.23	0.02	1.32	0.05	1.33	0.03	1.28	0.03
Protein(%)	20.95	0.16	20.17^{c}	0.35	20.83^{c}	0.30	20.88^{b}	0.39	21.90^{a}	0.14
Fat(%)	3.92	0.03	3.93	0.04	3.98	0.05	3.88	0.08	3.87	0.08
Cholesterol(mg %)	0.10	0.00	0.10	0.00	0.10	0.00	0.09	0.00	0.10	0.00

Means with similar superscript in each row under each rearing system do not differ significantly ($P \leq 0.05$)

CONCLUSION

The present study conclusively revealed that rabbits can be reared profitably under backyard system of housing with less capital inputs and supplementation of probiotics had the beneficial effect in increasing the meat protein and reducing the meat fat percentage thereby appealing to the health conscious urban consumers.

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