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Original article

Effect of different energy sources on feed consumption, weight gain and feed conversion ratio in broilers

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ABSTRACT

The 400 straight run, day old Vencobb broilers chicks were randomly divided into four treatment groups of 100 birds each viz., control, T1, T2 and T3. Each group was further divided into two replications of 50 birds each. Four iso-caloric and iso-proteinous experimental rations were formulated by replacing maize with jowar, bajra and broken rice at 25 %. The control group having diet with 100 % maize. The soyabean meal was the sole protein source for all the four rations (control, T1, T2 and T3). The observations of the parameters were taken on weekly basis and were analysed by using Completely Randomized Design (CRD) and simple arithmetic calculations. The use of different energy sources i.e. jowar, bajra and broken rice can be very well replaced with maize in broiler ration without affecting the performance of the broiler.

1. Introduction

The poultry industry in India has emerged as the most dynamic and rapidly expanding segment of livestock economy. Poultry farming is gaining importance in the rural as well as semi-urban area of our country. The poultry enterprise is able to generate self employment opportunities directly to the million of the rural masses and also provides job opportunities to thousands of skilled workers and labours. However, the increasing population and

the increasing demand of cereals for human and livestock consumption and their scathing price is putting great hindrance to the growth of Indian poultry industry.

The major objective of poultry production is to effectively and economically convert relatively unpalatable, unattractive and locally available cheap feed stuff into palatable, attractive and nutritious product for mankind. Feed is the single largest item of expense in poultry production, the feed expenses accounts for nearly 65-70 % of total cost of production. Therefore, the growth of poultry industry is directly proportional to the demand of feed (Ravi, 2000). Further, the growth of poultry industry in India is expected to limit supply of quality feed at remunerative price in order to sustain profitability in commercial poultry enterprise.

Maize is being the major constraint in cost of feeding of broilers. Maize is less available; hence conventionally used maize as energy source needs to be substituted by other less conventional energy sources. Substitution of maize as energy source by other less conventional sources should be such that the nutritional status of feed is not deteriorated. The less conventional energy sources which are nutritionally similar to maize, so that we can increase the production by having similar nutritional status of maize are bajra, jowar and broken rice which are available locally and abundantly at cheaper rates. Hence, the present study was designed to evaluate broilers performance by substituting maize with jowar, bajra and broken rice.

2. Materials and Methods

The experiment was carried out for 42 days (6 weeks) on 400 day old broiler chicks of Vencobb strain purchased from Vaishnavi Hatchery Private Ltd, Warvati, Ambejogai, Dist. Beed (MS), maintained at poultry unit in the Department of Livestock Production and Management. The chicks were weighed and randomly distributed in four groups as control, T1, T2 and T3 with two replications with 50 chicks in each replication. On the day of arrival, each chick was identified by using wing band to study the body weight recorded on individual basis and FCR on group basis. The brooding was carried out using electric hover brooders as a source of heat and was continued until 2 weeks of age in the respective pen of each treatment group.

The birds were housed under deep litter system with saw dust as litter material; the standard managemental practices were followed for all the groups. The brooding was carried out using electric hover. The routine farm operation like vaccination, medications etc. were carried out as per schedule. The necessary medications were provided and control measures were taken as and when necessary. The experimental chicks were housed in four different pens and provided one square feet floor space to each adult bird. Each pen was partitioned for corresponding treatment group to have 2 replications accommodating 50 birds in each replication.

Maize was replaced by inclusion of 25 per cent jowar, bajra and broken rice. The four iso-caloric and iso-proteinous experimental rations were prepared. Control group was prepared by using 100 per cent maize + soybean meal as a protein source + all essential feed ingredients. T1 treatment having 75 per cent maize + 25 per cent jowar + soybean meal as a protein sources + all essential feed ingredients; T2 treatment having 75 per cent maize + 25 per cent bajra + soybean meal as a protein source + all essential feed ingredients; T3 having 75 per cent maize + 25 per cent broken rice + soybean meal as a protein source + all essential feed ingredients.

The starter and finisher ration were prepared by purchasing ingredients, maize, jowar, bajra, broken rice, deoiled rice polish, soybean meal, vitamins, mineral mixture, limestone, dicalcium phosphate and salt from local market. The ration were prepared at feed mixing plant, Department of Livestock Production and Management, College of Veterinary and Animal Sciences, MAFSU, Parbhani. The starter ration was having CP per cent as 22.73 to 23.58 and ME as 2800.60 to 2878.98 K cal/kg ration. The finisher ration had CP per cent as 19.68 to 20.37 and ME as 2925.33 to 2968.83 K cal/kg ration. The nutrient compositions of experimental rations were analyzed at the Department of Animal Nutrition, College of Veterinary and Animal Sciences, MAFSU, Parbhani. The iso-caloric and iso-proteinous levels of feeding practices were followed for all the groups throughout the experimental period. Weighed amount rations were offered every day in the morning and evening to all the treatment groups.

The body weight, feed consumption and mortality were recorded for various groups. The differences among treatments within experiment were determined by using Equal Completely Randomized Design (Panse and Sukhatme, 1967). Treatment mean were compared by critical differences by using statistical method and analysis of variance. The simple statistical methods were used for calculating cost of production and economics of broiler production.

3. Results and discussion

Table 1

Weekly cumulative feed consumption, weight gain and feed conversion ratio / bird of broilers at different age by using different energy sources.

Treatment	Cumulative feed consumption(g) per bird						Weekly cumulative weight gain(g) per bird						Cumulative feed conversion ratio					
	7th	14th	21st	28th	35th	42nd	7th	14th	21st	28th	35th	42nd	7th	14th	21st	28th	35th	42nd
Control	102.5	320.0	688.50	1215.0	1905.0	2715.0	100.12	190.72	458.89	679.04	1119.72	1470.72	1.02	1.67	1.50	1.78	1.70	1.86
T1	107.5	335.0	708.50	1274.7	1920.7	2685.7	94.87	195.75	513.42	758.12	1234.48	1590.08	1.13	1.71	1.37	1.68	1.55	1.68
T2	112.5	365.0	736.50	1317.7	2037.4	2841.9	89.15	203.60	482.00	750.12	1249.70	1627.10	1.26	1.79	1.52	1.76	1.63	1.74
T3	107.5	352.5	690.50	1195.5	1855.0	2585.0	102.95	186.95	439.27	687.20	1269.45	1597.85	1.04	1.88	1.57	1.74	1.46	1.62
SE +	2.50	5.73	17.65	39.77	58.75	65.16	1.64	1.96	3.99	3.13	2.60	2.55	0.03	0.02	0.03	0.07	0.06	0.04
CD	9.80	22.45	69.20	155.92	230.28	255.41	6.45	7.70	1.56	1.23	1.02	1.00	0.12	0.10	0.14	0.28	0.23	0.15

Table 2

Analysis of Variance for weekly cumulative feed consumption, weight gain, feed conversion ratio of broilers at different age groups.

Analysis of Variance for cumulative feed consumption of broilers at different age groups.

Source	df	7th		14th		21st		28th		35th		42nd	
		MSS	'F' value	MSS	'F' value	MSS	'F' value	MSS	'F' value	MSS	'F' value	MSS	'F' value
Treatment	3	33.33	2.66	778.12	11.85*	988.67	1.58	6257.70	1.977	11921	1.72	22409	2.638
Error	4	12.50		65.62		623.50		3164.60		6903.2		8491.8	

Analysis of Variance for weekly cumulative weight gain of broilers at different age groups.

Treatment	3	74.04	13.63*	101.75	13.17*	2034.0	63.71**	3404.2	173.15**	9822.9	7.24*	9449.9	7.23*
Error	4	5.43		7.72		31.92		19.66		1356.6		1305.9	

Analysis of Variance for cumulative feed conversion ratio of broilers at different age groups.

Treatment	3	0.023	12.45*	0.086	13.45*	0.013	5.59	0.0047	0.45	0.021	3.08	0.017	5.41
Error	4	0.0018		0.0012		0.0024		0.010		0.006		0.003	

** P < 0.01

* P < 0.05

Table 3
Economics of broilers from different groups.

Sr No	Particulars	Control	T1	T2	T3
1	Cost of day old chicks (Rs)	25	25	25	25
2	Rate of feed (Rs/kg)				
	i) Starter	27.22	20.00	20.23	28.23
	ii) Finisher	26.26	26.87	27.16	27.30
3	Feed consumption (g)				
	i) Starter	1018.12	1007.14	1065.71	969.37
	ii) Finisher	1696.87	1678.56	1776.19	1615.69
	Total feed consumption (g)	2714.99	2685.7	2841.9	2585.0
4	Cost of feed consumed/bi(Rs.)				
	i) Starter	27.70	20.14	21.54	27.35
	ii) Finisher	44.54	45.08	48.23	44.08
5	Total feed cost (Rs)	72.24	65.22	69.77	71.43
6	Cost of medicine, vaccine, litter, etc. /bird (Rs)	5.00	5.00	5.00	5.00
7	Total cost of production (Rs) (1+5+6)	102.24	95.22	99.77	101.43
8	Average body weight (g)	1517.9	1636.8	1677.0	1643.3
9	Average price realized/bird @ Rs. 85/ kg live weight	129.02	139.13	142.54	139.68
10	Net profit/bird (Rs) (9-7)	26.78	43.91	42.77	38.25
11.	Net profit Rs/kg	17.65	26.84	25.50	23.28

The means for cumulative feed consumption at various age groups are depicted in Table 1. The results of the analysis of variance showed non significant influence on cumulative feed consumption of broilers at different age by using various energy sources (Table 2). These findings are in agreement with the finding noted by Tiwari et al (2002), Patil and Shaha (2003), Solanke and Kalbande (2004), Grace et al (2007), Tornekar et al (2009), Clement et al (2010), and Ravinder et al (2011). The non significant differences in cumulative feed consumption at various age groups may be indicative of the fact that maize can be very well replaced by jowar , bajra and broken rice up to 25% without affecting the consumption and there by the performance of the broilers.

The analysis of variance revealed highly significant ($P < 0.01$) effect on weekly cumulative weight gain of broilers (Table 2) at 21st and 28th day. Significant ($P < 0.05$) influences of weekly cumulative weight gain of broilers showed at 7th, 14th, 35th and 42nd days of age. The overall mean for weekly cumulative weight gain of broilers at 7th, 14th, 21st, 28th, 35th and 42nd days of age are depicted in Table 1. The highest weight gain was found in T2 fallowed by T3, T1 and Control. The present findings are in agreement with Thakur and Prasad (1992), Patil and Shaha ((2003), Ramarao et al.(2004), Tornekar et al (2009), Clement et al (2010), Ravinder et al (2011) and Ironkwe and Bamgbose (2012). These findings are suggestive of the fact that maize can be very well replaced by jowar, bajra and broken rice up to 25% level very safely with superior cumulative weight gain, however Verma et al (2001), Edwin et al (2002) and Rathod and Dhumal (2002) reported non-significant differences between treatment groups for replacement of maize by different energy sources.

The means for cumulative feed conversion ratio at various weeks of age are shown in Table 1. The analysis of variance revealed significant ($P < 0.05$) influence at 7th and 14th day of age for cumulative feed conversion ratio. However, non significant effect was revealed at 21st, 28th, 35th and 42nd days of age (Table 2). These findings are in close agreement with Nutan Subba and Siddiqui (2002), Rathod and Dhumal (2002), Edwin et al (2002)), Tornekar et al (2009) and Ravinder et al (2011) and in contrast, the higher FCR were reported by Grace et al (2007), Clement et al (2010) and Ironkwe and Bomgbose (2012). It may be concluded that replacement of maize at 25% by jowar, bajra and broken rice may have negligible effect during starter period and has resulted in to non significant differences during finisher period for feed conversion ratio.

The analysis of variance has revealed non-significant differences for the mortality pattern in the control and treatment groups. The mortality observed upto 42 days of age for control, T1, T2, and T3 were 2,2,3 and 1 percent.

The most economic group was T2 fallowed by T1, T3 and control (Table 3). Based on the economics of broiler production, it may be inferred that replacement of maize by 25% jowar, bajra and broken rice had significant effect over the economic returns of the different treatment groups. T2 treatment was most effective combination for obtaining the birds with high returns. These findings are in agreement with Nutan Subba and Siddiqui (2002) and Surewad and Auradkar (2002).

From the present study it may be concluded that there is always price fluctuations in the commodities that are used in formulating the broiler ration. Whenever the prices of maize goes up or prices of jowar, bajra and broken rice are low, one can think of formulating cost effective ration and can certainly increase the net profitability by keeping cost of feed at low level. However, while selecting these ingredients their quality should be considered first.

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