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Effect of Dietary Supplementation of Betaine Hydrochloride on Cost Effectiveness in Broiler Chicken

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A B S T R A C T

An in vivo experiment was conducted to determine the effect of dietary supplementation of betaine hydrochloride (betaine HCl) on cost effectiveness in broiler chicken. The study was conducted on Vencobb 400 broiler chicks (192) over a period of six weeks. The chicks were allotted to four groups, with four replications of 12 chicks each, randomly. The four groups were allotted to four dietary regimes and each replicate was randomly assigned to one of the four dietary treatments in this study. The experimental feed was formulated according to BIS (1992) specifications and to the control ration (T_1), feed grade betaine HCl at 250, 500, 750 ppm was added respectively to form different rations T_2, T_3 and T_4 for different treatment groups. The birds in each group were maintained on their respective ration throughout the study period. The production cost per kg live weight was highest in group that fed T_1 ration (Rs.76.47) and lowest in group that fed ration T_4 (Rs.72.20) due to efficient feed conversion ratio. It is concluded that the supplementation of betaine HCl at the rate of 750 ppm to broiler based diet results in economical broiler meat production.

Introduction

Betaine is a trimethyl derivative of the amino acid glycine. It is a naturally occurring substance in a various plant and animal species. Betaine is derived from the molasses of sugar beets. It plays vital metabolic role in maintaining osmotic balance in plant and animal species. Besides this trimethylglycine (TMG), is found in many foods, such as whole grains, spinach and beets. Heat stress represents one of the most important factor that has negative effects on poultry production. Most important solutions are using feed additives that have positive effects for resisting thermal stress. (Ahmed *et al*., 2018).

Materials and Methods

One hundred – and – ninety two, day-old Vencobb – 400 strain commercial broiler chicks were used as the experimental birds. All the birds were identified with wing bands

placed in the right wing on day one. The birds were allotted randomly into four dietary treatment groups, with four replications of 12 chicks in each. All the chicks were reared under uniform and standard management conditions throughout the experimental period.

The experimental feed (in mash form) was formulated using corn and soybean meal as per BIS (1992) specifications in feed mill, COVAS, Mannuthy. To the control ration (T_1), feed grade betaine HCl was added at 250, 500 and 750 ppm to formulate rations T_2, T_3 and T_4 respectively, taking special care for proper mixing of betaine HCl. No growth promoting antibiotics was added to any rations.

Broiler starter ration were fed up to four weeks of age and then switched to broiler finisher ration upto 6 weeks of age. The birds were provided with feed and water *ad libitum*. Feed consumption by the birds in each replicate, was calculated weekly. The rations were subjected to proximate analysis as per A.O.A.C. (1990). Return over feed cost were calculated based on the feed cost per kg feed and feed cost per kg live weight gain. Feed cost per kg for each treatment ration was calculated by using the prevailing cost of feed ingredients at the university farm and market price of broiler chicken that prevailed during the period of study.

Protein efficiency ratio (PER) = Weight gain/Protein intake (Kamran *et al*., 2008)

Energy efficiency ratio (EER) = Weight gain×100/total ME intake (Kamran *et al*., 2008)

Production Efficiency Factor (PEF) = (Final bird weight, kg X Livability %) / (Age in days X Feed conversion ratio X100) (Lemme *et al*., 2006)

The data collected on various parameters were statistically analyzed as per the methods of Snedecor and Cochran (1994) and the means of different experimental groups were also tested by using Duncan's Multible Range Test (DMRT) in SPSS Version 20.0.

Results and Discussion

The data on cost effectiveness of broilers from day 0 to 6 weeks of age as influenced by betaine HCl supplementation are presented in Table 1. The cost of ingredients used for study is as per rate contract fixed by the College of Veterinary and Animal Sciences, Mannuthy for that period.

The total feed cost per bird was highest in birds fed ration T_3 (Rs.123.05) and lowest in T_2 ration fed group (Rs.118.19) compared to T_1 ration fed group. The production cost per kg live weight was highest in group fed with T_1 ration (Rs.76.47) and lowest in group fed with T_4 ration (Rs.72.20). This is attributed by better feed conversion ratio observed in T4 feed ration goup. The net profit per bird was highest in group fed T_4 ration (Rs.40.42) and lowest in group fed T_1 ration (Rs.29.11). Similarly, the net profit per kg live weight was highest for birds fed ration T_4 (Rs.18.25) and lowest in T_1 (Rs.14.01).

Analysis of data on net profit / bird revealed significant difference between treatment groups at sixth week, all the treatment groups with inclusion of betaine HCl at different levels had significantly higher net profit than control group fed without betaine HCl. The highest net profit recorded with birds supplemented 750 ppm of betaine HCl.

This is in accordance with earlier findings of Creswell and Haldar (2011) who reported that supplementation of betaine HCl in the broiler diet resulted in improved economical gain with reduced feed cost by Rs. 600 per ton of broiler feed.

Table.1 Cost effectiveness of birds maintained on four experimental rations

Particulars		Treatments[1]				F value	P value
		T1	T2	T3	T4		
6th week body weight, g		2078.38	2145.83	2249.19	2215.44	--	--
Feed Consumption per bird, g	Starter	1897.60	1948.63	2033.29	1909.73	--	--
	Finisher	1955.90	1887.92	1956.23	1965.31	--	--
Starter feed cost / kg, Rs.		32.07	32.10	32.13	32.16	--	--
Finisher feed cost / kg, Rs.		29.45	29.48	29.51	29.54	--	--
Total Feed cost,Rs.		118.44	118.19	123.05	119.46	--	--
Day old chick cost/ bird, Rs.		36.50	36.50	36.50	36.50	--	--
Miscellaneous cost/bird,Rs.		4.00	4.00	4.00	4.00	--	--
Total cost of production / bird, Rs.		158.94± 0.98	158.69± 2.21	163.55± 1.12	159.96± 2.74	1.377 ns	0.297
Cost of production /kg of live weight, Rs.		76.47^{a} ± 0.73	73.95^{b} ± 0.43	72.71^{b} ± 0.79	72.20^{b} ± 0.29	10.142**	0.001
Revenue from bird sale,@ Rs.90/kg		187.05	193.13	202.43	199.39	--	--
Revenue from manure sale, Rs.		1.00	1.00	1.00	1.00	--	--
Total revenue, Rs.		188.05^{a}±1.55	194.13^{ab} ±3.26	203.43^{b}±3.47	200.39^{b} ± 3.30	5.191*	0.016
Net profit/bird, Rs.		29.11^{a} ± 1.68	35.43^{b} ± 1.37	39.88^{b} ± 2.48	40.42^{b} ± 0.89	9.386**	0.002
Net profit / kg live body weight, Rs.		14.0^{a} ± 0.73	16.51^{b} ± 0.43	17.73^{b} ± 0.78	18.25^{b} ± 0.29	10.121**	0.001

[1]Each value is a mean of 4 observations except 6th week body weightit is a mean of 48 observations

ns – non significant (P>0.05), ***significant at 0.01 level*

*Means bearing different superscripts within same column differ significantly (P≤ 0.05)

Table.2 Production efficiency factor, Protein efficiency ratio and Energy efficiency ratio of birds maintained on four experimental rations

Parameters	T1	T2	T3	T4	F value	P value
Production efficiency factor (PEF)	260.90^{a}±4.54	279.54^{b}±4.93	295.85^{b}±7.91	295.15^{b}±3.52	9.032**	0.002
Protein efficiency ratio (PER)	2 .47 ^{a}±0.03	2.56 ^{b}±0.02	2.58^{b}±0.02	2.61 ^{b}±0.02	7.593**	0.004
Energy efficiency ratio (EER)	13.80 ^{a}±0.15	14.25 ^{b}±0.09	14.64 ^{bc}±0.13	14.69^{c}±0.12	10.423**	0.001

**Means bearing different superscripts within same column differ significantly (P≤ 0.01)

Similarly Vasanthakumar (2013) also reported that there was a significant reduction in the feed cost with betaine HCl supplementation in the broiler diet at the rate of 0.2 and 0.3 per cent.

The Production efficiency factor (PEF) of birds belonging to four dietary treatments T_1, T_2, T_3 and T_4 were 260.90, 279.54, 295.85 and 295.15, Protein efficiency ratio (PER) were 2.47, 2.56, 2.58 and 2.61, energy efficiency ratio (EER) were 13.80, 14.25, 14.64 and 14.69, respectively and the datas were presented in Table.2. There was significant difference ($P<0.01$) among treatment groups for PEF, PER and EER.

In conclusion, betaine has been used broilers for many years. Studies show that betaine improve the performance. The T_4 group (Basal diet + betaine HCl at 750 ppm) fetched more income over control group, followed by T_3 (Basal diet + betaine HCl at 500 ppm) group. From the above study, it is concluded that the supplementation of betaine HCl at the rate of 750 ppm to broiler based diet results in economical broiler meat production.

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Conflict of Interest

The authors declare that they have no conflict of interest.

Ethical approval

The animal studies for the experiment have been approved by the ethics committee-COVAS, Mannuthy, Kerala and therefore have been performed in accordance with the ethics standards as applicable under institutional guidelines."

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