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Research Article

Effect of Partial Replacement of Soyabean Meal with Spent Brewer's Grain on Carcass Traits, Meat Quality and Blood Cholestrol of Broiler Chicks

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ABSTRACT

The objective of the study was to determine the effect of partial replacement of soyabean meal (SBM) with spent brewer's grain (SBG) with and without non starch polysaccharide enzyme (NSP) on carcass traits, meat quality and blood cholesterol of broiler chicks. For this study, 160, day old Vencobb- 400 broiler chicks were purchased and divided by completely randomized design into 5 groups, each group having four replicates with eight chicks each. The basal diet was formulated as per Bureau of Indian Standards (2007) recommendations. Experimental rations were prepared by replacing SBM with SBG at the rate of 10 and 20 per cent in T2 & T3, T4 & T5 respectively. Five hundred g/tonne of NSP enzyme were added on T3 and T5. Birds were reared for 42 days. At the end of the trial two birds from each replicate were sacrificed and used for carcass analysis. There were no significant difference among all treatments for eviscerated carcass yield, giblet weight and intestinal weight. The weight of pancreas and immune organs like thymus and spleen had shown significant difference among the treatments. However, weight of bursa of fabricious was similar. Also sensory parameters of cooked meat from these same birds were similar between groups. However, total blood cholesterol was decreased with increased inclusion of SBG.

Key words: *Spent brewers grain, Non starch polysaccharide enzyme.*

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INTRODUCTION

Poultry production is one of the most crucial animal husbandry sectors in India, whose progress is a very critical driver of agricultural growth and hence a valuable tool for socio-economic development of the country. There has been a phenomenal growth in the poultry sector in the last few decades, as evinced by the fact that the total poultry population in India rose from 729.21 million in 2012 to 851.81 million in 2019, ie., a 16.81 per cent increase (DAHD, 2019). India currently occupies the sixth position in world poultry production, accounting for 4.50 per cent of the world population (BAHS, 2019).

More than 50 per cent of the total meat production from India is poultry meat (BAHS, 2019). As per ICMR (2019) recommendations, an adult human being should consume 10.50 kg poultry meat per annum, as it is a rich source of energy and protein, but the percapita consumption in the country, at present is only 2.20 kg, indicating that there is tremendous scope for the broiler industry in India, which has an annual growth rate of 6.00 per cent (BAHS, 2019). Therefore, it is highly imperative that the progress made in this promising sector is sustained, for which the major constraint faced by the broiler farmers is escalating feed cost, as feed contributes nearly 75 to 80 per cent of the total cost of production.

Conventional protein and energy sources used in broiler rations, such as soyabean meal (SBM) and maize, respectively are consumed by human beings also and hence there is an intense competition between man and animals, for ingredients such as these, which in turn make conventional poultry rations expensive. This has necessitated a situation, wherein we have to explore ways for utilisation of unconventional feed resources, such as agro - industrial byproducts, to reduce the feed cost.

Spent brewer's grain (SBG) is one of the major agro - industrial byproducts obtained from the brewing industry, which accounts for approximately 85 per cent of the total byproducts from brewery (Tang et al., 2009). Economic affordability is the key challenge associated with the recycling of these huge volumes of byproduct, a major portion of which is wasted, leading to environmental pollution as a result of their accumulation. Therefore, if we can incorporate this abundantly available raw material, SBG in broiler rations, it will help not only in reducing feed cost, but will also result in considerable reduction in environmental pollution.

Spent brewer's grains, is an inexpensive product having 31 per cent of crude protein on dry matter basis. It has a crude fibre content of 14 per cent, which restricts its use in monogastrics like poultry. This might be the probable reason why studies on incorporation of SBG in poultry rations are scanty. However, the problem of more fibre can be solved by the addition of non starch polysaccharide (NSP) degrading enzymes. Therefore, the present investigation, was carried out; which envisages the study of the effect of partial replacement of soyabean meal with spent brewers grain on carcass traits, meat quality and blood cholestrol of broiler chicks.

MATERIALS AND METHODS

The study was conducted at Poultry Farm, Instructional Livestock farm complex (ILFC), at College of Veterinary and Animal Sciences, Pookode. For this study, 160, day old Vencobb 400 broiler chicks were purchased and divided by **Table 1. Experimental Design** completely randomized design into 5 groups, each group having four replicates with eight chicks each. The basal rations, viz., broiler pre starter, starter and finisher diets were prepared as per BIS (2007), with conventional feed ingredients and fed to birds in group T1. For birds in the other groups, the conventional protein source, viz., soyabean meal (SBM) was replaced with spent brewer's grain (SBG) at 10 and 20 per cent levels, in groups T2 and T3, T4 and T5, respectively; with the NSP degrading enzyme (BRIGOLD), supplemented at the rate of 500g per tonne of feed in groups T3 and T5, with no enzyme supplementation in groups T2 and T4. Birds were reared for 42 days.

Table 1:

Treatment	Level of replacement of SBM with SBG (%)	Level of enzyme supplementation (g/tonne of feed)
T1	0	0
T2	10	0
T3	10	500
T4	20	0
T5	20	500

At the end of the experiment (42 nd day) two birds from each replicate were randomly selected, weighed and slaughtered. The pre-slaughter weight, eviscerated carcass weight were taken and also recorded the weight of giblets, intestine, pancreas, spleen, bursa of fabricious. Yield percentage of carcass and giblet were calculated based on pre- slaughter live weight basis (Choo et al., 2014).

The sensory evaluation of poultry was conducted by a semi trained panel consisting of faculty and post graduate students from the Department of Livestock Products Technology, Pookode using a nine point Hedonic scale score card for cooked meat.

Blood samples were collected from two birds from each replicate at the end of the experiment. The serum was separated after centrifugation at 3000 rpm for 10 minutes. Serum samples were used to determine the blood cholesterol (CHOD- PAP method) using standard kits supplied by Agappe Diagnostics Limited, Ernakulam, Kerala.

Data collected were analysed statistically using one way ANOVA followed by Duncan Multiple Range test (DMRT) for pair wise comparison and Kruskal Wall's ANOVA was carried out for sensory parameters using SPSS 21.0 ®software.

RESULTS AND DISCUSSION

Table 2: carcass yield of experimental birds

Parameters	Treatment					F-value	P-value
	1	2	3	4	5		
Eviscerated carcass yield	61.78 ± 0.34	62.87 ± 0.57	61.42 ± 1.12	61.65 ± 0.43	63.5 ± 0.09	2.14^{ns}	0.125
Giblets Weight	4.62 ± 0.01	4.58 ± 0.08	4.73 ± 0.06	4.42 ± 0.14	4.75 ± 0.05	2.60^{ns}	0.078
Pancreas Weight	0.22 ± 0.01^{ab}	0.24 ± 0.02^{a}	0.22 ± 0.01^{ab}	0.17 ± 0.00^{bc}	0.20 ± 0.01^{bc}	5.04**	0.009
Spleen Weight	0.07 ± 0.00^{d}	0.09 ± 0.00^{c}	0.12 ± 0.00^{b}	0.14 ± 0.00^{a}	0.12 ± 0.00^{b}	100.70**	<0.001
Bursal Weight	0.12 ± 0.03	0.08 ± 0.00	0.16 ± 0.03	0.19 ± 0.03	0.15 ± 0.02	2.60600^{ns}	0.078
Thymus Weight	0.07 ± 0.01^{b}	0.10 ± 0.00^{b}	0.15 ± 0.01^{a}	0.10 ± 0.00^{b}	0.09 ± 0.01^{b}	12.58**	<0.001
Intestinal Weight	4.69 ± 0.17	4.61 ± 0.07	4.38 ± 0.06	3.76 ± 1.22	4.26 ± 0.06	0.44^{ns}	0.776

[a,b] Mean values with different superscripts within a row differ significantly. **significance at p<0.01 [ns] Non- significant

Table 3: sensory parameters of cooked meat of experimental birds

Sensory parameters	Treatment					χ^2-value	P-value
	1	2	3	4	5		
Appearance	8.50 ± 0.29	8.50 ± 0.29	8.50 ± 0.29	8.50 ± 0.29	8.50 ± 0.29	0^{ns}	1.00
Flavour	7.75 ± 0.48	8.00 ± 0.41	8.25 ± 0.25	8.25 ± 0.25	8.00 ± 0.41	1.38^{ns}	0.847
Tenderness	8.00 ± 0.41	7.75 ± 0.63	8.25 ± 0.48	7.75 ± 0.48	8.00 ± 0.41	0.81^{ns}	0.937
Juiciness	7.75 ± 0.48	7.75 ± 0.63	8.00 ± 0.41	8.00 ± 0.41	7.50 ± 0.65	0.58^{ns}	0.964
Aftertaste	7.75 ± 0.48	7.75 ± 0.63	8.00 ± 0.41	8.00 ± 0.41	7.50 ± 0.65	0.58^{ns}	0.964
Overall acceptability	7.75 ± 0.48	8.00 ± 0.41	8.00 ± 0.41	7.75 ± 0.25	7.50 ± 0.65	0.77^{ns}	0.942

[ns]Non- significant

Table 4:Total blood cholesterol of experimental birds

Treatment	Mean	Std. Error of Mean
1	146.05[a]	0.032
2	144.50[c]	0.108
3	145.02[b]	0.040
4	141.26[e]	0.034
5	142.08[d]	0.025
F-value (P-value)	1281.63** (<0.001)	

[a,b] Mean values with different superscripts within a row differ significantly.
****significance at p<0.01 [ns] Non- significant**

The effect of partial replacement of SBM with SBG, supplemented with and without enzyme on carcass traits of broiler chicken is illustrated in table 1. Statistical analysis of data showed that the carcass traits such as eviscerated carcass yield, giblet weight, bursal weight and intestinal weight at 42nd day were similar between groups. Generally, immunosuppressed chicks have smaller immune organs (Min et al., 2015). However, weight of immune organs like thymus and spleen in our study, were significantly affected between treatment groups and the spleen weight was recorded significantly higher in treatment groups compared to control group. In agreement with our results, previous observations reported that various levels (0, 3, 6, 9 per cent) of dried brewers grain (DBG) in broiler chicks did not have any effect on carcass and giblet percentage (Ashour et al., 2012). Also Nortey et al. (2018) found similar carcass yield between group upto 16 per cent inclusion of sorghum based brewers spent grain (SBBSG). Earlier investigation had shown an increase in intestinal weight with increase in SBBSG due to increased fibre content (Manu – Barfo et al., 2013). In this study no such effect was observed. In comparable with our results, Soltan (2009) found no effect of enzyme supplementation on bursal weight and in contrast, El –Katcha et al. (2014) observed that enzyme supplementation had no effect on spleen weight also. Comparable to our finding, Swain et al. (2012) found that, thymus weight increased due to the incorporation of dried brewers grain at 10 per cent level with enzyme in broiler chicks. In contrast, increased thymus weight was observed also at 20 per cent inclusion level.

Table 3 showed the sensory parameters such as appearance, flavour, tenderness, juiciness, aftertaste, overall acceptability and those were not affected with inclusion of SBG. However, Ashour et al. (2012) observed that meat samples from DBG groups showed lower appearance and tenderness values, compared with the control group. All samples decreased in cooking loss percentage, compared with the control. The opposite trend was observed in other sensory traits (flavour, texture and juiciness), which increased as a response to DBG inclusion.

Total blood cholesterol is indicated in the table 4. And it was significantly reduced with inclusion of SBG which indicated the high fibre content in SBG. Brown et al. *(*1999) reported that soluble fibres will reduce total and LDL cholesterol in blood by related quantity. Anjola et al. *(*2016) reported that total cholesterol level decreased with the inclusion of SBG which is comparable with our findings. However, Ashour et al. (2012) detected no substantial impact of SBG inclusion.

CONCLUSION

From the result of the current investigation, it can be concluded that SBG can be used for partial replacement of SBM upto 20 per cent without any detrimental effect on carcass traits and meat quality and also it reduces the total blood cholestrol. Moreover, it improves the immune response.

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