EXTENT OF REPLACEMENT OF SOYBEAN MEAL WITH DISTILLERS DRIED GRAINS WITH SOLUBLES (DDGS) ON CARCASS YIELD, DRESSING PERCENTAGE AND FEED COST IN BROILER CHICKENS

S.M. Gacche[1], A.B. Kanduri[2], P.V. Patil[3], N.Z. Gaikwad[4]

ABSTRACT

Escalation of prices of major ingredients of poultry ration, *viz*., corn (maize) and soybean meal (SBM) as the principal sources of energy and protein respectively, have forced the researchers to quest for inexpensive and effective alternate energy and protein sources to bail out the poultry industry struggling to recover from consistent losses. Distillers dried grain with solubles (DDGS), a by-product of bio-fuel industry, is an emerging alternate source for replacement of SBM due to its cost effectiveness and ready availability. The results on the level of substitution and its effects on poultry production are still controversial. The present study was conducted to study the effect of DDGS on the carcass yield, dressing percentage and feed cost in broiler chickens. For the present study, 120 healthy day old commercial broiler chicks of Vencob' strains were selected and divided into four groups of 30 chicks each. Each group was divided into 3 replicates of 10 birds each. The experimental birds were reared in deep litter system up to 42 days of age. Group I was the positive control, fed on 100% SBM diet. In groups II, III and IV, SBM was replaced by 10%, 20%, and 30%, respectively with DDGS. The study revealed significant ($P \leq 0.05$) effect of level of substitution of SBM with DDGS on the performance of chicks with respect to pre-slaughter body weight, edible carcass yield, and dressing percent. The pre-slaughter body weight and edible carcass yield of group I (0%DDGS), group II (10% DDGS) and group III (20% DDGS) chicks were significantly ($P \leq 0.05$) higher than group IV (30% DDGS) chicks, but did not differ ($P \geq 0.05$) from each other. The dressing % of group II (10% DDGS) and group III (20% DDGS) chicks were significantly ($P \leq 0.05$) higher than group IV (30% DDGS) and group I (control) chicks, but did not differ from each other ($P \leq 0.05$). The feed cost per kg live weight on 42- day was the lowest in group III chicks (Rs. 39.00), followed by group II (Rs. 39.35), group I (Rs. 39.68), and group IV (Rs. 42.72) chicks. It is concluded that the optimum level of replacement of SBM with DDGS is 20% for better carcass performance and cost efficiency.

KEY WORDS

Broilers, Carcass characteristics, Distillers dried grain with solubles, Feed cost

Author attribution: [1]PG student, [2]Assisitant Professor, Department of Animal Nutrition, [3]Farm Manager, Cattle Breeding Farm, [4]Associate Professor, Department of Veterinary Biochemistry, College of Veterinary & Animal Sciences, Maharashtra Veterinary & Animal Sciences University (MAFSU), Udgir, Maharshtra, India- 413517. [3]Corresponding author: (Email: drprafull9@rediffmail.com). It is a part of the MVSc thesis of first author submitted to MAFSU, Nagpur. Received: 31 January 2016, Accepted: 23 May 2016. pp. 109-114.

INTRODUCTION

Poultry feed contains two major ingredients, *viz*., corn (maize) and soybean meal as the principal source of energy and protein respectively. Corn and soybean meal, both are dearer to the poultry farmers now, due to skyrocketing prices of these two commodities, necessitating search for cheap alternatives. Distillers dried grain with solubles (DDGS), a by-product of bio-fuel industry, obtained during the process of ethanol production has emerged as a cost-efficient alternative source of protein and energy, for incorporation in poultry diet (Okah, 2004; Ghazalah et al., 2011; Ravindran, 2013). In fact, DDGS has replaced 98% of corn and 23% of soybean meal in U.S.A. in the year 2010-11 as per an estimate (Hoffman and Baker, 2011).

The results of earlier research on replacement of SBM by DDGS has indicated that DDGS at higher levels in chicken diet had either non-significant or negative effect on growth, feed efficiency and carcass characteristics in chicks, while the optimum levels of substitution differed in different experiments (Choi et al., 2008; Wang et al., 2008; Ghazalah et al., 2011; Hoffman and Baker, 2011; Loar II and Corzo, 2011; Bolu et al., 2012; Lukasiewicz et al., 2012).

The present investigation was planned to evaluate the extent of replacing soybean meal with DDGS on carcass yield, dressing percentage, and cost efficiency of feeds in broiler chickens.

MATERIALS AND METHODS

For the present study, 120 healthy day old commercial broiler chickens of Vencob' strains were procured, and divided into four groups of 30 chicks in each group. Each group was divided into 3 replicates of 10 birds each. The experimental birds were reared in deep litter system with similar management practices except feeding treatment.

Group-I was the positive control, and was fed on 100% Soybean meal (SBM) in the diet as a protein source. In groups II, III and IV, SBM was replaced with distillers dried grains with solubles (DDGS) @ 10%, 20% and 30% respectively (Table-1).

The experimental trial was conducted for 42 days. The chicks were fed on starter ration up to 28 days (Table-2) and finisher ration from 29 to 42 days (Table-3). The proximate compositions of starter mash and finisher mash are presented in Table-4 and Table-5, respectively. The rations were isocaloric and isonitrogenous.

The birds of al the four groups were sacrificed on the day after completion of 42 days of trial period for evaluation of carcass characteristics. The birds were fasted for a period of three hours prior to slaughter. The live weights of the birds were recorded before slaughter.

The edible carcass yield was the carcass weight (after removal of feathers, viscera, head and legs), along with heart (without pericardium), liver (without gall bladder), and empty gizzard.

Dressing percentage was determined, as : (Carcass yield / Live weight) × 100

The data were statistically analyzed as per Snedecor and Cochran (1994).

Table-1. Feeding treatments of experimental groups of broiler chickens.

Group	Treatment	Number of replicates	No. of birds / group
Group I	0% DDGS (control)	03	30
Group II	10% DDGS replacement of SBM	03	30
Group III	20% DDGS replacement of SBM	03	30
Group IV	30% DDGS replacement of SBM	03	30

Note: DDGS = Distillers dried grain with solubles, SBM = Soybean meal.

Table-2. Composition (%) of starter ration for broiler chickens (1-28 days of age).

Sr. no	Ingredient	Group I	Group II	Group III	Group IV
1	Maize	63	62	61	59
2	SBM	27	24.3	21.6	18.9
3	DDGS	00	2.7	5.4	8.1
4	Groundnut oil cake	00	01	02	04
5	Poultry starter ration	10	10	10	10
6	Total	100	100	100	100

Table-3. Composition (%) of finisher ration for broiler chickens (29 to 42 days of age).

Sr. no	Ingredient	Group I	Group II	Group III	Group IV
1	Maize	70	70	69	70
2	SBM	20	18	15	14
3	DDGS	0	02	04	06
4	Groundnut oil cake	0	0	02	00
5	Poultry finisher ration	10	10	10	10
6	Total	100	100	100	100

Table-4. Proximate composition (%) of starter mash on dry matter basis.

Nutrient	Group I	Group II	Group III	Group IV
Dry matter	93.70	93.29	92.78	93.52
Crude Protein	22.98	22.93	22.87	23.15
ME (kcal / kg), calculated	2800	2804	2808	2802
Ether Extract	2.85	3.25	4.83	5.50
Crude Fiber	5.20	5.38	5.56	5.85
Total ash	5.4	5.96	6.73	5.57
Calcium (calculated)	1.19	1.19	1.19	1.18
Phosphorus (calculated)	0.49	0.48	0.47	0.46
Nitrogen Free Extract	63.57	62.48	60.01	59.93

Table-5. Proximate composition (%) of finisher mash on dry matter basis.

Nutrient	Group I	Group II	Group III	Group IV
Dry matter	98.42	98.23	98.32	98.64
Crude Protein	20.50	20.22	20.23	19.66
ME (kcal / kg), calculated	2866.5	2876.5	2877.0	2896.5
Ether Extract	4.66	5.66	6.66	6.00
Crude Fiber	4.89	4.94	5.17	5.05
Total ash	1.18	1.17	1.17	1.16
Calcium (calculated)	0.47	0.43	0.45	0.43
Phosphorus (calculated)	5.85	5.71	6.83	5.34
Nitrogen Free Extract	64.10	63.47	61.11	63.95

RESULTS AND DISCUSSION

Carcass characteristics: There was significant ($P \leq 0.05$) effect of treatment on pre-slaughter body weight, edible carcass yield, and dressing percent of the birds (Table-6).

The pre-slaughter body weights (g) were, 1903.13 ± 47.77 (Group I), 1982.93 ± 30.70 (Group II), 1997.00 ± 29.31 (Group III), and 1524.73 ± 35.55 (Group IV) in different groups of chickens. The pre-slaughter body weight of Group IV chicks was significantly ($P \leq 0.05$) lower than the other three groups (Group I, Group II, and Group III), while the differences between Group I, Group II, and Group III chickens were statistically non-significant ($P \geq 0.05$).

The edible carcass yields (g) were, 1275.83 ± 27.5 (Group I), 1360.17 ± 29.18 (Group II), 1366.83 ± 43.98 (Group III), and 967.50 ± 26.33 (Group IV) in different groups of chickens. The carcass yields of Group IV chicks was significantly ($P \leq 0.05$) lower than the other three groups (Group I, Group II, and Group III), while the differences between Group I, Group II, and Group III chickens were statistically non-significant ($P \geq 0.05$).

The dressing (%) of different groups were, 67.03 ± 0.75 (Group I), 68.59 ± 0.79 (Group II), 68.44 ± 1.35 (Group III), and 63.45 ± 1.23 (Group IV) chickens. The dressing% of group II and group III chickens were significantly ($P \leq 0.05$) higher than group I and group IV chickens, whereas the difference between group II and group III was non-significant ($P \geq 0.05$). The dressing% of group I chickens was significantly ($P \leq 0.05$) higher than group IV chickens.

Cost efficiency of feeds: The feed costs per kg live weight on 42- day, were Rs. 39.68 (Group I), Rs. 39.35 (Group II), Rs. 39.00 (Group III), and Rs. 42.72 (Group IV) in different groups of chickens (Table-7). It was the lowest in group III chicks.

Table-6. Carcass characteristics of different groups of broiler chickens.

Group	Live weight (g)	Carcass yield (g)	Dressing (%)
Group I	1903.13^{a}±47.77	1275.83^{a}±27.5	67.03^{b}±0.75
Group II	1982.93 ^{a}± 30.70	1360.17^{a}±29.18	68.59^{a}±0.79
Group III	1997.00^{a}±29.31	1366.83^{a}±43.98	68.44^{a}±1.35
Group IV	1524.73^{b}± 35.55	967.50^{b}±26.33	63.45^{c}±1.23

Note: (1) The figures are presented as Mean ± SEM. (2) Means with different superscripts in a column differ significantly ($P \leq 0.05$). (3) Live weights of the birds were recorded prior to slaughter.

Table-7. Cost efficiency of feeds in different treatment groups of broiler chickens.

Factor	Group I	Group II	Group III	Group IV
Feed intake (g)				
Starter (1-28 days)	1053.29	1116.19	1084.03	1000.00
Finisher (29-42 days)	2206.17	2308.21	2394.60	1948.00
Total	3259.46	3424.40	3478.63	2948.00
Feed price (Rs / kg)				
Starter (1-28 days)	24.35	23.96	23.58	23.33
Finisher (29-42 days)	22.60	22.22	21.85	21.46
Feed cost / chick (Rs)				
Starter (1-28 days)	25.65	26.74	25.56	23.33
Finisher (29-42 days)	49.86	51.29	52.32	41.80
Total cost (Rs)	75.51	78.03	77.88	65.13
Body wt. (42d), g	1903.13	1982.93	1997.00	1524.73
Feed cost / kg. Live wt. (Rs)	39.68	39.35	39.00	42.72

Discussion: The results revealed that group II (10% DDGS) and group III (20% DDGS) chickens, performed better than the other groups with respect to the pre-slaughter body weight, carcass yield and feed cost efficiency indicating an ameliorative effect of DDGS on poultry productivity.

Choi et al. (2008) had observed that dietary replacement of DDGS with maize or soybean meal at 5%, 10%, and 15% level of displacement did not significantly affect growth performance in broiler chicks ($P \geq 0.05$). Lukasiewicz et al. (2012) has reported that replacement of soybean meal with DDGS at 5% and 7% levels had no significant effect on body weight, feed intake, and dressing percent in broiler chickens ($P \geq 0.05$).

Wang et al. (2008) had reported that the performance (body weight) of broiler chickens declined significantly ($P \leq 0.05$) and the intake of metabolizable energy decreased with increasing levels of DDGS (30%, 40%, and 50%) than at lower levels (10% and 20%) in the diet due to significant increase in calorie conversion ratio.

Loar and Corzo (2011) had observed that increasing the level of inclusion of DDGS from 0% to 32% with 8% increment, had decreased body weight gain with increase in the level of DDGS, and recommended a level of 8% for inclusion in the diets of broiler chickens.

Bolu et al. (2012) has suggested replacement of maize with 10% DDGS in the diet of

broiler chicks over 20%, 30%, and 40% levels, since protein retention was significantly ($P \leq 0.05$) affected with increase in the level of DDGS in the diet. Hoffman and Baker (2011) had also recommended replacement of maize / soybean meal up to a level of 10% DDGS in the diet of broiler chicks.

Our results showing inclusion of DDGS at 20% level reduced the feed cost and increased the feed cost efficiency was similar to the report of Choi et al. (2008), who has observed that use of DDGS in broiler diets up to 15% in the place of corn or soybean meal could decrease the feed cost without any negative effect on growth and meat qualities. Ghazalah et al. (2011) had observed that inclusion of DDGS (25% or 50% or 75%) as a replacement for soybean meal linearly reduced feed cost in hens.

CONCLUSION

It is concluded that replacement soybean meal with DDGS at the level of 20% in the diet, improved body weight, carcass yield and cost efficiency of feed in broiler chicken.

REFERENCES

Bolu, SA et al. 2012. Response of broilers to graded levels of distillers dried grain. Sustainable Agriculture Research, 1 (1), 147-150.

Choi, HS et al. 2008. Nutritive and economic values of corn distillers dried grains with solubles in broiler diets. Asian-Australasian Journal of Animal Sciences, 21 (3), 414-419.

Ghazalah, AA et al. 2011. Use of distillers' dried grains (DDGS) as replacement for soybean meal in laying hen diets. International Journal of Poultry Science, 10 (7), 505-513.

Hoffman, L.A.; Baker, A. 2011. Estimating the substitution of distillers' grains for corn and soybean meal in the U.S. feed complex. Outlook, October 2011, United States Department of Agriculture. pp. 1-57. (www.ers.usda.gov)

Loar II, R.E.; Corzo, A.A. 2011. Effects of varying levels of distillers dried grains with soluble on growth performance of broiler chicks. Revista Brasileria de Ciencia Avicola, 13 (4), 279-281.

Lukasiewicz, M et al. 2012. Application of dried distillers grains with soluble (DDGS) as a replacement of soybean meal in broiler chickens feeding. Archiv Tierzucht, 55 (5), 496-505.

Okah, U. (2004). Effect of dietary replacement of maize with maize processing waste on the performance of starter broiler chicks. Proc. 9th Annual Conference of Animal Science Association of Nigeria (ASAN). 13 -16 September 2004. Ebonyi State University, Abakaliki, Nigeria. pp. 2-5.

Ravindran, V. 2013. Poultry feed availability and nutrition in developing countries. Poultry Development Review. pp. 60-63. Food and Agriculture Organisation of United Nations.

Snedecor, G.W.; Cochran W.G. 1994. Statistical methods, 8th edition, Affiliated East West Press, Iowa State University press, USA. Published by Oxford and IBN Publishing Co., Kolkata.

Wang Z et al. 2008. Evaluation of high levels of distillers dried grain with solubles (DDGS) in broiler diets. International Journal of Poultry Science, 6 (10), 990-996.