Asian Journal of Poultry Science

ISSN 1819-3609

Academic Journals Inc.

www.academicjournals.com

Asian Journal of Poultry Science 5 (3): 116-123, 2011
ISSN 1819-3609 / DOI: 10.3923/ajpsaj.2011.116.123

Carcass Quality Characteristics of Broilers as Affected by Dried Poultry Excreta Supplementation

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ABSTRACT

Rapid growth rate in the poultry industry poses the problem of huge production of poultry excreta. Hence, utilization of this vast organic waste might be a critical issue in near future. One of the potential uses of poultry excreta could be its utilization as a source of protein in poultry ration. With this objective the study was conducted to evaluate the effect of Dried Poultry Excreta (DPE) supplementation on the performance of broilers, in terms of growth, conformation traits and carcass characteristics. Analysis of variance revealed that the difference between replicates were none significant for the different traits. In the study, maximum shank length was found in the feed containing 5% DPE in both male and female. The keel bone length was increased when DPE increased in diet. The breast angle measurements of males were higher than the females. The males had the widest breast angle with 5% DPE level at 4th week of age and 10% DPE level at 6th week of age. The% leg yield on combined sex basis ranged from 31.7 to 32.3%, breast yield 26.3 to 26.6%, back with neck yield 24.4 to 25.0% and wing yield 16.9 to 17.3% within three DPE levels of diet. All DPE levels of the study in broilers diet can be implemented and was very well accepted but for better results it is recommended that DPE should be replaced in broilers diet between 5 to 10%.

Key words: Dried poultry excreta, broilers, carcass, conformation traits, yield traits, feed supplementation

INTRODUCTION

Broiler industry is a fastest growing industry in the world. India ranks 4th and 18th with respect to production of egg and broiler respectively in the world (Yadav, 2003). As per FAO (2006) report, broiler production increases from 14 million (in 1971) to about 2000 million (in 2005). Report also added that total poultry meat production has increased from 70,000 MT in 1971 to 1900,000 MT in 2005 from 2000 million birds. The per capita availability of eggs per year has increased from 7 in 1961 to 44 in 2004-05 and poultry meat from 160 g to about 1900 g during the same period of time. However, the increase in this sector is not as much as required to cater the need of increase in human population.

The advancement in the sector is mainly due to massive application of modern technology on intensive system of housing and management, availability of genetically superior germplasm,

nutritionally balanced feed, better disease control and health care measures (Jain, 2001). Prolonged selection and breeding of broiler chicken for growth, feed efficiency and carcass traits lead to production of broilers of 2 kg live weight with feed efficiency of 1.65. Whereas, eviscerated yield around 1390 gm and breast yield 320 gm. The feed requirement for the production of 1 kg of breast meat was 10 kg at 37 days of age (Amanullah *et al.*, 2010). This has resulted in an improvement of 41% in reducing the marketable age for a 2 kg broiler (from 1: 2.5 to 1:1.65). Hassanien (2011), Rizvi *et al.* (1998) reported in his study the improvement in eviscerated yield was 4-5% (from 1330 gm to 1390 gm) and 28% in breast yield (from 250 gm to 320 gm). Mishra (2000) reported the 50% less feed requirement (from 20 kg to 10 kg) for one kg breast yield during the last 21 years i.e., form 1976 to 1997.

For the sustainability of fast growing poultry industry there is an urgent need to evolve the cost effective feed formulations. In this regard Dried Poultry Excreta (DPE) can be utilized for nitrogen and mineral source and its protein quality is comparable to standard poultry feed stuff. The production levels of conventional feed ingredients are not increasing proportionally to meet the future demand. So, DPE may be the good alternate feed ingredients in near future (Adesehinwa *et al.*, 2010). The search of alternative sources of feeds for poultry may be the future trend because low cost feeds with high nutritive value are the basic requirement for sustainability of poultry industry (Saki *et al.*, 2006). Poultry litter includes excreta, bedding wasted feed and feathers (Fontenot and Hancock, 2001). Poultry manure is a potential source of protein. It has attracted the attention of animal nutritionists all over the world because of its richness of protein, calcium (5.4%), phosphorus as K2O and magnesium as MgO (0.335%) other minerals (Obasa *et al.*, 2009). According to Aro and Tewe (2007) and Yaghobfar (2005) poultry manure is a rich source of essential minerals, with a crude protein content of between 25-50 and 55-60% Total Digestible Nutrient (TDN) on dry matter basis. They also reported that the nutritional value of DPE is similar to or higher than good quality legume hay. Several other workers also reported the importance of DPE in the production characteristics of broilers with respect to the other nutritional constituents (Jafarnejad and Sadegh, 2011; Ali *et al.*, 2011; Ismail *et al.*, 2011; Deepa *et al.*, 2011).

Keeping all these facts in mind present study was conducted with the objective to evaluate the effect of Dried Poultry Excreta (DPE) supplementation on the performance of broilers, in terms of growth, conformation traits (at 4th and 6th week of age) and carcass characteristics at 6th week of age.

MATERIALS AND METHODS

The study was conducted in the year 2004-2005 to assess the influence of Dried Poultry Excreta (DPE) on the performance of day old sexed four hundred and eighty commercial broiler chicks. A group of twenty broilers (male and female) distributed in 12 treatments replicated twice. The chicks were reared in electric battery brooders under same environmental conditions. These chicks were allotted at random to each treatment. Proximate composition of Dried Poultry Excreta (DPE) is shown in Table 1.

Data pertaining to performance traits such as growth, feed efficiency, conformation traits and percent mortality, body weights were recorded by weighing individual chicks at weekly interval up to 6 weeks of age. Chicks were fed experimental ration *ad-libitum*. Conformation traits like breast angle, shank length and keel length were measured of all the birds at 4th and 6th week's age. Four broilers of either sex from each replication were picked up randomly and slaughtered at 6th weeks of age to study the carcass characteristics.

Table 1: Proximate composition of dried poultry excreta (DPE)

Nutrients	Mean	Range
Dry matters (%)	90.42	88.74-92.10
Crude protein (%)	29.73	29.20-30.80
True protein (%)	15.00	14.80-15.20
Ether extract (%)	2.43	2.15-2.70
Crude fiber (%)	13.67	12.35-14.98
NFE 5	33.80	27.90-35.90
Total ash (%)	20.85	19.30-22.40
Calcium (%)	4.13	3.60-4.65
Phosphorus (%)	2.01	1.80-2.22
Gross energy (kcal kg^{-1})	1480.00	1315.00-1645
Gross energy (k joules kg^{-1})	6195.45	5500.205-6890.695

Conformation traits and carcass characteristics were measured for comparative evaluation and interaction effects of all treatments. Among them conformation traits such as breast angle (°), keel bone length (cm) and shank length (cm) was measured at 4th and 6th week of age. Whereas, carcass characteristics such as dressed weight (in%), giblet weight (in%), abdominal fat weight (in%) and cut-up parts weight (in%) were evaluated at the age of 6th week.

Three birds selected at random from each group were sacrificed for carcass evaluation at the end of experiment (at 6th weeks). The birds were kept off feed for over night prior to slaughter but were allowed to take fresh drinking water *ad libitum* during that period.

First of all, live weights of birds were recorded. The birds were slaughtered by 'Modified Kosher' method as described by Abe *et al.* (1996) and allowing them to bleed completely. The feathers were removed completely with hand picking, leaving the skin intact. The shanks were removed at hock joints and dressed weight recorded. The percent dressed weight was calculated on the basis of live weight.

Dressed wt. = Live wt. – (blood wt.+skin wt.+Feather wt.+giblets+visceral content)

Evisceration was done by removing crop, gullet, trachea and preens glands. A horizontal cut was made at the rear of the keel bone, thereby the breast was a little upturned and pushed forward, exposing the viscera along with the visceral organ which were then removed completely by pulling. The lungs were scrapped off and heart, liver and gizzard constituting giblet removed carefully from the viscera. The gizzard was then opened, the contents washed out and inner epithelial lining removed. The heart was made free from blood and adhering vessels. The eviscerated weight was recorded as the weight of carcass together with giblets.

Statistical analysis: The data collected in study were analyzed as 3x2x2 factorial completely randomized design according to Snedecor and Cochran (1995). The means were compared and considered significant at 5% level.

RESULTS AND DISCUSSION

Three levels of dried poultry excreta (0, 5 and 10% DPE), were considered for the study. DPE used in the study was rich in protein contents (29.73%) as shown in Table 1. After additions of DPE in different levels i.e., 0, 5 and 10%, the total crude protein contents were 22.03, 21.94 and 21.82,

Table 2: Calculated and analyzed Chemical Composition

Ingredients	D0 (0%)	D1 (5%)	D2 (10%)
CP%			
Calculated	22.08	22.00	21.98
Analyzed	22.03	21.94	21.82
ME Kcal kg^{-1}			
Calculated	2722.00	2702.00	2661.95
Analyzed	2782.50	2779.00	2698.01

Table 3: Composition of experimental ration

Ingredients	D0 (0% DPE)	D1 (5% DPE)	D2 (10% DPE)
Maize	56.0	56.0	56.0
DORP	5.0	2.0	-
Soya-Cake	15.0	14.0	8.0
GNC	11.0	12.0	13.0
Jawala Fish	10.0	8.0	10.0
Min. Mix.	2.5	2.5	2.5
Vit. Mix.	0.5	0.5	0.5
DPE	-	5.0	10.0

Table 4: Means for confirmation traits on combined sex basis due to the DPE effect at IV and VI weeks

Factors		IV week	VI week	IV week	VI week	IV week	VI week
DPE	D0	5.47^{a}	7.44	6.41^{a}	7.71^{a}	58.04^{a}	60.3^{a}
	D1	5.91^{b}	7.58	6.51^{b}	7.95^{b}	61.03^{b}	66.9^{b}
	D2	5.76^{ab}	7.63	6.36^{b}	8.03^{b}	60.74^{c}	63.2^{c}
SE Range		0.03-0.08	0.04-0.07	0.05-0.09	0.05-0.07	0.40-0.91	0.51-0.99

Means showing different super-scripts are significantly different ($p<0.05$)

Table 5: Means for carcass characteristics due to the DPE effects for pooled sexes (VI week)

Factors		Starved Live wt. In kg	Shrinkage (%)	Bleeding (%)	Feather (%)	Dressing (%)	Liver (%)	Heart (%)	Gizzard (%)	Giblets (%)	Abdominal fat (%)	Total meat yield (%)
DPE	D0	1121.65^{a}	3.33	4.32	4.87	63.27^{a}	1.78	0.51	1.69	3.98	0.76^{a}	67.95^{a}
	D1	1137.13^{b}	3.23	4.03	4.81	64.40^{b}	1.80	0.50	1.65	3.55	0.65^{a}	69.16^{b}
	D2	1155.00^{b}	3.19	4.46	4.58	63.76^{c}	1.78	0.53	1.63	3.94	0.62^{b}	68.42^{c}
SE Range		0.00	0.06-0.09	0.16-0.19	0.19-0.21	1.17-1.29	0.05-0.09	0.05-0.07	0.08-0.13	0.07-0.24	0.04- 0.08	0.21-1.23

Means showing different super-scripts are significantly different ($p<0.05$)

respectively (Table 2). The formulation for experimental poultry ration is depicted in Table 3. The experiment consisted of two replicates for each treatment of DPE. The performance of broiler was evaluated in terms of growth, conformation traits (at 4th and 6th week of age) and carcass characteristics at 6th week of age. Survivor and equal number of birds per subclass was considered for obtaining the data. No significant difference in various traits was noticed in analysis of variance under study. For further analysis, performance on combined sex basis was under taken. Means for confirmation traits on combined sex basis due to the DPE effect at IV and VI weeks are presented in Table 4. However, means for carcass characteristics due to the DPE effects for pooled sexes (6th week) are depicted in Table 5 and means of cut-up parts due to the DPE effects for males, females and on pooled sex basis are in Table 6.

Table 6: Means of cut-up parts due to the DPE effects for males, females and on pooled sex basis

		Males				Females			
Factors		Leg%	Wings%	Back and Neck%	Breast%	Leg%	Wings%	Back and Neck%	Breast%
DPE	D0	32.50	17.11	24.13	26.06	32.05	16.77	24.17	26.75
	D1	31.13	17.00	25.04	26.80	32.22	16.88	25.04	26.40
	D2	32.21	16.82	24.66	26.29	31.20	17.03	24.65	26.40
SE Range		0.23-0.31	0.14-0.23	0.17-0.37	0.16- 0.30	0.25-0.29	0.13-0.21	0.16-0.39	0.14- 0.29

		Pooled			
Factors		Leg%	Wings%	Back and Neck%	Breast%
DPE	D0	32.27	16.94	24.42	26.40
	D1	31.67	16.94	24.75	26.60
	D2	32.04	16.92	24.69	26.34
SE Range		0.21-0.28	0.12-0.21	0.17-0.38	0.15-0.31

Means showing different super-scripts are significantly different ($p<0.05$)

Experiment 1- conformation traits study

Shank length: Inclusion of DPE in diet was found to have significant ($p<0.05$) effect on the shank length measurement on combined sex basis at 4th weeks of age. However, it was non-significant measurement at 6th week of age. The values obtained at 0 and 5% level is significantly different among each other but individually these values are non significant from 10% levels at 4th week of age. At 4th week of age the shank length measurement was 5.47, 5.91 and 5.76 cm and at 6th week of age it was 7.44, 7.58 and 7.63 at 0, 5 and 10% DPE levels. At 6th week of age highest measurement for shank was observed at 5% DPE level. Although, at 6th week of age shank length measurement was statistically non-significant among all three DPE levels in combined sexes but it was increased shank length measurement was noticed with increased DPE level in diet. Data obtained in the study is expressed in Table 4.

Keel bone length: Keel bone length is a good criterion for the assessment of meat quantity in the poultry meat. The data obtained in the study is given in Table 4. The keel bone length ranges from 6.36 to 6.51 cm at 4th weeks of age and 7.71 to 8.03 cm at 6th weeks of age. Among them highest value was at 5% level on 4th week and at 10% level on 6th week of age. In observations we found increased keel bone length on increasing DPE levels in diet with the exception of 10% level at 4th weeks of age. Overall DPE have significant ($p<0.05$) effect on keel bone length of combined sex both at 4th and 6th weeks of age.

Breast angle: The inclusion of DPE (0-10%) showed significant ($p<0.05$) effect on breast angle of combined sex basis. The widest breast angle was with 5% DPE level and narrowest with zero percent DPE level both at 4th and 6th week of age. The data pertaining to breast angle value are given in Table 4. The measurement of breast angle was in the range of 58.04' to 61.03' at 4th weak and in between 60.3' and 66.9' at 6th weak of age in combined sex basis. These data can be seen in Table 4.

The results obtained in the study are very well in the range of the findings of Abe *et al.* (1996), Mishra (2000), Fontenot and Hancock (2001), Amanullah *et al.* (2010), Aro and Tewe (2007) and Yaghobfar (2005). However, data on keel bone length and shank length was not similar to the reports of Hassanien (2011) and Rizvi *et al.* (1998).

Experiment 2- carcass characteristics study: Four broilers of either sex from each replication were picked up randomly for slaughtering to study the carcass characteristics and proximate composition. The data were analyzed for each characteristic within and combined sex basis to study DPE. On (%) weight basis of different carcass traits the overall means for carcass traits at 6th week of age are tabulated in Table 5.

Starved live weight: The significant ($p<0.05$) effect was exerted due to DPE on starved weight in combined sex at slaughter age (6th weeks). The starved weight recorded significantly ($p<0.05$) lower at 0% DPE than the 5 and 10% DPE level. Non-significant differences were observed between 5 and 10% DPE level. Starved weight was in the range of 1121.65 to 1155 kg as shown in Table 5.

Percent shrinkage: The shrinkage percent after overnight fasting to that of live weight was in the range of 3.19 to 3.33% due to inclusion of DPE levels. In study, we found more shrinkage (%) for the diet including higher DPE level in pooled sex of broilers which is visible in Table 5.

Percent blood loss and percent feather loss: In average of other effects of DPE supplementation,% blood loss was lower at 5% DPE level (4.03%) as compared to highest in 10% (4.46%) and second highest in 0% levels (4.03%). The trend of feather loss was found in decreasing trend with respect to the enhancement of DPE level in feed (4.87 to 4.58%). In study, lowest percent feather was observed at 10% DPE level (4.58) which can be seen in Table 5.

Dressing percentage: The higher dressing percent showed at 5% DPE and 10% DPE level of diet. The effect of DPE was found significant ($p<0.05$). The mean values for (%) eviscerated yield ranged from 63.27 to 64.40% between three DPE levels for combined or pooled sexes as shown in Table 5. Similar results were observed by Cunningham and Lillich (1976) in the dressing percentage in the broilers feeded with dehydrated poultry waste (0 to 10%) containing isocaloric and isonitrogenous diet.

Percent giblet weight: Giblet weight includes the combined weight of liver, heart and gizzard. The giblet weight percentage was found higher at 0% DPE level for combined sexes as compared to other levels of DPE in diet. The range of giblet weight was 3.55 to 3.98 in which higher value was for the without DPE feed and lowest for 5% DPE level in feed as depicted in Table 5.

Percent abdominal fat: The inclusion of DPE showed significant ($p<0.05$) effect on percent abdominal fat in broilers of combined sex. It was noticed in the study that (%) abdominal fat decreased with increase in DPE level. The (%) abdominal fat was significantly ($p<0.05$) lower at 10% DPE (0.62%) than 5 and 0% dietary DPE level (0.65 and 0.76%, respectively). The values for abdominal fat are given in Table 5.

Percent total meat yield: Analysis of variance revealed significant ($p<0.05$) differences due to DPE on total meat yield (%). Similar findings were given by the Elizabeth *et al.* (1978), Reddy *et al.* (1983) and Nambi *et al.* (1992).

Percent cut up parts yield: Means of cut-up parts due to the DPE effects for males, females and on pooled sex basis are presented in Table 6. The non-significant differences were observed due to DPE effect for all (%) cut-up parts yield in males, females and on combined sex basis. On over all cut-up part yield basis the yield of (%) leg weight was higher followed by breast, back with neck and wing in either of the sexes. The (%) leg yield on combined sex basis ranged from 31.67 to 32.27%, breast yield 26.4 to 26.75%, back with neck yield 24.42 to 24.75% and wing yield 16.92 to. 16.94% within three DPE levels of diet.

Data obtained in this study regarding carcass quality characteristics were very well in the line of findings of Katoch *et al.* (1998), Mahajan *et al.* (1999), Sayed *et al.* (2000) and Banday and Risam (2001). However, the findings of Adesehinwa *et al.* (2010) was not very well agreed with the findings of present study on percent total meat yield and also on cut up parts.

CONCLUSION

Present results are showing the good acceptability of dried poultry excreta for supplementation in broilers diet rearing for meat purposes. Among the replicates it can be supplemented in all three levels (0, 5 and 10%). However, better results in carcass quality characteristics of broilers can be obtained in 5 to 10% level.

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