

Original Research Article

<https://doi.org/10.20546/ijcmas.2020.905.152>

## Effect of Phytobiotics Supplementation on Carcass Characteristics of Nandanam Broiler 3 Chicken

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### ABSTRACT

A study was conducted to evaluate the effect of phytobiotics on carcass characteristics of Nandanam broiler-3 chicken. A total of 120 day-old Nandanam broiler-3 chicks were randomly allotted into four treatments with three replicates each 10 chicks. The dietary treatments were formulated as control fed with basal diet (T1) and basal diet supplemented with 0.50 % ginger powder (T2) or garlic paste (T3) or turmeric powder (T4). At the end of 8 weeks of age, six birds (3 males and 3 females) were randomly selected and subjected to slaughter studies to determine the carcass characteristics. The results indicated that digestive stimulant effect of turmeric (T4) had resulted in increased per cent eviscerated (63.71%) and ready-to cook (69.71%) weights which is followed by other treatment groups (T2 and T3) compared to control (T1). The per cent cut-parts of breast, back, thigh and wings were significantly ( $P < 0.05$ ) higher in T4 compared to other treatment groups. Significant ( $P > 0.05$ ) differences were observed in per cent head, gizzard and intestine length (cm) among the treatments. There was no significant difference observed in per cent blood, feather, shank, liver, heart and giblets. There was no significant difference observed on drumstick and neck parts also.

#### Keywords

Phytobiotics,  
Ginger, Garlic,  
Turmeric, carcass  
yield, cut-up-parts

#### Article Info

Accepted:  
10 April 2020  
Available Online:  
10 May 2020

### Introduction

Poultry industry can harvest first class protein for human nutrition, as a source of revenue and play an important role in economic growth of any country (Tarhyel *et al.*, 2012).

In the past, antibiotics were the regularly used as feed additives to improve the meat and egg production of chicken. However, the use of antibiotics is facing serious criticism (Iji *et al.*, 2001) and restricted due to drug residue in carcass and also due to modification of

natural gut micro flora (Botsoglou *et al.*, 2002). Recently, many countries banned the use of antibiotics because of their harmful side effects and due to increased awareness; the alternatives to antibiotics such as, herbs and medicinal plants are being widely used now (Manseh *et al.*, 2012). Nutritionists are shifting their attention from utilization of chemical to phytogenic growth promoters in recent years (Iji *et al.*, 2001). Ginger, garlic and turmeric can be used as good alternatives for common artificial growth promoters like antibiotics. Hence, this study was conducted with these three different phytobiotics as feed additives to study the effect on carcass characteristics in Nandanam broiler chicken-3.

### Materials and Methods

The study was carried out at Poultry Research Station, Madavaram Milk Colony, Tamil Nadu Veterinary and Animal Sciences University, Chennai, located between 13° -9' and 13° -15'N and longitudes 80° -14' and 80° - 24' E with an altitude of 22 meters above mean sea level. Chennai has a hot and humid climate, classified as 'Tropical Maritime Monsoon' type. The average annual rainfall is 130mm and depends mostly on the North East monsoon. Average temperature was 28.4°C during the study period (December to February). The relative humidity was high throughout the year in range of 65- 85 per cent.

### Experimental design

A total of one hundred and twenty Nandanam broiler-3 chicks with average hatch weight of 36.67g were distributed randomly into four groups having three replicates of each ten birds in a Completely Randomized Design. The standard recommended commercial broiler diet was prepared as per BIS (2007) broiler standards with similar nutrient

composition for all the treatments. The design of experiment is presented in Table 1. The control diet was formulated without supplementation of any antibiotics, growth promoters yeast or prebiotics (T1). The experimental diets were prepared by supplementing the control diet with 0.50 per cent ginger powder (T2) or 0.50 per cent garlic paste (T3) or 0.50 per cent turmeric powder (T4). The required amount of various phytobiotics were prepared and weighed and initially mixed with small quantity of feed and then mixed with bulk quantity. All the diets were isocaloric and isontrogenous. The feed and water were provided *ad libitum* during the experimental periods. Standard management practices were adopted in all the experimental groups. At the end of eight weeks experimental period, six birds for each treatment (3 males + 3 females) were picked up randomly and slaughtered by standard method.

### Dressed yield

The dressed yield of the carcass was determined as per ISI Standard. The dressed yield of the carcass was recorded after removing blood, feather, shank, oil gland, head and viscera and expressed as percentage

$$\text{Dressed yield (\%)} = \frac{\text{Carcass weight (g) excluding blood, feather, shank, oil gland, head and viscera}}{\text{Slaughter live weight (g)}} \times 100$$

### Giblet yield

The weight of heart, liver and gizzard were weighed and collectively recorded as giblet yield (g) and expressed as percentage of live weight as follows:

$$\text{Giblet yield (\%)} = \frac{\text{Weight of heart, liver and gizzard (g)}}{\text{Slaughter live weight (g)}} \times 100$$

## Cut up parts

The weight of individual cut up parts were recorded and expressed as percentage of live weight as follows:

$$\text{Cut up parts weight (\%)} = \frac{\text{Weight of individual cut - up part}}{\text{Dressed weight}} \times 100$$

## Statistical analysis

Data, thus collected, was subjected to statistical analysis by analysis of variance using Completely Randomized Design as described by Snedecor and Cochran (2002). The treatment means were compared by critical differences (CD).

## Results and Discussion

The effect of supplementation of phytobiotics on carcass traits like processing yields are presented in Tables 2, processing loss and offal weights in table 3 and cut-up parts in Table 4.

### Per cent eviscerated weight and ready-to-cook weight

The values of per cent eviscerated weight and ready-to-cook weight obtained in this study are presented in Table 2. The treatment groups T4 (63.66%), T3 (62.57%) and T2 (61.65%) recorded significantly ( $P < 0.05$ ) higher eviscerated carcass yield compared to control (58.42%).

Although the giblet weight alone did not differ among different treatment groups, the giblets with dressed weight was significantly ( $P < 0.05$ ) high in T3 (67.73) and T4 (69.71). Similar observations of significant ( $P < 0.05$ ) difference in the carcass traits including dressing percentage in broiler chicken due to inclusion of turmeric powder in the diet was made by Hussein (2013) and

Mondal *et al.*, (2015). In contrary, Nouzarian *et al.*, (2011), Noori *et al.*, (2011), Al-Jaleel (2012), Mashhadani (2015), Wang *et al.*, (2016) and Hidayat *et al.*, (2017) reported no significant effect on carcass quality traits including dressed weight and dressing percentage due to supplementation of turmeric powder. Similarly Kirubakaran *et al.*, (2016) reported that incorporation of 5 and 10 g garlic powder/ kg diet, resulted in insignificant difference in dressed weight (73.89 and 73.97% respectively) than control (73.78%).

The result of present study agrees with earlier findings of Milosevic *et al.*, (2013). Rinkesh *et al.*, (2015) showed that significantly ( $P < 0.05$ ) higher dressing percentage was observed in 0.1 per cent as compared to 0.5 per cent garlic supplementation and control; however, eviscerated yield remained comparable ( $P > 0.05$ ) among different dietary treatment groups.

Ashayerizadeh *et al.*, (2009) also reported significant ( $P < 0.05$ ) increase in dressing percentage in garlic supplementation. In contrast to present findings, Aji *et al.*, (2011) reported non-significant effect of garlic supplementation on dressing percentage in broilers. Barad *et al.*, (2017) supplemented the feed with coriander seed (2%), turmeric powder (2%) and black pepper (0.5%) and found no significant difference in dressing percentage.

Karangiya *et al.*, (2016) fed broiler chicken with 1% garlic or 1% ginger or 1% garlic + 1% ginger. They observed that 1% garlic had significant ( $P < 0.05$ ) effect on dressing percentage. A broiler trial conducted with supplementation of 0.2% ginger or pepper or curry leaf powder has shown that the carcass characteristics viz. eviscerated weights and ready-to-cook percentage did not differ significantly among treatment groups at 6

weeks of age (Moorthy *et al.*, 2009). Similar to the present findings, Ei-Deck *et al.*, (2003) also observed no significant effect on dressing percentage of broilers fed with 0.1% ginger powder up to 6 weeks of age. Safa and Eltazi (2014) reported that diets with 1.5% garlic+ 0.25% ginger had significantly ( $P<0.05$ ) highest hot and cold dressing percentage of the broilers at 6 weeks of age.

Similarly, Dieumou *et al.*, (2012) reported that carcass dressing percentage of broiler chicks fed on diets supplemented with garlic essential oil were significantly ( $P<0.05$ ) better than control. Zomrawi (2013) recorded higher dressing percentage in birds receiving 1% ginger root powder diet in comparison to control.

Belalet.al. (2018) reported that dressing percentage were significantly higher in 0.15% ginger supplemented birds compared to 0.15% garlic, 0.7% ginger + 0.15% garlic powder feed supplemented groups and 0.15% ginger + 0.15% garlic water infused groups. The dressing percentage was also significantly ( $P<0.05$ ) higher when ginger and garlic were fed in powder form.

### **Organ weight**

The weights liver, heart and giblet were recorded in the present study did not differ significantly ( $P>0.05$ ) among the different groups (Table 3). Similar to the present findings Patel *et al.*, (2017) observed non-significant effect of garlic and fenugreek supplementation on weights of liver, heart and spleen in broilers.

Barad *et al.*, (2017) also reported that the supplementations of feed with turmeric powder did not have any significant difference in weight of different organs. Kirubakaran *et al.*, (2016) reported that the garlic fed groups had no significant difference

in gizzard percentage when compared control at six weeks of age in broilers. Shewita and Taha (2018) reported non-significant differences in relative liver, heart, spleen and proventriculus percentages among the groups receiving different levels of ginger powder. Rinkesh *et al.*, (2015) reported non-significant effect of garlic supplementation on relative weights of heart, liver and giblet.

The mean per cent weights of relative organs of broiler chicken on dressed weight basis did not differ significantly ( $P>0.05$ ) among different treatment levels of turmeric powder groups except the per cent weight of liver. (Choudhury *et al.*, 2019). Javandel *et al.*, (2008) and Onibi *et al.*, (2009) stated that garlic supplementation had no significant effects on organ characteristics. The present findings were in agreement with the observations of Noori *et al.*, (2011), Al-Jaleel (2012), Maaty *et al.*, (2014), Mashhadani (2015), Hady *et al.*, (2016) and Yesuf *et al.*, (2017), who found that relative organ weights of chicken were not significantly ( $P>0.05$ ) affected by dietary supplementation of turmeric powder. In contrast to the present findings, Choudhury *et al.*, (2019), found significantly ( $P<0.05$ ) higher liver weight in turmeric supplemented groups.

Abou-Elkhair *et al.*, (2014) and Maaty *et al.*, (2014) found significant ( $P<0.05$ ) increase in the mean weights of liver due to feeding of turmeric powder in broiler chickens. Kirubakaran *et al.*, (2016) reported significantly ( $P<0.01$ ) higher liver weight percentage in 10g garlic powder/kg of diet supplementation. Karangiya *et al.*, (2016) reported that supplementation of ginger and garlic led to significant ( $P<0.05$ ) increase in the weight of different visceral organs. Safa and Eltazi (2014) fed different levels of garlic and ginger powder and found that gizzard yield was significantly ( $P<0.05$ ) decreased due to supplementation.

### **Processing loss**

All the processing loss like weights of blood, feather and shank had no significant difference among treatments (Table 3). Rinkesh *et al.*, (2015) reported non-significant effect on blood and feather loss among different levels of garlic supplemented groups. The other relative organs like head, shank, intestine, kidneys and pancreas showed non-significant ( $P>0.05$ ) difference in three different levels of turmeric powder groups (Choudhury *et al.*, 2019). Raesi *et al.*, (2010) stated that supplementation of 1 and 3% garlic in the broiler diet had no significant effects on digestive organs. Tekeli *et al.*, (2011) who concluded that dietary supplementation of ginger had significant effects on the weight of visceral organs of broiler chickens.

### **Small intestine length**

The small intestine length (cm) showed significant ( $P<0.01$ ) difference among the treatment groups. The turmeric (179.83cm) and garlic (175.33cm) supplemented birds had significantly ( $P<0.01$ ) higher intestinal length than other groups. In contrast, Patel *et al.*, (2017) also reported that the length of intestine and caecum had non-significant ( $P>0.05$ ) difference due to the supplementation of garlic and fenugreek alone and in combination. Javandel *et al.*, (2008) reported non-significant effect of garlic on intestine length of broilers.

### **Cut-up-parts of carcass**

The cut-up-parts of different treatment groups were presented in Table 4. The per cent yields of cut-up-parts like breast and back were significantly ( $P<0.05$ ) higher in T4 (27.30 %) followed by T3 (27.10 %), T2 (26.16 %) and T1 (23.86 %) respectively. The per cent thigh and wings were significantly

( $P<0.05$ ) higher in T4 followed by T3, T2 and T1. The per cent drumstick and neck did not differ significantly ( $P>0.05$ ) among different treatment groups. Similar findings of significant ( $P<0.05$ ) differences in per cent yield of breast were reported by Wang *et al.*, (2016) in broiler chicken due to supplementation of turmeric powder in the basal diet. Hussein (2013) and Ukoha and Ununkwo (2016) found significant ( $P<0.05$ ) differences in per cent yields of thigh and back between the control and turmeric supplemented groups.

In, contrary to the present findings, Durrani *et al.*, (2006) and Mashhadani (2015) found non-significant differences in the per cent yield of breast, thigh, back and wings among the control and turmeric powder fed groups. Similarly, Choudhury *et al.*, (2019) reported per cent yields of cut-up-parts like neck and drumsticks did not differ significantly ( $P>0.05$ ) among different treatment groups. Similar to the present findings, Durrani *et al.*, (2006) and Mashhadani (2015) found non-significant difference in per cent yields of drumsticks and neck in turmeric powder feed group. Raesi *et al.*, (2010) reported significant effect on carcass parts of broilers fed with garlic. Oleforuh-Okoleh *et al.*, (2014) reported that 0.1% ginger powder, 0.1% garlic powder in feed, 50 ml/litre ginger or garlic infusion through water significantly ( $P<0.05$ ) influenced carcass parts of 7 week old broilers. In contrary to the present results, Dieumou *et al.*, (2009) and Pourali *et al.*, (2010) reported that the carcass parts were not affected by ginger and garlic. Zomrawi (2013) reported that the percentages of commercial cuts like breast showed significant ( $P<0.05$ ) improvement at different levels of garlic and ginger powder in broiler diets. Safa and Eltazi (2014) reported that the diets with 11.5% garlic + 0.25% ginger significantly ( $P<0.05$ ) increased the commercial cuts percentage like breast and thigh.

**Table.1** Experimental design

Group	Treatment	Replicates	Total no. of birds
T1	Basal diet (control)	3	30
T2	Basal diet + Ginger powder 0.50%	3	30
T3	Basal diet +Garlic paste 0.50%	3	30
T4	Basal diet +Turmeric powder0.50%	3	30

**Table.2** Effect of phytobiotics on processing yield of Nandanam broiler -3 (Mean ± S.E)

Parameters	T1 (Control)	T2 ( 0.50% Ginger powder)	T3 ( 0.50% Garlic paste)	T4 (0.50% Turmeric powder)	F- value
Live wt. (g/bird)	1129.33±24.71	1114.17±30.20	1174.17±25.70	1133.17±31.34	0.8314 <sup>NS</sup>
Eviscerated wt (%)	58.42±1.04 <sup>b</sup>	61.65±1.26 <sup>a</sup>	62.57±0.90 <sup>a</sup>	63.66±0.64 <sup>a</sup>	5.251 <sup>**</sup>
Giblet wt (%)	5.10±0.481	5.67±0.39	5.16±0.15	6.05±0.31	1.615 <sup>NS</sup>
Ready-to-cook wt (%)	63.52±1.24 <sup>b</sup>	67.31±0.97 <sup>b</sup>	67.73±0.87 <sup>a</sup>	69.71±0.88 <sup>a</sup>	6.672 <sup>**</sup>
<b>Weight of Giblet</b>					
Liver (%)	2.52±0.26	2.57±0.20	2.44±0.10	3.09±0.36	1.427 <sup>NS</sup>
Heart (%)	0.53±0.07	0.37±0.06	0.53±0.01	0.55±0.08	1.988 <sup>NS</sup>
Gizzard (%)	2.04±0.24 <sup>b</sup>	2.73±0.21 <sup>a</sup>	2.18±0.06 <sup>b</sup>	2.40±0.05 <sup>a</sup>	3.2621 <sup>*</sup>

\*\* Significant (P<0.01); \*- Significant (P<0.05); NS-Not Significant (P>0.05)

Mean values within each row bearing common superscripts do not differ significantly (P0.05)

**Table.3** Effect of phytobiotics on processing loss and weight of the offal of Nandanam broiler -3 (Mean ± S.E)

Parameters	T1 (Control)	T2 ( 0.50% Ginger powder)	T3 ( 0.50% Garlic paste)	T4 (0.50% Turmeric powder)	F- value
Blood wt. (%)	5.63±0.73	4.37±0.34	4.04±0.27	4.02±0.57	2.2023 <sup>NS</sup>
Feather loss with skin (%)	13.04±1.04	11.60±0.36	11.64±0.41	11.01±0.16	2.133 <sup>NS</sup>
Head wt. (%)	3.28±0.19 <sup>b</sup>	3.96±0.07 <sup>a</sup>	3.16±0.08 <sup>b</sup>	3.74±0.19 <sup>a</sup>	6.767 <sup>**</sup>
Shank wt. (%)	4.13±0.46	5.18±0.25	4.40±0.21	4.93±0.24	2.3616 <sup>NS</sup>
Liver wt. (%)	2.52±0.26	2.57±0.20	2.44±0.10	3.09±0.36	1.427 <sup>NS</sup>
Heart wt. (%)	0.53±0.07	0.37±0.06	0.53±0.01	0.55±0.08	1.988 <sup>NS</sup>
Gizzard wt. (%)	2.04±0.24 <sup>b</sup>	2.73±0.21 <sup>a</sup>	2.18±0.06 <sup>b</sup>	2.40±0.05 <sup>a</sup>	3.2621 <sup>*</sup>
Intestine wt (%)	7.56±0.22	7.26±0.58	7.24±0.27	8.87±0.14	1.386 <sup>**</sup>
Intestine length(cm)	141.50±4.36 <sup>b</sup>	139.50±8.26 <sup>b</sup>	175.33±7.91 <sup>a</sup>	179.83±5.44 <sup>a</sup>	10.313 <sup>**</sup>

\*\* Significant (P<0.01); \*- Significant (P<0.05); NS-Not Significant (P>0.05)

Mean value within each row bearing common superscripts do not differ significantly (P >0.05)

**Table.4** Effect of Phytobiotics on cut-up-parts of Nandanam broiler -3 (Mean  $\pm$  S.E)

Parameters	T1 (Control)	T2 ( 0.50% Ginger powder)	T3 ( 0.50% Garlic paste)	T4 (0.50% Turmeric powder)	F- value
Breast (%)	23.86 $\pm$ 0.48 <sup>b</sup>	26.16 $\pm$ 0.55 <sup>a</sup>	27.10 $\pm$ 0.77 <sup>a</sup>	27.30 $\pm$ 1.27 <sup>a</sup>	3.636*
Back (%)	14.68 $\pm$ 0.18 <sup>b</sup>	15.20 $\pm$ 0.71 <sup>b</sup>	16.87 $\pm$ 0.49 <sup>a</sup>	16.17 $\pm$ 0.32 <sup>a</sup>	4.316*
Thigh (%)	14.48 $\pm$ 0.42 <sup>b</sup>	15.18 $\pm$ 0.39 <sup>b</sup>	16.89 $\pm$ 0.33 <sup>a</sup>	17.53 $\pm$ 0.45 <sup>a</sup>	12.737**
Drumstick(%)	14.77 $\pm$ 0.41	16.19 $\pm$ 0.39	15.89 $\pm$ 0.41	15.75 $\pm$ 0.68	1.580 <sup>NS</sup>
Neck(%)	9.41 $\pm$ 0.66	9.43 $\pm$ 0.29	8.70 $\pm$ 0.44	7.61 $\pm$ 0.48	3.077 <sup>NS</sup>
Wings (%)	13.27 $\pm$ 0.57 <sup>b</sup>	15.39 $\pm$ 0.13 <sup>a</sup>	14.56 $\pm$ 0.20 <sup>a</sup>	14.78 $\pm$ 0.27 <sup>a</sup>	7.009**

It could be concluded that 0.50% turmeric powder supplementation can benefit broilers in terms of per cent eviscerated, giblet and ready-to-cook weight and carcass cut-up-parts like per cent breast, back and weight. Therefore, turmeric powder at 0.50 per cent level in feed can be recommended as non-antibiotic feed supplement for better carcass traits in colour broilers like Nandanam broiler-3.

### Acknowledgement

Authors are thankful to the Director, Centre for Animal Production Studies, Tamil Nadu Veterinary and Animal Sciences University, Madhavaram Milk Colony, Chennai, Tamil Nadu, India for the necessary facility provided during this experiment.

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**How to cite this article:**

Sangilimadan. K., R. Richard Churchil, K. Premavalli, S. T. Selvan and Omprakash. A. V. 2020. Effect of Phyto-biotics Supplementation on Carcass Characteristics of Nandanam Broiler 3 Chicken. *Int.J.Curr.Microbiol.App.Sci*. 9(05): 1349-1358.  
doi: <https://doi.org/10.20546/ijcmas.2020.905.152>