

## **Effects of garlic extract on growth, carcass characteristics and haematological parameters in broilers**

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### **Abstract**

Garlic (*Allium sativum*) is a popular spice in Bangladesh. Its beneficial effect as growth promoter in poultry has not been studied. Broilers were grouped into four: T<sub>1</sub> (1% garlic), T<sub>2</sub> (2% garlic), Pc (ciprofloxacin positive control) and Nc (negative control). Aqueous extract of garlic (1% and 2%) was administered with drinking water. T<sub>1</sub> group (1%) showed better performance with regard to body weight gain than T<sub>2</sub> (2%), positive and negative control. In T<sub>1</sub> group, significant difference was observed in terms of live body weight gain and dressed weight but no significant differences in feed conversion ratio, offal's weight and in blood parameters. It is suggested that 1% aqueous extraction of garlic improves growth and carcass qualities in Broilers. (*Bangl. vet.* 2015. Vol. 32, No. 1, 1 – 6)

### **Introduction**

Feed additives are used in poultry feed to improve nutritive value and enhance performance. Antibiotics are used in broiler rations to improve productivity but have negative effects on animal and human health. Therefore, the use of antibiotic as growth promoters has not been encouraged (Castanon, 2007). Phyto-genic feed additives have shown promising effects with regard to weight gain, feed efficiency, lowered mortality and increased viability in poultry (Ahmad and Khan, 2008).

Aromatic plants and essential oil extracted from them have been used as alternatives to antibiotics. For this reason, these plants are becoming more important due to their growth promoting and antimicrobial effect on animal health (Al-Kassie, 2009). Garlic (*Allium sativum*) is widely distributed, grown in various parts of the world and is commonly used in the food industry because of its special aroma.

Garlic has a great impact on haematological parameters, which affects the physiological, pathological and nutritional status of poultry (Oleforuh-okoleh *et al.*, 2015). It is an important spice in traditional cooking in the Indian sub-continent, and is cheap and widely available (Huda *et al.*, 2008). This study was designed to evaluate garlic extract as a safe growth promoting agent in broiler chickens.

### **Materials and Methods**

#### ***Study location***

Collected birds were kept at the departmental poultry shed, located at 24°43'N,

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90°25'E, and elevation 45 feet. The study lasted for 35 days from early December 2014 to mid-January 2015.

### ***Test ingredients***

Fresh garlic was purchased from KR Shopping centre, Bangladesh Agricultural University campus. The garlic was peeled, cut into small pieces and dried at 40°C for 24 hours. The dried garlic was crushed by grinder (Jaipan-CM/L-7360065) and aqueous extract was prepared by Soxhlet extraction as described by Dieumou *et al.* (2012). One percent and 2% solutions of garlic extract were prepared.

### ***Birds' management***

A total of 40 day-old Cobb 500 broiler chicks were purchased from Nourish Poultry and Hatchery Limited, Gazipur, Bangladesh. The chicks were kept for nine days for acclimatization and were fed commercial broiler starter feed (Narish Poultry Feed Limited, Gazipur, Bangladesh) and drinking water. The brooding temperature was maintained at 35°C during the first week, and then lowered by 3°C every week until it reached room temperature (25 ± 1°C). Mean initial weight of the chicks was 35.9g. Newcastle disease vaccine (Baby Chick Ranikhet Disease Vaccine-BCRDV, Livestock Research Institute, Mohakhali, Dhaka, Bangladesh) was given intra-ocularly at 4<sup>th</sup> and 21<sup>st</sup> days.

On day 7, 40 chicks with mean body weight 91g were allotted to two treatment and positive and negative control groups in a completely random design (CRD). The birds were reared in iron cages of 5 × 4 × 3.5 feet. Four experimental groups were identified as T<sub>1</sub> (1% garlic), T<sub>2</sub> (2% garlic), Nc (negative control: only feed and water) and Pc [positive control: antibiotic (Ciprofloxacin, Renaflox®, Renata Animal Health, Dhaka, Bangladesh, Vitamin B-complex (B-comvit®, Square agrovet and pesticide, Dhaka, Bangladesh)] supplied as pharmaceuticals recommended dose.

### ***Data collection***

Birds were weighed every day. At the end of treatment blood samples were collected from the wing vein of each bird using disposable plastic syringe and needle with EDTA. After sacrifice, dressing percentages were taken and liver, heart, pancreas, gizzard and spleen were weighed.

### ***Haematological assay***

Packed Cell Volume (PCV), Total Erythrocyte Count (TEC) and Haemoglobin concentrations (Hb) were measured as described by Lamberg and Rothstein (1977).

### ***Statistics and data analysis***

The data were analysed using general linear model procedure of Statistical Package for Social Science (SPSS) IBM 20, and comparison of means tested using Duncan's multiple range test: significance was considered at P<0.05 (Dieumou *et al.*, 2012).

## Results and Discussion

The effects of feeding different concentrations of garlic extract on daily body weight gain are shown in Table 1. All groups had initial body weight  $91.5 \pm 1.4$ g. No birds died during the study period. Feed Conversion Ratio (FCR) is shown in Table 2, where no significant variation was evident in T<sub>1</sub>. Dressed weights of birds are shown in Table 3; better dressed weight was in T<sub>1</sub> group ( $1223.7 \pm 2.1$ g). No significance variation was found in offal weight (Table 4) and in blood profiles (Table 5).

### *Growth performance*

In Table 1, average weight gain from day 7 to day 35 are presented at 7 day intervals. Best weight gain was experienced by T<sub>1</sub> group at day 35 followed by T<sub>2</sub>, Pc and lowest in Nc.

Table 1: Live body weight (g) of birds treated with garlic extract

| Groups         | Body weight gain (g) |                   |                   |                    |                    |
|----------------|----------------------|-------------------|-------------------|--------------------|--------------------|
|                | Day 7                | Day 14            | Day 21            | Day 28             | Day 35             |
| T <sub>1</sub> | $89.9 \pm 0.5^*$     | $311.0 \pm 1.2^d$ | $739.5 \pm 1.9^a$ | $1334.7 \pm 1.9^b$ | $1823.9 \pm 2.2^a$ |
| T <sub>2</sub> | $90.7 \pm 0.5^b$     | $338.5 \pm 1.2^a$ | $732.1 \pm 1.9^b$ | $1113.5 \pm 1.8^d$ | $1758.7 \pm 2.2^b$ |
| Pc             | $92.5 \pm 0.5^a$     | $313.5 \pm 1.2^c$ | $709.8 \pm 1.9^c$ | $1352.8 \pm 1.9^a$ | $1755.3 \pm 2.2^b$ |
| Nc             | $92.7 \pm 0.5^a$     | $319.5 \pm 1.2^b$ | $625.6 \pm 2.0^d$ | $1129.1 \pm 3.0^c$ | $1527.6 \pm 2.3^c$ |

\*Different letters denote significant variation between groups

Supplementation with garlic extract significantly increased ( $P < 0.05$ ) body weight gain from 7 to 35 days of age, compared with the two control groups.

A number of researchers have reported growth promoting effect of garlic extract in broilers (Meraj, 1998; Javed *et al.*, 2009; Mahmood *et al.*, 2009; Elagib *et al.*, 2013). It is suggested that the antibacterial compound dialkyl polysulphide present in garlic extract is playing a pivotal role in weight gain of broilers (Meraj, 1998; Ross *et al.*, 2001).

### *Feed Conversion Ratio (FCR)*

FCR was calculated every 7 days: the best FCR was in T<sub>1</sub> group at 35<sup>th</sup> day, followed by Pc, T<sub>2</sub> and lowest was in Nc group (Table 2).

No significant ( $P < 0.05$ ) differences were recorded in FCR between treatments from 7 to 35 days of age. However, few studies showed better FCR data with garlic extract treatment (Rehman *et al.*, 2012; Senthikumar *et al.*, 2015).

### *Dressed weight*

After dressing, each bird at day 35 was weighed. Among the groups T<sub>1</sub> had highest dressed weight ( $P < 0.05$ ) followed by Pc, T<sub>2</sub> and the lowest was Nc group (Table 3).

Table 2: Feed Conversion Ratio (FCR) of birds treated with garlic extract

| Groups         | Feed Conversion Ratio (FCR) |        |        |        |        |
|----------------|-----------------------------|--------|--------|--------|--------|
|                | Day 7                       | Day 14 | Day 21 | Day 28 | Day 35 |
| T <sub>1</sub> | 1.2                         | 1.8    | 1.6    | 1.5    | 1.6    |
| T <sub>2</sub> | 1.1                         | 1.7    | 1.7    | 1.6    | 1.7    |
| Pc             | 1.1                         | 1.7    | 1.8    | 1.6    | 1.7    |
| Nc             | 1.1                         | 1.7    | 2.0    | 1.9    | 1.9    |

Table 3: Dressed weight of birds treated with garlic extract

| Groups         | Weight of dressed birds (g) |
|----------------|-----------------------------|
| T <sub>1</sub> | 1223.7 ± 2.1 <sup>a</sup>   |
| T <sub>2</sub> | 1076.0 ± 2.1 <sup>c</sup>   |
| Pc             | 1143.0 ± 2.2 <sup>b</sup>   |
| Nc             | 986.3 ± 2.3 <sup>d</sup>    |

\*Different letters denotes significant variation among the groups

### Offal weight

Individual bird's liver, gizzard, heart, spleen and pancreas were weighed: no statistically significant difference was observed ( $P>0.05$ ).

Table 4: Offal weight of birds after dressing at day 35

| Groups         | Offal's weight of birds (gm) |                         |                         |                        |                        |
|----------------|------------------------------|-------------------------|-------------------------|------------------------|------------------------|
|                | Liver                        | Gizzard                 | Heart                   | Spleen                 | Pancreas               |
| T <sub>1</sub> | 48.1 ± 0.5 <sup>b</sup>      | 27.2 ± 0.9 <sup>a</sup> | 9.3 ± 1.9 <sup>a</sup>  | 2.3 ± 0.2 <sup>a</sup> | 2.3 ± 0.2 <sup>a</sup> |
| T <sub>2</sub> | 52.5 ± 0.5 <sup>a</sup>      | 21.6 ± 0.4 <sup>b</sup> | 10.0 ± 1.9 <sup>b</sup> | 3.0 ± 0.2 <sup>a</sup> | 2.5 ± 0.2 <sup>a</sup> |
| Pc             | 52.5 ± 0.5 <sup>b</sup>      | 21.0 ± 0.4 <sup>b</sup> | 10.3 ± 1.9 <sup>b</sup> | 2.5 ± 0.2 <sup>a</sup> | 2.5 ± 0.2 <sup>a</sup> |
| Nc             | 51.6 ± 0.5 <sup>a</sup>      | 19.7 ± 0.4 <sup>c</sup> | 10.3 ± 1.9 <sup>b</sup> | 2.6 ± 0.2 <sup>a</sup> | 2.6 ± 0.2 <sup>a</sup> |

\*Different letters denotes significant variation between groups

The results indicated no significant differences ( $P>0.05$ ) between groups in weight of liver, gizzard, heart, spleen or pancreas. The lower weight of liver of birds on supplemented diets differs from Tchakounte *et al.* (2006) where liver and gizzard of birds on supplemented diets were well developed. Higher body weight and lower offal weight indicate good performance (Plumber and Kiepper, 2011).

It is concluded that 1% garlic extract treated group (T<sub>1</sub>) had best performance.

### Haematological assay

No significance variation was observed in blood parameters (Table 5).

Table 5: Haematological data of birds at day 35

| Groups         | Mean                              |           |            | Standard deviation                |           |            |
|----------------|-----------------------------------|-----------|------------|-----------------------------------|-----------|------------|
|                | TEC<br>(million/cm <sup>3</sup> ) | Hb<br>(g) | PCV<br>(%) | TEC<br>(million/cm <sup>3</sup> ) | Hb<br>(g) | PCV<br>(%) |
| T <sub>1</sub> | 2.9                               | 7.4       | 25.7       | 0.1                               | 0.2       | 0.6        |
| T <sub>2</sub> | 2.9                               | 7.6       | 28.0       | 0.1                               | 0.2       | 1.0        |
| Pc             | 2.3                               | 7.3       | 23.8       | 0.2                               | 0.3       | 3.8        |
| Nc             | 2.3                               | 7.0       | 21.0       | 0.2                               | 0.3       | 3.8        |

There was no significant increase ( $P>0.05$ ) in the PCV, Hb and TEC of birds in treated groups compared with control. High PCV, Hb, and RBC indicate improved oxygen-carrying capacity of the cells, which translate to better availability of nutrients (Oleforuh-Okoleh *et al.*, 2015). Garlic extract (1%) shows highest mean TEC, Hb and PCV (2.9, 7.4 and 25.7) and lowest standard deviation (0.1, 0.2 and 0.6). Administration of garlic extract reduced the platelets in the blood. Lawson *et al.* (1992) reported that garlic could decrease the sensitivity of platelets as aggregating agents. This implies that garlic extract could improve blood circulation on account of its inhibitory effects on platelet aggregation.

## Conclusions

Aqueous extract of garlic showed better performance than positive and negative control groups. Among garlic extracts, 1% garlic extract showed better performance in relation to carcass weight than 2%. It is suggested that garlic extract can be used as an alternative organic growth promoter in poultry.

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