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Effect of various levels of garlic (*Allium sativum* L.) powder in feed on growth performance of Japanese quail (*Coturnix japonica*)

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Abstract

A biological experiment was conducted by using 300 day old Japanese quail chicks randomly grouped into 4 treatments with 3 replicates of 25 chicks each. Garlic powder was incorporated at 0, 0.5, 1.0 and 1.5 per cent level in the basal diet of Japanese quail and fed for a period of 6 weeks to assess the growth performance. There was no significant difference in initial body weights upto fourth week between control and garlic powder supplemented groups. Quails fed with garlic powder supplemented diets exhibited significantly ($P < 0.05$) higher mean live body weight from fourth to sixth week than control. Significantly ($P < 0.05$) better feed conversion ratio was recorded for garlic powder supplemented diets T2 – T4 (2.88-2.85) than T1 control group (2.97). There was no significant difference in per cent livability. It was concluded that dietary supplementation of garlic powder at 1.5% level improved growth performance in Japanese quails.

Keywords: Japanese quail, garlic powder, growth performance

Introduction

In India, commercial quail farming has created a huge impact in recent years because of its fast growing nature, short generation interval, and hardy birds which can withstand poor managemental conditions. Feed is the single most expenditure amounts to nearly 70-75% of total cost of production in poultry farming. Nutritive and non nutritive feed additives are being used to obtain improved production performance. The use of antibiotic growth promoters is restricted in many countries due to issues such as the development of drug resistance in bacteria and the drug residues in products which may infect human and thus poses great public health concern. This had led to the use of various alternatives to antibiotic growth promoters such as probiotics^[1], prebiotics^[2], organic acids^[3], enzymes^[4] and phytogetic^[5-7]. Phytogetics are a heterogeneous group of feed additives originating from plants and consist of herbs, spices, fruit, and other plant parts. Garlic (*Allium sativum* L.) is known to contain allicin which is rich in vitamin content (vitamin C, thiamine, riboflavin and niacin), selenium and potassium. Garlic also contain Fructooligosaccharides (FOS) with prebiotic activity. Garlic (*Allium sativum* L.) was known as spice and herbal medicine for prevention and treatment of a verity of diseases^[8] as well as growth promoter^[9] and improves productive performance in broiler chickens^[7, 10]. Garlic has antimicrobial, antioxidant as well as antihypertensive properties^[11] and lower serum and liver cholesterol^[12]. These functions were attributed to bioactive components present in garlic^[13] including sulphur containing compound such as allin, diallylsulpher and allicin^[14]. Studies on the use of garlic as a feed additive in quail diet is lacking in India. Hence, this study was conducted to find out the effect of various levels of garlic (*Allium sativum* L.) in feed on the growth performance of Japanese quail (*Coturnix japonica*).

Materials and Methods

This study was conducted at the Poultry Research Station, Tamil Nadu Veterinary and Animal Sciences University, Chennai, Tamil Nadu, India. A total of 300 day old Japanese quail chicks were randomly divided into four treatment groups (T1, T2, T3 and T4) with three replicates of 25 chicks each. The locally available garlic was purchased, powdered and incorporated at 0, 0.5, 1.0 and 1.5 per cent level in the basal diet and fed for a period of 6 weeks to assess the growth performance.

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The control and experimental diets were formulated without supplementation of any antibiotics, probiotics, prebiotics, enzymes. All the birds were fed standard quail starter and finisher diets containing ME levels of 2855 and 2600 Kcal/kg and crude protein levels of 25.45 and 23.00% respectively. The birds were housed in cages and standard managemental conditions were followed throughout the experimental period. Growth performance viz. body weight, feed intake and livability were recorded biweekly from 0 day to 6 weeks of age. The recorded data were analyzed statistically as per Snedecor and Cochran [15].

Results and Discussion

The Mean (\pm S.E.) growth performance of Japanese quail (*Coturnix japonica*) as influenced by various levels of dietary

garlic (*Allium sativum* L.) in feed are presented in Table 1. The analysis of variance of data revealed that there was no significant difference in initial body weights upto fourth week between control and garlic powder supplemented groups. The quails fed with garlic powder supplemented diets exhibited significantly ($P<0.05$) higher mean live body weight from fourth to sixth week in comparison with control group. Among the garlic powder supplemented groups, the higher mean body weight was recorded in the birds fed at 1% and 1.5% groups. This is in agreement with the results of Khalil *et al.* [16] and Raya *et al.* [17] who reported that quail fed with the garlic-containing diets exhibited significantly better ($P\leq 0.01$) final live body weight, body weight gain and feed conversion ratio but feed intake was not affected ($P>0.05$), compared with their control counterparts.

Table 1: Mean (\pm S.E.) growth performance of Japanese quail (*Coturnix japonica*) as influenced by various levels of dietary garlic (*Allium sativum* L.) in feed

Parameters	Control T1 (0%)	T2 (0.5%)	T3 (1%)	T4 (1.5%)
Hatch weight(g) ^{NS}	8.65 \pm 0.11	8.63 \pm 0.11	8.73 \pm 0.12	8.81 \pm 0.08
2 nd week body weight(g) ^{NS}	48.68 \pm 1.43	50.23 \pm 1.25	51.49 \pm 1.31	50.51 \pm 1.50
4 th week body weight(g) *	145.55 ^b \pm 2.33	148.49 ^a \pm 1.97	153.24 ^a \pm 2.37	153.08 ^a \pm 1.88
6 th week body weight (g) **	183.17 ^b \pm 2.24	186.56 ^a \pm 1.90	193.43 ^a \pm 1.73	192.99 ^a \pm 1.88
Feed Conversion Ratio *	2.97 ^b	2.88 ^a	2.88 ^a	2.85 ^a
Livability% ^{NS}	96.00	96.00	97.33	98.67

** - Highly Significant ($P<0.01$), * - Significant ($P<0.05$)

Mean values having the different superscript in a row differ significantly ($P<0.05$)

Positive significant effect of dietary garlic on growth performance of broiler was reported by earlier studies [5-7, 11]. However, non significant effect of dietary garlic on growth performance of broiler chicks was reported by earlier studies [18-20]. The significant improvement in final mean body weight observed in the present study may be due to the action of allicin (an antibiotic substance found in garlic), which inhibits the growth of pathogenic bacteria and aflatoxin producing fungi as reported earlier by Meraj [21] and Sivam [11] and/or its positive effect on gut morphology, leading to enhanced rates of nutrient absorption through the enterocytes [22].

Significantly ($P<0.05$) better feed conversion ratio was recorded for garlic powder supplemented diets (2.88-2.85) than control group (2.97). Similarly, Khalil *et al.* [16] and Raya, *et al.* [17] reported that quail fed the garlic-containing diets exhibited significantly better ($P\leq 0.01$) feed conversion ratio but feed intake was not affected ($P>0.05$), compared with their control counterparts. This is in agreement with the results of Patel *et al.* [6] and Sangilimadan *et al.* [11] who concluded that the broiler birds, using ration supplemented with 0.5% garlic utilized their feed significantly ($P<0.05$) more efficiently among the treatment groups. Suriya *et al.* [23] reported that overall performance of 0.5% and 0.1% garlic supplementation improved feed conversion ratio when compared to control. However, Issa and Abo Omar [20] stated that feeding of garlic powder (GP) had no significant effects on broilers feed intake (FI) and feed conversion ratio (FCR). Better feed conversion ratio recorded in garlic powder supplemented groups may be attributed to the antibacterial properties of garlic, which resulted in better absorption of the nutrients present in the gut and finely leading to improvement in feed conversion ratio of the rations. There was no statistical significant difference observed in mean per cent livability between garlic supplemented and control groups.

Conclusion

A recent increase in the popularity of alternatives to antibiotic

growth promoters has renewed interest in garlic and their derivatives as potential natural phyto-genic growth promoters in poultry production. The results of the present study showed that significantly ($P<0.05$) higher mean live body weight, better feed conversion ratio and a numerical increase in percent livability were exhibited by the Japanese quails fed with different levels of garlic powder supplemented diets at sixth week of age in comparison with unsupplemented control group. Among the garlic supplemented groups, the Japanese quails fed with 1.5% level of garlic powder supplemented diets showed superior growth performance in terms of higher mean live body weight, better feed conversion ratio and a numerical increase in percent livability. It can be concluded that garlic (*Allium sativum* L.) powder can be used as a potential natural phyto-genic growth promoter at 1.5% level in the diet of Japanese quails (*Coturnix japonica*).

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