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Original article

Effect of garlic (*Allium stivum*) powder supplementation on growth performance and body measurements in Japanese quail

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ABSTRACT

Experiment was conducted at Avian Research and Training Centre UVAS Lahore in order to observe and identify the effect of different levels of garlic supplementation and a commercial growth promoter on Japanese quail. Four different levels of garlic powder (0.1% (GA), 0.2% (GB), 0.3% (GC) and 0.4% (GD)), 0.2% commercial growth promoter (GP) and a controlled (C) diet according to NRC standards (1994) were used in this experiment. Thirty six hundred day old chicks of Japanese quail were randomly divided into six experimental units having six replicate of each with hundred birds in each replicate. Analysis of data through ANOVA technique in completely randomized design and the comparison of mean with the help of Duncan's Multiple Range Test by using SAS 9.1 revealed significant differences in terms of body weight with the highest value for group fed 0.4% Garlic and the lowest for 0.2% garlic. Significantly higher feed intake was observed in birds fed 0.2% garlic and the lowest for control group followed by 0.4% garlic supplemented. Significantly the best FCR was observed for GB (1.58 ± 0.03) followed by C (1.53 ± 0.02), GC (1.46 ± 0.04), GP (1.41 ± 0.05), GA (1.34 ± 0.03) and GD (1.32 ± 0.03) also significant differences were observed in drum stick length with the highest value for GD (4.95 ± 0.18) and the lowest GP (4.05 ± 0.30), and breast width with GB (3.38 ± 0.23) having the highest value and the lowest in GP (2.65 ± 0.19), while non-significant differences were observed in bird length (cm), keel length (cm), drumstick circumference, shank length (cm) and shank circumference.

1. Introduction

In addition to nutritional substances necessary for growth and development of chicks, the feed is regularly supplemented with pharmacological products, either for preventive purposes, as prevention against certain diseases (coccidiostat) or as growth stimulators (antibiotics), primarily in case of young chicks (Doyle, 2001). The application of such treatment reduces the number of chicken deaths and the costs of medical treatment. In addition, these additives have a positive effect on growth, feed conversion and meat quality, but they also have negative effects manifested through the emergence of pathogens resistant to the applied antibiotics in animals and human beings. For these reasons the European Union prohibited the use of such supplements in 2006 (Stanačev *et al.*, 2011).

The alternatives to antibiotics as growth stimulators are numerous, amounting to finding an adequate non-pharmacological products from the group pre-biotics, pro-biotics, organic acids and other essential oils, medicinal plants or parts of plants such as thyme, basil, oregano and others (Simon, 2005).

Garlic has been shown to have several effects in the body. The virtues of garlic (*Allium sativum*), as a medicinal plant are known to most cultures of the world. Garlic is one of the oldest cultivated plant (Moyers, 1996). Garlic supplements in broiler chicken have been recognized for their strong stimulating effect on the immune system and the very rich aromatic oils enhance digestion of birds (Gardzielewska *et al.*, 2003). The key active ingredient in garlic is a powerful plant chemical called allicin which rapidly decomposes to several volatile organosulphur compounds with bioactivities (Chang and Cheong, 2008). Garlic is used both as condiment and medicament, anticoagulant, antioxidant, hypolipidaemic, antihypertensive, anti-ageing, anti-platelet and heavy metal detoxifier (Agarwal, 1996; Marilynn, 2001). The anti-oxidative influence of garlic in meat becomes more imperative in less developed nations, considering storage problems and increasing use of alternative feed resources without due consideration for meat quality (Onibi *et al.*, 2007). Keeping this in view present study was conducted to evaluate the effect of garlic powder on production performance and carcass quality of Japanese quails.

2. Materials and methods

Present study is mainly focused on evaluating the effect of garlic (*Allium Stivum*) powder on production performance and carcass characteristics of Japanese quail (*Coturnix Coturnix Japonica*) at Avian Research and Training (ART) Centre, University of Veterinary and Animal Sciences, Lahore, Pakistan. The testing was carried out under production conditions with day-old-chicks of Japanese quails divided in 6 groups, comprising 6 replicates, 100 birds in each. Treatment groups were given: 0.1% garlic powder in group I, 0.2% garlic powder in group II, 0.3% garlic powder in group III, 0.4% garlic powder in group IV, 1% antibiotics in group V and controlled group.

2.1. Parameter studied

The data was collected regarding production performance and body measurements.

Production Performance: - Weekly body weight, Weekly body weight gain, Weekly Feed Intake and weekly FCR.

Body Measurements: - Bird length, Keel length, Drum stick length, Drum stick circumference, Shank length, Shank circumference and breast width.

2.2. Statistical analysis

The data thus obtained were statistically analyzed through Completely Randomized Design (CRD) using analysis of variance (ANOVA) techniques. The mean was compared using DMR (Duncan Multiple Range) Test by the help of SAS 9.1 for windows.

3. Results and discussion

3.1. Production performance

Statistical analysis revealed significant differences in body weight among different groups, although birds which received 0.1 and 0.4% garlic powder have greater body weight gains than those of who were fed 0.2 and 0.3% garlic powder or control group (table 1, 2). The levels which stimulated significantly higher gains might have better adjustments with the physiological demands of bird's body. Similarly bird which received growth promoter also showed higher body weight when compared with other groups. Contrarily Sarica *et al.*, 2005 found no significant effects of garlic and thyme powder on production performance, when they added them to broilers diet while Amooz mehre *et al.*, 2009 also reported that garlic extract did not influence broiler performance.

Present study showed non-significant differences in overall feed intake (table 3) of all the experimental groups. Chowdhury *et al.*, added different levels of garlic to layers diet and also reported no significant effects of this supplementation on growth, feed intake and feed efficiency.

Significant difference were observed in Feed Conversion ratio, birds receiving 0.4 % garlic powder in their diets had better FCR compared to 0.1, 0.2 and 0.3% supplementation. However, supplementation with growth promoter decreased feed conversion ratio when compared with other groups. But Demir *et al.*, 2003 added thyme and garlic powder to broiler diets and concluded that this supplementation did not affect growth, feed intake and feed conversion rate in the whole experiment.

3.2. Body Measurements

Present study revealed significant differences in drum stick length (cm) and breast width (cm) whereas bird length (cm), keel length (cm), drumstick circumference, shank length (cm) and shank circumference showed non-significant differences (table 5). Birds fed 0.4% garlic powder remains the highest in terms of drumstick length when compared with group supplemented with growth promoter. Birds supplemented with 0.2% garlic powder remains highest in breast width when compared with group supplemented with growth promoter. Similar findings have also been reported in other study (Ahmad *et al.*, 2012).

Table 1

Weekly trend of body weight.

Treatment	DOC	Week 1	Week 2	Week 3
Control	8.80 ± 0.13	23.82 ± 0.92 ^a	54.38 ± 1.46 ^c	119.94 ± 0.89 ^c
Growth Promoter	8.57 ± 0.11	21.29 ± 0.60 ^b	55.28 ± 0.69 ^{bc}	137.78 ± 5.09 ^{ab}
Garlic Powder (0.1%)	8.70 ± 0.15	22.83 ± 0.94 ^{ab}	55.49 ± 0.51 ^{bc}	136.69 ± 4.66 ^{ab}
Garlic Powder (0.2%)	8.65 ± 0.14	23.41 ± 0.56 ^{ab}	57.25 ± 0.27 ^{abc}	118.39 ± 3.94 ^c
Garlic Powder (0.3%)	8.67 ± 0.22	23.79 ± 0.46 ^a	56.27 ± 0.90 ^{ab}	126.83 ± 3.50 ^{bc}
Garlic Powder (0.4%)	8.36 ± 0.24	22.55 ± 0.65 ^{ab}	58.30 ± 0.51 ^a	142.21 ± 3.56 ^a

Note: - Different superscripts on different values represent significant differences among their means (P≤0.05)

Table 2

Weekly trend of body weight gain.

Treatment	Week 1	Week 2	Week 3	Cumulative
Control	15.02±1.023 ^{ab}	30.56±2.16 ^b	65.57±1.16 ^c	111.14±0.88 ^c
Growth Promoter	12.73±0.66 ^b	33.99±0.91 ^{ab}	82.50±5.32 ^a	129.22±5.16 ^{ab}
Garlic Powder (0.1%)	14.13±0.94 ^{ab}	32.67±1.28 ^{ab}	81.20±4.42 ^{ab}	127.99±4.69 ^{ab}
Garlic Powder (0.2%)	14.76±0.67 ^{ab}	33.84±0.77 ^{ab}	61.14±4.09 ^c	109.74±4.04 ^c
Garlic Powder (0.3%)	15.13±0.40 ^a	32.48±1.03 ^{ab}	70.57±2.93 ^{bc}	118.17±3.53 ^{bc}
Garlic Powder (0.4%)	14.19±0.51 ^{ab}	35.75±0.73 ^a	83.91±3.66 ^a	133.85±3.60 ^a

Note: - Different superscripts on different values represent significant differences among their means (P≤0.05)

Table 3

Weekly trend of feed intake.

Treatment	Week 1	Week 2	Week 3	Cumulative
Control	46.33 ± 1.91	97.17 ± 0.70 ^b	153 ± 1.06 ^{ab}	296.50 ± 2.0
Growth Promoter	43.33 ± 1.05	100.67 ± 0.72 ^a	156.33 ± 2.17 ^{ab}	300.33 ± 1.98
Garlic Powder (0.1%)	44 ± 1.41	96.83 ± 0.98 ^b	151.33 ± 2.06 ^b	292.17 ± 2.77
Garlic Powder (0.2%)	44 ± 1.69	97.17 ± 0.79 ^b	158.17 ± 2.39 ^a	299.33 ± 3.03
Garlic Powder (0.3%)	46.50 ± 2.05	96.50 ± 0.50 ^b	153 ± 1.75 ^{ab}	296 ± 3.57
Garlic Powder (0.4%)	41.67 ± 0.33	98.50 ± 1.18 ^{ab}	155.83 ± 1.72 ^{ab}	296 ± 2.78

Note: - Different superscripts on different values represent significant differences among their means (P≤0.05)

Table 4

Weekly trend of FCR.

Treatment	Week 1	Week 2	Week 3	Cumulative
Control	3.12 ± 0.13 ^{ab}	2.51 ± 0.15 ^a	1.90 ± 0.05 ^{ab}	2.20 ± 0.02 ^{ab}
Growth Promoter	3.44 ± 0.13 ^a	2.37 ± 0.05 ^{ab}	1.67 ± 0.10 ^c	2.00 ± 0.07 ^{cd}
Garlic Powder (0.1%)	3.16 ± 0.09 ^{ab}	2.35 ± 0.09 ^{ab}	1.60 ± 0.05 ^c	1.94 ± 0.04 ^{cd}
Garlic Powder (0.2%)	3.00 ± 0.12 ^b	2.29 ± 0.04 ^{ab}	2.11 ± 0.10 ^a	2.26 ± 0.05 ^a
Garlic Powder (0.3%)	3.07 ± 0.08 ^{ab}	2.35 ± 0.06 ^{ab}	1.80 ± 0.07 ^{bc}	2.09 ± 0.06 ^{bc}
Garlic Powder (0.4%)	2.96 ± 0.12 ^b	2.24 ± 0.04 ^b	1.60 ± 0.10 ^c	1.89 ± 0.07 ^d

Note: - Different superscripts on different values represent significant differences among their means (P≤0.05)

Table 5

Body measurements.

Treatment	B.L (cm)	K.L (cm)	D.L (cm)	D. Circum.	S.L (cm)	S. Circum.	Brst. Wdth
Control	26.67 ± 0.33	4.73 ± 0.07	4.72 ± 0.23 ^{ab}	4.40 ± 0.10	3.55 ± 0.11	1.92 ± 0.09	2.88±0.12 ^{bc}
Growth Promoter	24.50 ± 0.62	4.40 ± 0.08	4.05 ± 0.30 ^b	4.03 ± 0.18	3.20 ± 0.12	1.83 ± 0.07	2.65±0.19 ^c
Garlic Powder (0.1%)	25.33 ± 2.11	4.73 ± 0.23	4.63 ± 0.23 ^{ab}	4.03 ± 0.28	3.38 ± 0.16	1.85 ± 0.08	3.22±0.10 ^{ab}
Garlic Powder (0.2%)	27.50 ± 0.85	4.88 ± 0.14	4.72 ± 0.22 ^{ab}	4.10 ± 0.22	3.40 ± 0.15	2 ± 0.09	3.38 ± 0.23 ^a
Garlic Powder (0.3%)	26.67 ± 0.67	4.85 ± 0.22	4.68 ± 0.13 ^{ab}	4.15 ± 0.06	3.45 ± 0.13	2.05 ± 0.05	3.22±0.11 ^{ab}
Garlic Powder (0.4%)	27.83 ± 0.60	4.82 ± 0.17	4.95 ± 0.18 ^a	4.48 ± 0.17	3.52 ± 0.11	1.98 ± 0.05	3.12 ± 0.14 ^{abc}

Note: - Different superscripts on different values represent significant differences among their means (P≤0.05)

4. Conclusion

In conclusion, significant differences were observed in production performance and body measurements among different groups except drumstick length and breast width whereas 0.1% and 0.4% supplemented groups showed better performance compared to other groups. Garlic can act as a successful alternate to other commercial growth promoters provided optimizing its level in different species. Further the blessed plant may also be used as a preventive medicine in human beings due to its certain recognized health friendly characteristics without any harmful effects.

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