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Effect of garlic (*Allium Sativum*) powder on growth performance and carcass characteristics of broilers

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Abstract

This study conducted to investigate the effects of garlic (*Allium sativum*) powder as a growth promoter on growth performance and carcass characteristics of broiler. Thirty 1-day old chicken were randomly allocated to three treatments and two replications by using Completely Randomized Design (CRD) for 42 days of the experiment. The treatments included C (Control group with 0% garlic), T1 (Treatment 1= Chicken received 1.5% garlic powder) and T 2 (Treatment 2= Chicken received 2% garlic powder). Body weight, body weight gains and feed consumption measured at the end of each week and the body part weight measured at the end of day 42. The result showed, the feeding group by 2% garlic powder had statistically significant high values on body weight during the days of 14-21, 28-35 and 35-42 ($p<0.05$), high value in weight gain during the day of 28-42 and low value on feed conversion rate (FCR). Also, this group shows high value in breast weight and heart weight ($p<0.05$). The feeding group by 1.5% garlic powder presents statistically significant difference on feed consumption, and gizzard weight ($p<0.05$). In conclusion, adding various level of *Allium sativum* improves growth performance and body part weight but for accurate amount of garlic powder need to have further study.

Keywords: *Allium sativum*, antibiotics, broiler, feeding, weight gain

Introduction

Antibiotics are commonly involved in poultry diets as a growth promoters and disease control but in nowadays, the use of antibiotics as feed additives restricted in poultry because of pathogen and drug resistance in meat (Schwarz *et al.*, 2001; Senthilkumar *et al.*, 2015)^[21, 20] and the negative human health issue (Javandel *et al.*, 2008)^[10]. On the other hand, there is pressure on commercial poultry to produce high body weight chicken due to raise of demand. Eliminating antibiotics as growth promoters from the diet of broiler results in low growth efficiency and less disease resistance. Therefore, to improve the efficiency, it requires consider on other alternatives (Patterson *et al.*, 2003)^[14].

Garlic (*Allium sativum*) as a natural feed additive has been researched in broilers. It is used as a significant dietary and medicinal through the human history and use for prevention and treatment of wide range of disease (Javandel *et al.*, 2008 and Belal *et al.*, 2018)^[10, 4]. This plant has antibiotic (Adibmoradi *et al.*, 2006)^[2], antioxidant, immunomodulatory, anticancer, anti-inflammatory, hypoglycemic and cardiovascular protecting effects (Qureshi *et al.*, 1983; Reuter *et al.*, 1996, Elagib *et al.*, 2013 and Belal *et al.*, 2018)^[12, 13, 19, 6, 4]. Garlic has been considered to lower serum and liver cholesterol (Qureshi *et al.*, 1983 and Javandel *et al.*, 2008)^[12, 13, 10], prevent platelet aggregation (Apitz-Castro *et al.*, 1983 and Javandel *et al.*, 2008)^[3, 10]. Use of garlic as a feed additive had improved growth performance (Demir *et al.*, 2003)^[5] and Feed Conversion Ratio (FCR) (Javandel *et al.*, 2008)^[10].

The aim of this study was to investigate the effect of garlic powder on growth preference of broilers and evaluate the favorite dietary dosage of garlic powder in broilers ratios.

Materials and methods

1. Animals and treatments

In this experiment, thirty 1-day old Ross 308 broilers by mean weight of 31.37 ± 3.65 (g) were randomized into three treatments and two replications, each replication containing 5 chicken. The feeding program included two phases: starter (1-20 days of age) and grower (21-42 days of age).

Control group (C) was fed by mixture without any additives. The treatment 1 (T1) was fed a diet containing 1.5% garlic powder and the treatment 2 (T2) was fed a diet containing 2% of garlic powder.

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2. Performance record

The data of body weight (g), body weight gain (g), feed consumption (g) and feed conversion rate were recorded weekly. At the end of experiment two chicken from each replication were slaughtered and each body part weighted. The experiment was focus on the carcass weight (g), breast (g), thigh (g), liver (g), heart (g) and gizzard (g).

3. Statistical analysis

The recorded data analyzed by analysis of variance using software program of STATA. Differences between the indicators were tested using analysis of variance by Tukey’s test and significance was considered at $P \leq 0.05$.

Results and discussion

1. Growth performance

Table 1 presents the mean body weight and body weight gain of broiler during 42 days of experiment by feeding different percentage of garlic powder. According to the presented values, the mean body weight of broiler had statistically significant difference on the treatment that fed by 2% (T2) of garlic powder ($p < 0.05$) during the days of 14-21, 28-35 and 35-42. The result showed no different in body weight in the group of chicken that fed by 1.5% of garlic powder. Study of Elagib *et al.* (2013) [6] presented that 3% of garlic powder has significant effect on live body weight of broiler ($p < 0.05$). The data of Milošević *et al.* (2013) [11] shown that 1.5% and 3.0% of garlic powder had positive effect on body mass. The other research by Javandel *et al.*, (2008) [10] showed that adding 1% garlic powder to the diet improve the body weight of broilers but 2% of garlic

powder decreased the body weight of broilers. The reason behind those difference is may be due to the variety of garlic, method of drying, processing and storage. This result agreed with the study of Ademola *et al.*, (1999) [1] that reported there is no significant different on body weight of chicken after feeding 1.5% of garlic powder. Also Horton *et al.*, (1991) [7] and Valavi *et al.*, (2016) [23] had the same finding that adding 1.5% of garlic powder doesn’t have any effect on weight gain of broilers. Study of Belel *et al.*, (2018) [4] showed garlic supplement does not have positive effect on body weight of chicken.

The values presented in Table 1 shows that feeding 2% of garlic powder had statistically significant higher body weight gain rather than control group during the days of 28-42 ($p < 0.05$) and overall weight gain of chicken whom fed by 2% (T2) garlic powder during 42 days of experiment was significantly higher than other feeding groups ($p < 0.05$). The study of Raeesi *et al.* (2010) [17] considered that feeding group by 1% garlic additive had greater body weight gain during day 22-42 but in whole experiment (0-42 d), feeding group by 1 and 3% of garlic supplement, significantly increased body weight gain. Also, Elagib *et al.* (2003) [6] reported that 3% of garlic powder additive had positive effect on weight gain of broilers. Study of Shi *et al.* (1999) [22] shown that the feeding group by 1% garlic meal had higher weight gain. The result of Ramiah *et al.* (2014) [18] and Puvāča *et al.* (2015) [16] presented that 0.5% of garlic powder had significant effect of weight gain of chicken ($p < 0.05$).

Table 1: Mean Body Weight (g) and body weight gain (g) of chicken

Treatment	No. Chicken	Day 1	Day 7	Day 14	Day 21	Day 28	Day 35	Day 42	Total weight gain
Body weight									
C	10	30.69±3.17	136.13±6.63	350.11±3.85	672.66±6.24 ^b	1045.91±5.89	1471.53±17.10 ^b	1956.18±13.09 ^b	
T1	10	30.56±4.44	138.72±5.07	350.58±6.34	675.8±5.63 ^{ab}	1044.88±7.53	1486.7±26.23 ^b	1971.22±17.57 ^b	
T2	10	32.85±2.65	140.57±5.25	350.31±4.47	679.19±3.60 ^a	1048.15±5.33	1523.01±10.65 ^a	2050.52±42.45 ^a	
p-value		NS	NS	NS	*	NS	*	*	
Body weight gain									
C	10		105.44±7.11	213.98±7.39	322.55±7.80	373.25±5.25	425.62±18.56 ^b	484.65±16.45 ^b	1925.49±12.84 ^b
T1	10		108.16±7.48	211.86±7.92	325.22±10.65	369.08±10.45	441.82±27.54 ^b	484.52±33.12 ^b	1940.66±18.96 ^{ab}
T2	10		107.72±6.56	209.74±7.45	328.88±5.32	368.96±5.19	474.86±9.53 ^a	527.51±39.95 ^a	2017.67±42.99 ^a
p-value			NS	NS	NS	NS	*	*	*

^a ^bDifference between mean value shown with different superscript in the same column ate statistically significant (* $p < 0.05$; NS: $p > 0.05$)

2. Feed consumption

Table 2 presents the weekly feed consumption. The result shows statistically significant higher values of weekly feed consumption in the group that fed by 1.5% (T1) of garlic in weeks 2nd, 4th, 5th, 6th and 7th ($p < 0.05$). Also the values indicated that total feed intake of this group is significantly higher than the other feeding groups. Shi *et al.* (1999) [22] reported that adding 1% garlic meal had positive effect on feed consumption. Romiah *et al.*, (2014) [18] reported that adding 0.5% of garlic powder had higher value on feed consumption of broiler to the control group ($p < 0.05$). The result of Javandel *et al.* (2008) [10] shown that adding 2% of garlic supplement to the diet has positive effect on feed consumption of broilers ($p < 0.05$). The result of Pistova *et al.* (2016) [15] Shown that adding 1.8% of humic acid and 0.2% of garlic powder doesn’t have significant effect on feed consumption of broiler ($p > 0.05$). But Raeesi *et al.*

(2010) [17] presented that adding deferent level of garlic did not have significant effect on feed consumption of broiler. Providing of 2% garlic powder, decreased feed conversion rate (FCR) compare with 1.5% supplemented and control group. The result of indicated that at end of 42 days of experiment, FCR in the group that received 1.5% (T1) garlic powder was significantly higher than the groups of control (C) and the supplemented 2% garlic powder. The report of Javandel *et al.* (2008) [10] presented that diet including 2% of garlic supplement had higher feed conversion rations in compare with other feeding groups. Saeedi *et al.* (2010) indicated that adding 3% of garlic powder had positive effect on FCR in broilers. Although, the study of Jagdish and pandey (1994) [9] presented that diets with 0.25% garlic meal had lower feed conversation ration in cocks rather than the group that fed by 0.5% of garlic meal.

Table 2: Weekly feed consumption (g) and feed conversion rate

Treatment	Day 7	Day 14	Day 21	Day 28	Day 35	Day 42	Total feed intake
Weekly feed consumption							
C	190.86±12.74 ^{ab}	429.77±12.71 ^{ab}	695.35±17.95 ^a	723.65±8.39 ^a	675.36±23.71 ^b	961.61±28.82 ^b	3676.58±21.66 ^b
T1	198.98±10.62 ^a	455.65±14.84 ^a	597.95±20.53 ^b	669.79±6.33 ^{ab}	903.33±23.52 ^a	1019.05±40.35 ^{ab}	3844.75±45.58 ^a
T2	186.61±8.56 ^b	412.58±11.06 ^b	606.71±7.84 ^{ab}	653.14±20.84 ^b	830.89±13.34 ^{ab}	1043.60±55.70 ^a	3733.53±73.70 ^{ab}
p-value	NS	*	*	*	*	*	*
Feed conversion rate							
C	1.81 ^a	2.01 ^b	2.16 ^a	1.94 ^a	1.59 ^b	1.98 ^b	1.91 ^{ab}
T1	1.84 ^a	2.15 ^a	1.84 ^b	1.82 ^b	2.05 ^a	2.11 ^a	1.98 ^a
T2	1.73 ^b	1.97 ^b	1.85 ^b	1.77 ^b	1.75 ^b	1.98 ^b	1.80 ^b
p-value	*	*	*	*	*	*	*

^{a b} Difference between mean value shown with different superscript in the same column ate statistically significant (**p*<0.05; NS: *p*>0.05)

3. Carcass characteristics

Table 3 shows that carcass characteristics of chicken and the end of 42 days of experiment. That values shows that there is statistically significantly difference on breast, heart and gizzard weight (*p*<0.05). The result shows that the group that received 2% (T2) of garlic powder had higher weight in breast and heart and the control group had lower weight. The values indicated that gizzard weight is higher in the group that fed by 1.5% (T1) of garlic powder. There is not statistically significant difference in the thigh and liver weight of chicken. Study of Elagib *et al.* (2013) ^[6] determined that 3% garlic supplement had positive effects on hot weight, Breast weight, dressed weight, fleshed breast weight and fleshed breast percentage. Report of Issa *et al.* (2012) ^[8] presented that adding 0.2% and 0.4% of garlic

powder had significant effect on carcass weight of broilers. Also, Pistora *et al.* (2016) ^[15] explained that garlic powder and humic acid had positive effect on carcass weight compared to the control group (*p*<0.05). The result of Saeedi *et al.* (2010) determined that 0.5% and 3% garlic supplement had effects on some body parts of broilers. Our study is not in line with study of Belal *et al.*, (2018) ^[4] and Valavi *et al.* (2016) ^[23] who stated that garlic supplement had no significant effects on carcass characteristics and organ parts. Also, a report of feeding 0.125%, 0.25%, 0.5%, 1% and 2% of garlic meal to different experiment groups by Javandel *et al.* (2008) ^[10] conveyed there is not significant differences in carcass percentage and interior organs between birds during their experiment.

Table 3: Carcass characteristics of chicken in different treatments

Treatment	Carcass weight (g)	Breast (g)	Thigh (g)	Liver (g)	Heart (g)	Gizzard (g)
C	1416.57±10.10	389.87±3.24 ^b	370.98±10.37	46.21±3.80	10.37±0.07 ^b	35.42±2.52 ^b
T1	1394.56±8.78	397.34±2.90 ^{ab}	363.59±5.50	46.58±2.78	10.85±0.16 ^{ab}	43.15±1.52 ^a
T2	1435.09±28.89	407.55±7.80 ^a	388.17±9.55	46.76±5.56	11.23±0.24 ^a	40.56±1.97 ^{ab}
p-value	NS	*	NS	NS	*	*

^{a b} Difference between mean value shown with different superscript in the same column ate statistically significant (**p*<0.05; NS: *p*>0.05)

Conclusion

In conclusion, the result of this study clearly indicated that supplementation by garlic powder could have positive effects on production performance parameters. The values in the group by feeding 0% garlic powder additive had shown lower in compare with the other dietary groups on weight gain. But to achieve more accurate results, it needs to have more study.

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