



Effect of Feeding Different Levels of Ajwain (*Trachyspermum ammi* L.) Powder on Growth Performance and Carcass Characteristics in Japanese quails

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ABSTRACT

An experiment was carried out to study the effect of inclusion of ajwain powder at varying levels on growth performance, carcass characteristics and nutrient utilization in Japanese quails. One hundred and fifty day-old quail chicks were randomly allotted to five dietary treatment groups with 3 replicates of 10 birds for 5 weeks. Ajwain was ground and included at 0% (T_1 ; Control), 0.25 (T_2), 0.50 (T_3), 0.75 (T_4) and 1.0 (T_5) percent levels in iso-caloric and iso-nitrogenous broiler quail diets to meet the nutrient requirements as per NRC, 1994. Body weight gain and feed intake were recorded while feed efficiency was calculated. Results indicated that inclusion of ajwain powder up to 1.0% level in the diet of Japanese quail had no effect ($P>0.05$) on body weight gains, feed intake and on feed consumed / kg gain. Similarly, inclusion of ajwain powder up to 1.0% level in the diet had no effect ($P>0.05$) on carcass characteristics in quails. The feed cost / kg gain decreased by ₹ 1.01 in T_2 while it was increased by ₹ 4.11 in T_3 , ₹ 6.84 in T_4 and ₹ 9.55 in T_5 groups of quails fed diets containing ajwain powder up to 1.0% level as compared to the control.

Key words: Carcass characters, Ajwain powder, Production performance, Quail

INTRODUCTION

In recent years, the use of dietary plant derived natural bioactive compounds (phytobiotics) has attracted increased attention to augment performance and health in poultry production. Phytogenics are a group of natural growth promoters (NGP) or phytobiotic growth promoters used as feed additives, derived from herbs, spices or other plants. Phytogenic additives being natural, non-toxic, residue free and their easy availability make them first choice as alternate to antibiotic growth promoters in poultry production. The knowledge regarding the modes of action and aspects of application of phytobiotics as feed additives are quite rudimentary (Windisch *et al.*, 2008). They have multiple effects in birds including appetite stimulation; enhance digestion, and possess immune-stimulant, bactericidal, antiviral, anti-oxidant properties when supplemented in diets for poultry.

Ajwain (*Trachyspermum ammi*) is a medicinal plant that belongs to family Apiaceae (Chatterjee *et al* 2012). Its seeds are used extensively for medicinal purposes as a digestive stimulant and to treat liver

disorders (Ishikawa *et al.*, 2001). Ajwain is highly esteemed as a remedial agent for flatulence, flatulent colic, atonic dyspepsia, diarrhoea and in short, as a digestive aid and as an antiseptic (Bentely and Wrinen, 1999). Inconsistent results and inadequate data exist regarding the potential use of ajwain as phytobiotic growth promoter in poultry. Positive effects of ajwain on growth rate, feed conversion ratio (Anurag *et al.*, 2018; Waheed *et al.*, 2017; Valiollahi *et al.*, 2014) and carcass characteristics (Waheed *et al.*, 2017; Falaki *et al.*, 2016) were reported earlier in broilers. However, Kheiri *et al.* (2018) reported that supplementation of ajwain as substitute to AGP in Japanese quails had no effect on body weight, feed intake, feed efficiency and carcass composition and yield. Hence, the present study was undertaken to evaluate the performance of quail in terms of growth rate, carcass yield and economics fed diets containing ajwain powder at varying levels.

MATERIALS AND METHODS

One hundred and fifty, day-old quail chicks were procured and randomly allotted into 5 groups, each with 3 replicates of 10 chicks. Chicks were wing banded and

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weight of the chick was recorded. The experiment was carried out for 5 weeks in a completely randomized design (CRD). During the experiment, ajwain seed was ground and was included at 0% (T₁; Control), 0.25 (T₂), 0.50 (T₃), 0.75 (T₄) and 1.0 (T₅) percent levels in iso-caloric and iso-nitrogenous quail diets (Table 1) to meet the nutrient requirements (NRC, 1994). All the chicks were housed in battery brooders under uniform management conditions. Feed and water were provided *ad libitum*. The feed offered and feed leftover was weighed daily, to quantify the feed utilized. The data for growth rate was recorded at weekly intervals.

Samples of feed were analyzed for proximate principles (AOAC, 2005). At the end of study period (5th week), two birds per replicate and thus a total of 6 birds per experimental diet were randomly selected, weighed and slaughtered. The data on dressing percentage, carcass yield, meat bone ratio, ready-to-cook yield and per cent weight of heart, liver, gizzard and giblet were recorded. All the data were analyzed statistically (SPSS, 17th Version) as per Snedecor and Cochran (1993) and comparison of means was done using Duncan's multiple range tests (Duncan, 1955).

RESULTS AND DISCUSSION

The chemical composition of ajwain powder indicated that the percent DM, OM, CP, EE, CF, NFE, TA and AIA of ajwain powder were 91.34, 92.40, 18.30, 4.84, 9.86, 59.40, 7.60 and 1.52, respectively. The percent NDF, ADF, hemi-cellulose, cellulose, ADL and silica content of ajwain powder were 38.82, 34.34, 4.48, 29.45, 5.09 and 2.82, respectively.

Body weight gain (g), feed intake (g) and FCR under different dietary treatments during the experimental period (0-5 weeks) are presented in Table 2. Incorporation of ajwain powder up to 1.0% level in the diet had no effect ($P>0.05$) on body weight gain in quails. In corroboration, Kheiri *et al.* (2018) reported that feeding of ajwain @ 2 g/kg diet as substitution to antibiotic growth promoter had no effect ($P>0.05$) on body weight gain in Japanese quails. Similarly, no effect ($P>0.05$) on body weight gains upon feeding diets containing ajwain powder were reported by Samadian *et al.* (2016), Samadian *et al.* (2017) and Chowdhury *et al.* (2018) in broiler chicken. Lack of significant effect of ajwain on body weight gain can be attributed to the highly digestible ingredients in the basal diet and the ideal conditions of experimentation. Addition of

Table 1. Ingredient (%) and chemical composition (% DM basis) of quail diets

Constituent/ Diet	T ₁ Control	T ₂	T ₃	T ₄	T ₅	Cost/kg (₹)
Maize	51.00	51.45	51.30	51.15	51.00	16.00
De oiled rice bran	9.90	10.70	10.70	10.60	10.60	13.50
Soybean meal	31.70	30.20	30.10	30.10	30.00	38.00
Fish meal	5.00	5.00	5.00	5.00	5.00	30.00
Ajwain powder	0.00	0.25	0.50	0.75	1.00	300.00
Di calcium phosphate	0.20	0.20	0.20	0.20	0.20	26.00
Shell grit	1.25	1.25	1.25	1.25	1.25	2.00
Salt	0.25	0.25	0.25	0.25	0.25	3.00
Trace min mix	0.15	0.15	0.15	0.15	0.15	240.00
Feed additives	0.55	0.55	0.55	0.55	0.55	278.50
Total	100	100	100	100	100	
ME* kcal/kg	2900.30	2900.19	2900.09	2900.49	2900.40	
Crude protein (%)	23.99	24.01	24.00	24.01	23.99	
Feed cost/100 kg (₹)	2492.30	2528.30	2597.10	2668.30	2737.10	

*Calculated value

growth promoters to poultry diets may have more impact when the diet used is less digestible (Toghyani *et al.*, 2010). In contradiction, several authors (Tripathi *et al.*, 2013; Valiollahi *et al.*, 2014; Falaki *et al.*, 2016; Waheed *et al.*, 2017; Anurag *et al.*, 2018) reported increased ($P<0.05$) body weight gain in poultry upon feeding diets containing ajwain powder.

Incorporation of ajwain powder up to 1.0% level in the diet had no effect ($P>0.05$) on feed intake of quails. However, the feed intake (g) increased numerically in quails fed diets containing 0.25, 0.50 and 0.75% ajwain powder and decreased numerically in quails fed diets containing 1.0% ajwain powder as compared to the control (Table 2). This slight reduction in feed intake at higher doses might be due to increasing repulsive odour and taste of ajwain. In line with the present findings, Samadian *et al.* (2016) reported numerically increased feed intake in broilers fed diets containing ajwain essential oil up to 100 ppm while it decreased at 150 ppm as compared to those fed control diet. Similarly, no effect ($P>0.05$) on feed intake upon feeding diets containing ajwain powder were also reported by Falaki *et al.* (2016), Samadian *et al.* (2017), Chowdhury *et al.* (2018), Hajiaghapour and Rezaeipour (2018) in broilers and Kheiri *et al.* (2018) in Japanese quails. In contradiction, increased (Valiollahi *et al.*, 2014; Davoodi *et al.*, 2016; Waheed *et al.*, 2017) and decreased (Tripathi *et al.*, 2013) feed intake in poultry upon feeding ajwain in the diet were also reported earlier.

The feed conversion ratio (FCR) was not affected ($P>0.05$) by incorporation of ajwain powder up to 1.0% level in the diet. Similar findings were also reported earlier in broiler chicken (Falaki *et al.*, 2016; Samadian

et al., 2016; Samadian *et al.*, 2017; Chowdhury *et al.*, 2018) and Japanese quails (Kheiri *et al.*, 2018). In contrast, some researchers reported that feeding of ajwain powder or essential oil in the diet resulted in improved feed conversion ratio in Japanese quail (Tripathi *et al.*, 2013) and broilers (Valiollahi *et al.*, 2014; Davoodi *et al.*, 2016; Waheed *et al.*, 2017).

The results pertaining to carcass characteristics are presented in Table 3. The current study revealed that incorporation of ajwain powder up to 1.0% level in the diet had no effect ($P>0.05$) on carcass yield (g), dressing percent, ready to cook yield (g) and meat to bone ratio as compared to the control. In line with these findings, many researchers reported that incorporation of ajwain powder in the diet had no effect ($P>0.05$) on carcass yield (Habibi *et al.*, 2016; Falaki *et al.*, 2016; Chowdhury *et al.*, 2018; Kheiri *et al.*, 2018) and dressing percent (Samadian *et al.*, 2017; Chowdhury *et al.*, 2018) in poultry. Increased levels of inclusion of ajwain powder up to 1.0% in the diet of quails had no effect ($P>0.05$) on ready to cook yield as compared to the control (Table 3). However, inclusion of ajwain powder at 1.0% in the diet resulted in significant decrease ($P<0.05$) in ready to cook yield (g) as compared to 0.25% level inclusion in the diet.

Similarly, incorporation of ajwain powder up to 1.0% level in the diet had no effect ($P>0.05$) on per cent weight of heart, liver, gizzard and giblets in quails which was in agreement with the findings of earlier researchers (Habibi *et al.*, 2016; Falaki *et al.*, 2016; Samadian *et al.*, 2017; Chowdhury *et al.*, 2018; Kheiri *et al.* 2018). The effect on carcass characteristics and relative weights of internal organs in several studies conducted with herbs and spices as alternative to

Table 2. Effect of incorporation of ajwain powder in diet on body weight gain, feed intake, FCR and feed cost/kg gain of quails

Parameter	T ₁	T ₂	T ₃	T ₄	T ₅
Body weight gain (g)	194.30±2.70	205.70±6.70	196.30±4.90	194.20±3.90	190.50±4.20
Overall Feed Intake (g)	630.30±19.70	648.40±10.20	641.50±9.00	637.70±7.20	629.00±16.60
Feed Conversion Ratio	3.24±0.06	3.16±0.07	3.27±0.04	3.28±0.03	3.30±0.02
Feed cost / kg** (₹)	80.81 ^a ±1.40	79.80 ^a ±1.84	84.92 ^b ±1.12	87.65 ^{bc} ±0.79	90.36 ^c ±0.67

Values in row bearing different superscripts differ significantly **($P<0.01$)

Table 3. Effect of incorporation of CSM in diet on carcass characteristics of quails

Parameter	T ₁	T ₂	T ₃	T ₄	T ₅
Carcass yield (g)	123.33±4.33	133.00±4.29	127.83±7.19	122.00±2.67	118.50±3.36
Dressing (%)	60.26±1.29	61.52±1.48	60.87±3.20	59.91±1.42	58.97±1.31
Ready to Cook yield* (g)	133.83 ^{ab} ±4.54	144.83 ^b ±4.56	138.50 ^{ab} ±7.31	132.00 ^{ab} ±2.58	128.00 ^a ±3.25
Meat: Bone ratio	5.36±0.46	5.77±0.05	5.56±0.41	5.22±0.07	4.93±0.13
Heart (%)	2.33±0.21	2.50±0.22	2.17±0.17	2.17±0.17	2.00±0.01
Liver (%)	4.00±0.26	4.50±0.22	4.17±0.31	3.83±0.17	2.67±0.33
Gizzard (%)	4.17±0.40	4.83±0.17	4.33±0.49	4.00±0.26	3.83±0.17
Giblet (%)	10.50 ^{ab} ±0.56	11.83 ^b ±0.48	10.67 ^{ab} ±0.33	10.00 ^a ±0.37	9.50 ^a ±0.43

Values in row bearing different superscripts differ significantly, *(P<0.05)

antibiotic growth promoters in poultry were not consistent. These variations in results obtained in different studies may be attributed to the differences in animal physiology, rearing environments, illness, diet compounds and the ingredients of the essential oils.

There is a significant (P<0.05) increase in feed cost/kg gain (₹) with incorporation of ajwain powder at 0.50, 0.75 and 1.0% in diet as compared to the control (Table 2). However, inclusion of ajwain powder at 0.25% in the diet of quails had no effect (P>0.05) on feed cost / kg gain as compared to the control. The study indicated that the feed cost / kg gain decreased by ₹ 1.01 in T₂ while it is increased by ₹ 4.11 in T₃, ₹ 6.84 in T₄ and ₹ 9.55 in T₅ group of quails fed diets containing ajwain powder at varying levels as compared to the control. Similarly, Anurag *et al.* (2018) reported that dietary supplementation of ajwain up to 0.2% level in the diet of Pratapdhan chicken resulted in highest benefit cost ratio while inclusion at higher levels *viz.* 0.3% in the diet had resulted in lower benefit cost ratio.

CONCLUSION

The current study indicated that incorporation of ajwain powder had no effect on the performance of Japanese quail. However, incorporation of ajwain powder at 0.25% level in the diet resulted in decreased feed cost / kg gain of quails.

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