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Effect of Dietary Inclusion of *Trachyspermum ammi* on Growth Performance and Carcass Characteristics of Broiler Chickens

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ABSTRACT

Background: Ajwain (*Trachyspermum ammi*) has anti-bacterial activities and immuno modulatory activities which contribute to better growth performance in broilers. Ajwain can be promoted as a natural growth promoter in the broiler industry to produce quality meat without antibiotics in a very cost-effective manner. Keeping in view these facts, the present experiment was conducted to find out the effect of Ajwain seeds at various levels as feed additive on growth performance and carcass characteristic of broiler chickens.

Methods: A total of 150, day-old broiler chicks were weighed and randomly assigned to five dietary treatment groups in a completely randomized design and each treatment with three replicates of 10 birds each. The birds were fed on fairly isocaloric and isonitrogenous diets of varying levels of Ajwain seeds. The inclusion levels of Ajwain seeds in diets T_1, T_2, T_3, T_4 and T_5 were 0, 0.5, 1.0, 1.5 and 2.0%, respectively. Chicks at different phases were fed as per the recommendations of BIS. During the experimental period, the chicks were reared under standard management practices including feeding, watering and disease control.

Result: The addition of Ajwain to the diet did not affect the total dietary intake and protein efficiency ratio in the chicks. However, average daily body weight gain, total weight gain, feed conversion ratio and performance index of broiler chicks significantly ($P<0.05$) increased by Ajwain seed supplementation. Birds fed on 1.5% Ajwain diet showed heaviest body weight with the best FCR. Results revealed significantly ($P<0.01$) higher carcass yield, eviscerated yield and giblet weight in Ajwain supplemented groups as compared to control. It was concluded that dietary inclusion of Ajwain seeds @ 1.5% is effective in improving the growth performance and carcass characteristics of broiler chicks.

Key words: Ajwain, Broilers, Carcass, Feed conversion ratio.

INTRODUCTION

The Indian poultry industry has experienced a fundamental change in structure and operation over the past few decades. From being a mere backyard activity, poultry sector has transformed into a major commercial agro-based industry. Poultry is one of the fastest growing sectors of the agricultural industry in India with growth rate of about eight per cent per year (APEDA, 2021). In India, number of poultry birds has risen from 729.2 million to 851.8 million, an increase of almost 17 per cent from 19th to 20th livestock census (DAHD, 2019).

Antibiotic growth promoters (AGP) were supposed to improve growth rate, feed conversion and reduce mortality as a result of improved intestinal microbial flora (Miles *et al*., 2006 and Pfaller, 2006). The continuous use of feed grade AGP could lead to the risk of development of antibiotic resistant bacteria in humans (Goodarzi *et al*., 2014). Therefore, nowadays phytogenic feed additives are used as alternatives to AGP in poultry feed and they have been accepted by consumers as non-antibiotic substances (Toghyani *et al*., 2015). Feed additives in poultry diets modifies intestinal microflora and help to improve bird's performance and health status, increase the digestibility of feed and FCR, inhibit the effect of enzymes produced by microorganism, minimize the adverse effect of dietary changes, reduce stress and increase the productivity in terms of meat and egg production.

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Trachyspermum ammi commonly known as Ajwain is an aromatic, spice and medicinal plant that belong to family Apiaceae. It was originated in Egypt and widely distributed throughout the World. In India, Ajwain is extensively grown in the states of Rajasthan, Gujarat and Andhra Pradesh. The therapeutic, medicinal and pharmaceutical potential of Ajwain seeds is attributed to its phytochemical composition and their bioavailability. The important role of Ajwain in broilers are anti-bacterial activities and improvement in immune response as these two factors may contribute to better growth performance in broilers

(Yang *et al*., 2009). Several trials have been performed to evaluate the effect of Ajwain powder (Samadian *et al.,* 2015 and Deepika *et al.,* 2013) on quail growth performance and serum biochemical parameters but the results have not been consistent.

Thus, this experiment was carried out to ascertain the efficiency of different level of Ajwain seeds as feed additive on growth performance and carcass characteristic of broiler chickens.

MATERIALS AND METHODS

A total of one hundred fifty day-old, unsexed and apparent healthy broilers chicks (Vencobb-400) were procured from Kewalramani Hatcheries Private Limited, Ajmer. The experimental broiler chicks were wing banded for identification and weighed individually before starting the experiment. The broiler chicks were divided randomly into 5 treatment groups with three replicates under each treatment. The birds were fed on fairly isocaloric and isonitrogenous diets of varying levels of Ajwain seeds. The dietary levels were T_1 (0%), T_2 (0.5%), T_3 (1.0%), T_4 (1.5%), and T_5 (2.0%). The basal diet was formulated according to the BIS (2007) recommendations for chicks (Table 1). All broiler chicks were vaccinated against Ranikhet and infectious bursal disease as per schedule. During the experimental period, the chicks were reared under standard management practices including feeding, watering and disease control. Fresh and dry wheat straw was used as bedding material. The growth performance parameters were observed and recorded during the entire experimental period. Two birds from each replicate were sacrificed at the end of the sixth week to observe the characteristics of the carcass. The birds were weighed immediately before slaughter and then slaughtered by cutting the jugular vein. After 5 minutes bleeding time dressed birds were eviscerated by giving a median cut in the abdomen and removing the crop, gullet, trachea and viscera. The lungs were scrapped off. Heart, liver, pancreas, spleen and gizzard were separated from GI tract. The giblets (heart, liver and gizzard) were cleaned and retained along with the carcass to record eviscerated weight and expressed as percentage of pre-slaughter weight. Giblets such as heart, liver and gizzard were cleaned and weighed.

Statistical analysis of experimental data was performed for effect of Ajwain in one way ANOVA according to Snedecor and Cochran (2004) and the significance of mean difference was tested by Duncan's new multiple range test (DNMRT), modified by Kramer (1957).

RESULTS AND DISCUSSION

Growth performance

Results of growth performance of chicks with dietary inclusion of Ajwain seeds at different levels are shown in Table 2. Average daily gain, total weight gain, feed conversion ratio and performance index of broiler chicks

Table 1: Chemical composition of broiler pre-starter, starter, finisher feed and Ajwain (%DM basis).

Chemical composition	Broiler pre-starter	Broiler starter	Broiler finisher	Ajwain
Dry matter	90.89	90.19	90.27	92.17
Crude protein	23.18	22.08	20.15	15.50
Ether extract	3.08	3.61	4.09	18.99
Crude fibre	4.22	4.45	4.73	12.04
Total ash	5.20	5.51	5.53	6.52
Nitrogen free extract	64.32	64.35	65.50	46.95
Calcium	1.28	1.18	1.21	1.34
Phosphorus	0.79	0.80	0.90	0.38
ME (kcal/kg of feed)*	3390.50	3393.80	3402.09	-
E/P ratio	146.27	153.70	168.84	-

*ME (Kcal/kg) - Pauzenga (1985)

Table 2: Performance of broiler chicks fed on different levels of Ajwain seeds.

Parameters	Treatment groups					SEM
	T_1	T_2	T_3	T_4	T_5	
Total feed intake (g)	3957	4029	3973	3967	3954	15.56
Average daily gain (g)	54.12^{a}	55.81^{ab}	55.95^{ab}	57.92^{b}	55.89^{ab}	0.47
Total weight gain (g)	2273^{a}	2344^{ab}	2350^{ab}	2433^{b}	2348^{ab}	19.62
Feed conversion ratio	1.77^{b}	1.75^{ab}	1.72^{ab}	1.63^{a}	1.72^{ab}	0.02
Performance index	1284^{a}	1342^{ab}	1370^{ab}	1497^{b}	1370^{ab}	27.77
Protein efficiency ratio	2.76	2.78	2.81	2.90	2.80	0.02

Means with different superscripts in a row differ significantly.

Table 3: Effect of Ajwain seeds on carcass parameters of broilers.

Parameters	Treatment groups					SEM
	T_1	T_2	T_3	T_4	T_5	
Dressing yield (%)	71.02^{a}	73.16^{b}	74.97^{c}	75.27^{c}	72.51^{ab}	0.382
Eviscerated yield (%)	65.07^{a}	65.20^{a}	67.28^{b}	69.11^{d}	68.21^{c}	0.397
Liver (g)	60.05^{a}	61.13^{a}	66.05^{b}	70.16^{d}	68.06^{c}	0.745
Heart (g)	9.01^{a}	9.02^{a}	11.02^{c}	11.08^{c}	10.05^{b}	0.185
Gizzard (g)	34.01^{a}	35.05^{b}	35.62^{bc}	36.07^{c}	35.23^{b}	0.167
Giblet (g)	103.06^{a}	105.20^{b}	112.69^{c}	117.31^{d}	113.35^{c}	1.011

Means with different superscripts in a row differ significantly.

were significantly (P<0.05) increasing by Ajwain supplementation upto 1.5% level followed by decreased at 2.0% level. A diet supplemented with 1.5% Ajwain showed a significant increase in body weight with an improved feed conversion ratio and performance index.

These findings may be due to the effects of carvacrol and thymol contained in ajwain. Carvacrol is a monoterpenoid phenol that has a remarkable bioactivity on poultry metabolism (Reiner *et al*., 2009). The results are established the work of Hazarti *et al.* (2020) and Kolbadinejad *et al*. (2020) who reported significantly higher weight gain and better FCR of birds fed diets with Ajwain as compared to the control diet. However, Chowdhary *et al.* (2018) reported that addition of Ajwain oil at 0.4 g/kg level had no effect on body weight gain in broilers. Similarly, no effect (P>0.05) on body weight gains upon feeding diets containing ajwain powder was reported by Samadian *et al.* (2017) in broiler chicken. On the other hand, Kheiri *et al.* (2018) and Deepthi *et al*. (2020) also reported that Ajwain supplementation at varying levels in the diet had no effect (P>0.05) on feed conversion ratio in quails. Performance index (PI) is in accordance with findings of Anurag *et al.* (2018) who observed significantly higher performance index (PI) in broilers fed ration supplemented with 0.2% Ajwain as compare to control group. Whereas, Tripathi *et al.* (2017) observed that feeding of Ajwain had non-significant effect on performance index of broilers.

Results revealed that dietary inclusion of Ajwain seeds had no effect on total feed intake and protein efficiency ratio in broiler chicks. Similarly, Samadian *et al.* (2017) and Chowdhury *et al.* (2018) reported non-significant effect of Ajwain supplementation on feed intake in broilers. Falaki *et al.* (2016) reported that supplementation of *Carum copticum* essential oil (CCEO) at 150, 250 and 350 mg/kg in the diet had no effect (P>0.05) on feed intake in broiler chickens. Similarly, no effect (P>0.05) on feed intake upon feeding diets containing ajwain powder or essential oil were also reported by Habibi *et al.* (2016), Kheiri *et al.* (2018) and Deepthi *et al.* (2020). However, Waheed *et al.* (2017) found significantly higher feed intake in Ajwain treated groups in comparison to control. On contrary to this, Hazrati *et al*. (2020) reported reduction in feed intake with Ajwain supplementation.

The results of PER are in agreement with Amaefule *et al*. (2011) who observed non-significant differences among starter broilers fed raw pigeon pea seed meal on protein efficiency ratio in broilers. In contrast, Anurag *et al.* (2018) reported that Ajwain supplementation in the diet @ 0.2% significantly increase (P<0.05) protein efficiency ratio as compare to control.

Carcass characteristics

The effect of Ajwain on carcass evaluation parameters and organs weight is shown in Table 3. Supplementation of Ajwain in broilers diets showed highly significant (P<0.01) effect on dressing yield, eviscerated yield and organs weight. Highest dressing, eviscerated yield and organs weight was recorded in T_4 group containing 1.5% Ajwain and lowest was in control group.

The present results are favourably compared with the findings of Saei *et al.* (2021) reported that chickens fed the diet with 300 ppm of Ajwain extracts showed significantly (P<0.05) higher carcass weight, heart and liver weight compared to control and also reported that the Ajwain @150 ppm supplemented group showed the highest (P<0.05) weight of gizzard. Similarly, Kumar *et al.* (2018) also reported that addition of cumin seeds in the diet increase the in the final carcass weight and liver weight.

However, Habibi and Ghahtan (2019) reported that there was no significant difference (P>0.05) in dressing percentage in all the dietary treatments of Ajwain fed groups. Kheiri *et al*. (2018) also reported that dressing percentage, giblet, liver and gizzard weight were not influenced by the dietary treatment of thyme and Ajwain in Japanese quail. Contrary to this, Jahan *et al.* (2015) reported non-significant effect (P>0.05) of cumin seed supplementation on the weight of liver, heart and gizzard.

CONCLUSION

Looking to the performance of broilers in terms of growth and carcass yield, it could be concluded that dietary inclusion of Ajwain (*Trachyspermum ammi*) seeds at 1.5% level as non-antibiotic growth promoter is quite effective and could be a viable proposition to gain profit from broiler farming.

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Conflict of interest

All authors declare that they have no conflict of interest.

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