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Effect of combined feeding of cinnamon (*Cinnamomum verum*) and black cumin (*Nigella sativa*) powder on growth performance and feed conversion ratio of broiler chicken

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Abstract

An experiment was conducted in the poultry farm of Animal Husbandry and Dairy Science section, College of Agriculture, Dhule (Maharashtra). The present study entitled "effect of combination feeding of cinnamon (*Cinnamomum verum*) and black cumin (*Nigella sativa*) powder on growth performance and meat characteristics of commercial broiler chicken." One hundred broiler chicks were weighed and randomly distributed into four treatments, with 5 replicates. The combination of cinnamon and black cumin powder was mixed with broiler's diet. Control group (T₀) received a ration without any treatment. The birds received treatments upto 6 weeks of age at concentrations 0.30%, 0.75% and 1.0% cinnamon and black cumin powder each having treatments T₁, T₂ and T₃ respectively. The results showed that, feeding of the diets with 0.75% (T₂) cinnamon and black cumin powder was significantly increased the cumulative body weight and weekly body weight gain of broilers than control and other treatment groups. No significant difference was observed in feed intake among different treatments. Broilers fed with 0.75% group (T₂) had better Feed Conversion Ratio (FCR) (1.66) than any other treatments. Based upon this study it can be said that, combination of cinnamon and black cumin powder can be used as a natural feed additive at a rate of 0.75% for better growth performance and FCR of broilers.

Keywords: Combined feeding, cinnamon, black cumin, broiler, growth performance, feed conversion ratio, weight gain

Introduction

The poultry industry is a rapidly growing sector of animal husbandry and the Indian economy. The production of eggs and broilers has contributed nearly of 8 to 10 percent and 15-20% respectively. Poultry is one of the allied agricultural sectors in India that is growing at the highest rate.

India is the eighth-largest producer of meat in the world, and the broiler meat market is the fastest-growing in the meat industry. The poultry industry in India is also experiencing remarkable growth. The country's meat production in 2016-17 was 3.46 million tons and has climbed up to around 4.20 million tons in the year 2020, meat availability per capita has increased from 2.22 Kg/annum in the year 2014-15 to 3.21 kg/annum in 2020, with an about 6% growth rate (DAHD, 2022) [4]. In poultry meat Protein, vitamins, and minerals like iron, selenium, zinc and B vitamins are all present in sufficient quantity. Consequently, chicken flesh is regarded as a healthy meat. Use of antibiotics in broilers diet has many dis-advantages, aromatic medicinal plants are likely to substitute antibiotics, due to their antibacterial and cordial effects on an animal's digestive system. These plants play a significant role in growth promotion.

Cinnamomum verum is the scientific name for cinnamon. In India, it is popularly known as "Dalchini." It belongs to the family Lauraceae. It is both an ancient medicinal plant and one of India's most widely used condiments. Cinnamon, a natural spice, is obtained from the bark of the cinnamon tree. As a result, it has been proposed that cinnamon can be used as a natural appetite stimulant and food preservative, which helps with digestion and may enhance the performance of the broiler. It contains different medicinal properties like anti-ulcer, anti-inflammation, anti-diabetic and anti-hypercholesterolemic effects (Jakhetia *et al.*, 2010) [7].

The scientific name for black cumin seeds is *Nigella sativa*, it is also referred as Kalonji, black seed and black caraway seed. The seeds are widely known for their therapeutic benefits.

Black cumin seeds have been used in traditional medicines and offer a variety of health benefits, including those for digestion, appetite, and immunity; they also have antibacterial and antioxidant characteristics. *N. sativa* has active components such as thymoquinone, Di-thymoquinone. There are several types of proteins, moisture, resins, reducing sugars, etc., (Nadkarni, 1976) [9]. *N. sativa* seeds seem to be a multipurpose feed growth promoter and the performance of broilers may be improved by the use of the seeds in the diet broilers. In context of this, the current study examined the effects of feeding cinnamon and black cumin powder on broiler chickens with the objectives of to study growth performance of broiler chickens and to assess feed conversion ratio.

Materials and Methods

The present research was conducted at the poultry unit of the Department of Animal Husbandry and Dairy Science, in College of Agriculture Dhule, under Mahatma Phule Krishi Vidyapeeth, Rahuri, (MS), India. Which is located at 20.90020 N and 74.79880 E at an altitude of 258 meters above mean sea level. The study was conducted from June to July 2022.

Sakshi Poultry, Dhule (Rajdhani Agro-products) provided 100

(Vencobb-400) chicks of day-old broiler chicks for the current study. With the four treatments and 25 chicks per treatment. The following are the treatment details:

Table 1: Details of Dietary Treatments and Feedings

Treatment	Treatment details
T ₀	Basal diet without black cumin and Cinnamon powder
T ₁	Basal diet + Cinnamon powder + Black cumin seed powder @ 0.30% each
T ₂	Basal diet + Cinnamon powder + Black cumin seed Powder @ 0.75% each
T ₃	Cinnamon powder + Black cumin seed Powder @ 1% each

Feeding and Watering

For the first two days after hatching, broiler chicks were given crushed maize grains, followed by the experimental ration. As per the treatment, commercial poultry ration was mixed with Cinnamon and black cumin seed powder. Throughout the 6-week experiment, birds were provided fresh, clean, and cool drinking water. Chicks were vaccinated against the diseases; vaccination schedule was followed as shown in Table 2.

Table 2: Vaccination schedule of experimental birds

Sr. No.	Disease	Vaccine	Age of vaccination	Dose/Route
1.	Ranikhet	Lasota vaccine (F1 Strain)	7 th day	One drop in the eye (intraocular)
2.	Gumboro (IBD)	Gumboro vaccine	14 th day	One drop in the eye (intraocular)
3.	Gumboro (IBD)	Gumboro vaccine	21 st day	through drinking water
4.	Ranikhet	Booster dose	28 th day	through drinking water

Observations Recorded

During the experimental period following observations were recorded

Growth Trait

Body weight

At weekly intervals, the weight (g) of each of the experimental birds was recorded on an electronic weighing balance. The weight of the birds was taken on the 7th day in the morning before new water and feed was given to the birds, and then every 7 days interval after that.

Body weight gain of chicks

The body weight gain of chicks at different weeks was obtained by subtracting the body weight of chicks of the current week from the previous week.

Feed Intake

The amount of feed consumed by each group in a day was used to calculate daily feed intake. The total feed offered and the feed left over the next morning were used to compute the average feed intake. The weekly feed intake was computed by adding up the daily average feed intake of the particular week. The values for weekly feed intake per bird were calculated.

$$\text{Weekly feed intake (g/bird)} = \frac{\text{Total feed intake by all birds in treatment during a week}}{\text{No. of live chicks in the treatment during that week}}$$

Feed Conversion Ratio

By dividing weekly feed intake by weekly weight gain, the weekly feed conversion ratio was obtained. The weekly cumulative feed conversion ratio was calculated by

multiplying the cumulative feed consumption (total amount of feed ingested) up to that particular week by the body weight gain reported up to that week.

The following formula is used to calculate the weekly feed conversion ratio

$$\text{FCR} = \frac{\text{Feed consumption (g) during the week}}{\text{Gain in body weight (g) during the week}}$$

Statistical Analysis

The data collected throughout the trial were statistically analyzed by CRD (Snedecor and Cochran 1994) [11].

Results and Discussion

Growth Performance

Body Weight

The broiler's cumulative weekly body weight is shown in Table 3 (g). The average live weight (g) of day-old experimental chicks in the T₀, T₁, T₂, and T₃ groups was found to be 44.23 g, 44.50 g, 44.62 g, and 44.43 g, respectively. The experimental chick's final average body weights during the sixth (final) week was T₀ (2040.22 g), T₁ (2102.55 g), T₂ (2186.19 g), and T₃ (2142.35 g). Treatment T₂ (2186.19 g) recorded a significantly ($p < 0.05$) higher body weight than treatments T₃, T₁, and control. The results are according to Beg *et al.* (2016) [2] who found that cinnamon and black cumin @ 0.75% level demonstrated the maximum live body weight. Also, the results are in agreement with the findings of Behera *et al.*, (2020) [3] who reported that chicks supplemented with different levels of Cinnamon i.e., 0.5% and 1% had increased the body weight significantly as

compared to the control group. The results are in harmony with the findings of Dhakal and Tiwari (2019)^[5] who reported

that the highest broiler body weight with 0.5% Black cumin followed by ration supplemented with 0.75% Black cumin.

Table 3: Effect of feeding different levels of combination of cinnamon & black cumin powder on cumulative body weight of broilers

Weeks	Treatments				SE (±)	CD@5%
	T ₀	T ₁	T ₂	T ₃		
Initial	44.23	44.50	44.62	44.43	1.92	NS
first	187.42	196.73	200.36	194.66	8.53	NS
Second	396.24	409.09	429.96	415.16	18.06	NS
Third	695.26 ^c	719.01 ^b	748.77 ^a	726.36 ^b	7.32	21.63
Fourth	1095.00 ^c	1143.35 ^b	1186.93 ^a	1156.39 ^b	4.23	12.68
Fifth	1563.01 ^d	1620.72 ^c	1675.62 ^a	1637.51 ^b	5.35	16.06
Sixth	2040.22 ^d	2109.55 ^c	2186.19 ^a	2142.35 ^b	5.25	15.78

SE: standard error; CD: critical difference

Body Weight Gain

The weekly live body weight gain during the first two weeks was non-significant. However, a significant difference was recorded from the 3rd to 6th week. The observations recorded in (Table 4). During the sixth week observations recorded for treatments T₀, T₁, T₂ and T₃ was 477.21 g, 488.83 g, 510.57 g and 504.78 g respectively. The highest weight gain was observed in treatment T₂ (510.57 g) which is significantly ($p < 0.05$) superior to other treatment groups. T₀ has a weight gain of (477.21 g) was found to be the lowest among all the treatments. The results are in agreement with findings of Behera *et al.*, (2020)^[3] who reported that chicks supplemented with different levels of Cinnamon i.e., 0.5% and 1% had significantly increased body weight gain as

compared to the control group. Also, supplementation of Cinnamon powder at all the levels i.e., low, medium, high which are 0.5%, 1.0%, 1.5% improved body weight gain than the control (Singh *et al.*, 2014)^[10]. The results of the experiment are in harmony with the investigation of Tehseen *et al.*, (2016)^[13] who observed that the broiler fed ration supplemented with phytobiotic growth promoters, both Black cumin and garlic feed was more efficiently utilized in improving body weight gain than the control group. Also, the results are in accordance with the findings of Dhakal and Tiwari (2019)^[5] who recorded that the highest average weight gain in chicks fed ration with 0.50% followed by 0.75% Black cumin.

Table 4: Effect feeding of different levels of combination of cinnamon & black cumin powder on weekly body weight gain of broilers

Weeks	Treatments				SE (±)	CD@5%
	T ₀	T ₁	T ₂	T ₃		
First	143.19	146.23	155.74	150.23	6.45	NS
Second	209.32	212.36	229.06	220.5	9.43	NS
Third	298.52 ^c	309.92 ^b	318.81 ^a	311.20 ^b	1.95	5.85
Fourth	399.74 ^d	424.34 ^c	438.16 ^a	430.23 ^b	1.60	4.82
Fifth	468.01 ^c	477.37 ^b	488.69 ^a	481.12 ^b	1.71	5.13
Sixth	477.21 ^d	488.83 ^c	510.57 ^a	504.78 ^b	1.39	4.18

Feed Intake and Feed Efficiency

Weekly Feed Intake

In order to calculate the average weekly feed intake of broiler chicks, data on their average feed consumption was collected for experimental broiler chicks under various treatments at weekly intervals over a period of six weeks. The results are shown in Table 5. The feed intake of the birds fed in various concentration groups was reported to be statistically non-significant, indicating a similar feed consumption across all treatments. At sixth week old, the average daily feed intake for treatments T₀, T₁, T₂, and T₃ was 901.10 g, 905.12 g, 921.0 g, and 901.48 g, respectively. Treatment T₂ (921.0 g)

had the highest weekly feed consumption during the sixth week, followed by T₁, T₃, and T₀. The results are in accordance with the reports of Mehdipour *et al.*, (2013)^[8], Symeon *et al.*, (2014)^[12], Toghyani *et al.*, (2011)^[14] who reported that non-significant ($p > 0.05$) difference observed among treatments, birds fed with Cinnamon at different concentrations. The results are in line with the findings of Guler *et al.*, (2006)^[6], Dhakal and Tiwari (2019)^[5], Tehseen *et al.*, (2016)^[13] reported a non-significant ($p > 0.05$) difference among groups fed with Black cumin at different concentrations.

Table 5: Effect of feeding different levels of combination of cinnamon & black cumin powder on weekly feed intake of broiler

Weeks	Treatments				SE (±)	CD@5%
	T ₀	T ₁	T ₂	T ₃		
First	193.63	181.20	177.32	179.41	7.85	NS
Second	380.53	372.42	371.18	374.24	16.20	NS
Third	613.47	616.19	620.50	614.63	20.39	NS
Fourth	799.94	800.23	809.24	796.29	34.69	NS
Fifth	829.24	824.58	852.15	810.83	35.72	NS
Sixth	901.10	905.12	921.0	901.48	39.27	NS

Feed Conversion Ratio

The weekly mean feed conversion ratio from the 1st to 6th week of the age of birds is presented in Table 6. The overall feed conversion ratio of six weeks for treatments T₀, T₁, T₂ and T₃ were 1.81, 1.73, 1.66 and 1.69, respectively. Statistically better FCR was recorded in treatment T₂ (1.66) compared to the other treatments. The results corroborated with the findings of Beg *et al.*, (2016)^[2] who reported that the

best FCR was found with the cinnamon and black cumin level @ 0.75% concentration. Also, the results of this study through combined feeding are comparable to those of Arif *et al.* (2019)^[1], who observed that a feed mixture supplemented with black cumin, *Moringa oleifera*, and chicory seeds enhanced the feed conversion ratio when compared to the control group.

Table 6: Effect of feeding different levels of combination of cinnamon & black cumin powder on weekly feed conversion ratio of broiler

Weeks	Treatments				SE (±)	CD@5%
	T0	T1	T2	T3		
First	1.35	1.23	1.13	1.19	0.05	NS
Second	1.81	1.75	1.61	1.69	0.07	NS
Third	2.05 ^b	1.98 ^{ab}	1.90 ^a	1.97 ^{ab}	0.03	0.09
Fourth	2.00 ^c	1.88 ^b	1.80 ^a	1.85 ^{ab}	0.02	0.08
Fifth	1.77 ^c	1.72 ^b	1.71 ^b	1.68 ^a	0.01	0.029
Sixth	1.88 ^b	1.85 ^b	1.82 ^b	1.69 ^a	0.04	0.12
Overall	1.81 ^b	1.73 ^b	1.66 ^a	1.69 ^b	0.01	0.05

Conclusion

In comparison to the other treatments, the effect of combined feeding of cinnamon and black cumin powder on growth performance of broiler concluded that, 0.75% (T₂), has significantly increased the cumulative live weight and weekly body weight gain.

The effect of combination feeding of cinnamon and black cumin powder in the diet at different levels had a non-significant effect on weekly feed intake

The treatment group T₂ @0.75% group had better FCR (1.66) than any other treatments by combination feeding of cinnamon and black cumin powder in the diets of broiler.

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