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Effect of black pepper and coriander seed powder addition on average daily weight gain of broilers

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Abstract
The study in the text was carried out in broiler chickens to investigate the inclusion of black pepper (*Piper nigrum*) and coriander (*Coriandrum sativum*) at graded levels (0.5%, 1.0% and 1.5% black pepper; 1.0%, 2.0% and 3.0% coriander) either alone or in combination as an alternative to body weight (g). A 42-day feeding trial followed by a metabolic trial was conducted under standard feeding and management conditions on 360 day-old Vencobb broiler chickens randomly divided into 10 treatment groups (T_1-T_{10}) with three replicates of 12 chickens each. Feeding was done according to 'ICAR (2013) standards. The total mean daily gain in treatment groups T_1 (control), T_2, T_3, T_4, T_5, T_6, T_7, T_8, T_9 and T_{10} were recorded as 51.83, 52.15, 58.51, 57.73, 54, 68, 59.30, 55.75, 55 54.88, 54.52 g, respectively. Statistical analysis of the data revealed a highly significant (p<0.01) effect of black pepper and coriander administration in II. to VI. week and a significant (p<0.05) effect in week I.

Keywords: Average daily body weight gain, black pepper, broiler, coriander

Introduction
The poultry industry in India has undergone significant change in its structure and operation in the last two decades. This change requires significant investment in breeding, incubation, development and operations.

With the continuous improvement of people's understanding and the advancement of various technologies, the production and production of chicken meat has also improved, along with the continuous development of poultry processing businesses. Chicken is preferred because it is considered more hygienic than other meat products, is available throughout the country and is cheaper than fish/mutton. The population of India is 1.23 billion and this number is increasing every year.

There are many nontherapeutic agents for antibiotics such as enzymes, inorganic acids, probioics, prebiotics and plantbased feed additives such as herbs and pices (Banerjee, 1998) [1]. Herbs and spices have received great attention as botanical/phytobiotic alternatives for antimicrobial development due to their antibacterial, coccidiostatic, anthelmintic antioxidants, anti-inflammatory potential, digestive stimulants, antiinflammatory, lower cholesterol, growth promoters (Eevuri and Putturu, 2013) [7]. When multiple herbs are mixed together, they are often referred to as a "polyherb" due to their wide variety of properties (such as antiinflammatory, hepatoprotective, and many other benefits without side effects) and have received international attention (Chowdhury *et al*., 2009) [4]. Herbs or plants may provide beneficial effects on the colon.

Coriander (*Coriandrum sativum* L.) is a food and medicinal plant of economic importance as it is been used as agent in food products, perfumes and cosmetics. The major compounds present in essential oil are linalool (67.70%); α-pinene (10.5%); γ-terpinene (9.0%); geranyl acetate (4.0%); camphor (3.0%); and geraniol (1.9%) (H. Hossein and M. Mohammad, 2000) [21]. Powdered seeds or dry extract, tea, tinctures have been recommended for for the treatment of indigestion, loss of appetite, convulsion, insomnia and anxiety (Emamghoreishi, Khasaki & Aazam, 2005) [9]. Coriander essential oils and various extracts have been shown to have antibacterial properties (Burt, 2004, Kubo *et al*., 2004) [2, 14], antioxidant (Wangensteen, Samuelsen, & Malterud, 2004) [20], antidiabetic (Gallagher, Flatt, Duffy, & Abdel-Wahab, 2003) [10], anticancerous, hypolipidemic, antimutagenic (Chithra &

Leelamma, 2000) [3] and antimicrobial (Delaquis *et al*., 2002; Singh *et al*., 2002 & Elgayyar *et al*., 2001) [5, 19, 8] activities. It is widely used in folk medicine for its antimicrobial, antianxiety, analgesic, anticonvulsant, carminative, antifertility, antiasthamatic and insulin like activity.

Black pepper (*Piper nigrum*) is a flowering plant and spices for its fruit, which is usually dried and used as a spice and seasoning (Moorthy *et al*., 2009) [17]. The medicinal properties of pepper are attributed to the compounds it contains: piperine, pipridine, curcumin, piperic acid, beta-pinene, cupsisin and cupsantine. Piperine a compounds found in black pepper has catalase activity and reduce rheumatic ache (Mahady *et al*., 2008) [15]. Black pepper (*P. nigrum* Linn) has been shown to rich in glutathione peroxidase and glucose-6-phosphate dehydrogenase (Karthikeyan and Rani, 2003) [12]. Research shows that piperine can increase absorption of selenium, vitamins. Other nutrients include B complex, beta carotene and curcumin (Khalaf, 2008) [13]. Piperine improves lipid thermogenesis and accelerates energy metabolism in the body (Malini *et al*., 1999) [16] and also increases the production of serotonin and beta–endorphin production in the brain. Therefore, this study aims to evaluate the effect of Black pepper (*Piper nigrum*) and Coriander (*Coriandrum sativum*) as phytochemical feed additives on carcass characteristics of broiler chicks.

Materials and Methods

The experiment was carried out for 6 weeks period the Poultry Farm of College of Veterinary and Animal Science. The estimation of different parameters and chemical analysis are generally in the laboratory of Animal Nutrition Department and in different Departments of CVAS, Bikaner.

Experimental chicks

360-one day old Vencobb-400 broilers chicks were purchased from a well known producer. The experimental broiler chicks were wing banded and weighed individually before starting of feeding trial. The broiler chicks were assigned randomly assigned to different groups.

Experimental Designs

The completely randomized design was adopted for the present feeding trial. The 360, day-old broiler chicks were divided into ten dietary treatments groups as presented in Table 1. The T_1 i.e., control group was fed on basal diet while T_2, T_3, T_4 and T_5 treatment groups were supplemented with 0.50%, 1.00%, and 1.50% of black pepper powder in the basal broiler starter and finisher ration, respectively. The T_6, T_7 and T_8 treatment group were supplemented with 1.0%, 2.0% & 3.0% of coriander in the basal broiler starter and finisher ration, respectively. The T_8, T_9 and T_{10} treatment group were supplemented with 0.25%, 0.50% & 0.75% of black pepper with 0.50%, 1.0% & 1.5% of coriander in the basal broiler starter and finisher ration, respectively. Each dietary group was randomly replicated to three sub-groups (R_1-R_3) to make sure uniformity in various treatment groups.

Table 1: Trail design for multiple treatment Groups

S.N.	Treatment Groups		No. of Broiler Chicks/ Replication			Total No. of Broiler Chicks in Each Group
			R_1	R_2	R_3	
1	T_1	Basal diet (Control)	12	12	12	36
2	T_2	Basal diet +Black pepper at 0.50% level	12	12	12	36
3	T_3	Basal diet + Black pepper at 1% level	12	12	12	36
4	T_4	Basal diet +Black pepper at 1.5% level	12	12	12	36
5	T_5	Basal diet + Coriander at 1% level	12	12	12	36
6	T_6	Basal diet + Coriander at 2% level	12	12	12	36
7	T_7	Basal diet + Coriander at 3% level	12	12	12	36
8	T_8	Basal diet +Black pepper at 0.25% level + Coriander at 0.50% level	12	12	12	36
9	T_9	Basal diet +Black pepper at 0.50% level + Coriander at 1% level	12	12	12	36
10	T_{10}	Basal diet +Black pepper at 0.75% level + Coriander at 1.5% level	12	12	12	36

Housing and general management

The broiler chicks were vaccinated against Ranikhet Disease (F1 strain) on 4th day and Bursal virus on 14th day. Throughout experiement, Broilers were raised as standard management including brooding, feeding, water and disease control. Use fresh and dry wheat straw was used as bedding material. Brooding of chicks was carried out by usual brooding method through photoperiod of 24 hours duration throughout experimental trial. Ad lib access to water and feed was arranged for all the treatments groups.

Average Daily Weight Gain (ADG)

Average daily gain in body weight (in grams) is calculated by dividing the total weight gain by number of days.

Statistical Analysis

The experimental data were analyed using using one way ANOVA (SPSS *Ver*. 20.0) described by Snecdor and Cochran (2004) [22] to assess significant variation between treatment groups. Probabilities values of less than 0.05 (p<0.05) were considered significant. Comparison of mean values was made using Duncan's Multiple Range Test (Duncan, 1955) [6].

Results and Discussion

The weekly observations of live body weights gain of broilers in different treatment groups are listed in Table 1 and statistical analysis is given in Table 2 and shown in Figure 1.The overall average daily weight gain in T_1 (Control), T_2, T_3, T_4, T_5, T_6, T_7, T_8, T_9 and T_{10}, treatment groups were recorded to be 51.83, 52.15, 58.51, 57.73, 54.68, 59.30, 55.45, 55.75, 54.88, 54.52 g, respectively. The statistical analysis of data revealed highly significant (p<0.01) effect of feeding of black pepper and coriander at II to VI weeks and significant (p<0.05) effect at I week.

Table 2: Effect of black pepper and coriander powder on average daily weight gain (g) at different weeks

Treatment Groups	Period (weeks)						
	I	II	III	IV	V	VI	I-VI
T_1	17.49^{a}	36.23^{ab}	56.40^{a}	69.07^{a}	70.94^{a}	60.82^{a}	51.83^{a}
T_2	17.60^{a}	35.51^{a}	58.65^{bc}	69.11^{a}	70.19^{a}	61.44^{ab}	52.15^{a}
T_3	18.18^{bc}	40.46^{e}	70.48^{d}	79.88^{de}	74.63^{de}	67.63^{d}	58.51^{e}
T_4	17.52^{a}	40.36^{e}	69.63^{d}	79.69^{d}	74.94^{e}	64.17^{c}	57.73^{d}
T_5	17.45^{a}	37.23^{bc}	57.93^{ab}	72.50^{b}	72.82^{b}	70.07^{d}	54.68^{b}
T_6	18.01^{abc}	42.15^{f}	71.67^{e}	81.50^{e}	74.34^{cde}	68.09^{d}	59.30^{f}
T_7	17.81^{c}	38.35^{cd}	59.11^{bc}	73.72^{bc}	74.23^{bcde}	69.39^{d}	55.45^{c}
T_8	17.84^{bc}	39.34^{de}	60.58^{c}	74.46^{c}	73.63^{bcde}	68.58^{bc}	55.75^{c}
T_9	18.29^{c}	40.50^{e}	59.52^{bc}	74.02b^{c}	73.05^{bc}	63.87^{abc}	54.88^{b}
T_{10}	18.12^{bc}	39.99^{e}	58.88^{bc}	73.86^{bc}	73.43^{bcd}	62.82^{abc}	54.52^{b}
SEM	0.17	0.45	0.61	0.54	0.43	0.81	0.17

a, b, c - Means superscripted with different letters within a column differ significantly from each other.

Table 2: Statistical analysis of average daily weight gain (g) of broilers in different weeks

Period	Source of Variation	DF	SS	MSS	F-Value
I Week	Treatments	9	2.443	0.27145	3.20*
	Replicate	2	0.134	0.067493	0.79 ^{NS}
	Remainder	18	1.525	0.084747	
II Week	Treatments	9	122.16	13.57372	21.78**
	Replicate	2	0.121	0.060663	0.09 ^{NS}
	Remainder	18	133.50	0.623184	
III Week	Treatments	9	884.31	98.25765	88.68**
	Replicate	2	0.325	0.162541	0.14 ^{NS}
	Remainder	18	19.942	1.107896	
IV Week	Treatments	9	524.462	58.2736	65.30**
	Replicate	2	0.291	0.14563	0.16 ^{NS}
	Remainder	18	16.061	0.892314	
V Week	Treatments	9	66.483	7.38700	13.16**
	Replicate	2	1.805	0.90298	1.60 ^{NS}
	Remainder	18	10.100	0.561165	
VI Week	Treatments	9	318.377	35.375	17.93**
	Replicate	2	7.898	3.9491	2.00 ^{NS}
	Remainder	18	35.497	1.972095	
I-VI Week	Treatments	9	122.408	13.60098	219.05**
	Replicate	2	0.111	0.05556	0.89 ^{NS}
	Remainder	18	1.117	0.06209	

NS = Not significant (p>0.05)* = Significant at 5% level (p<0.05), ** = Significant at 1% level (p<0.01)

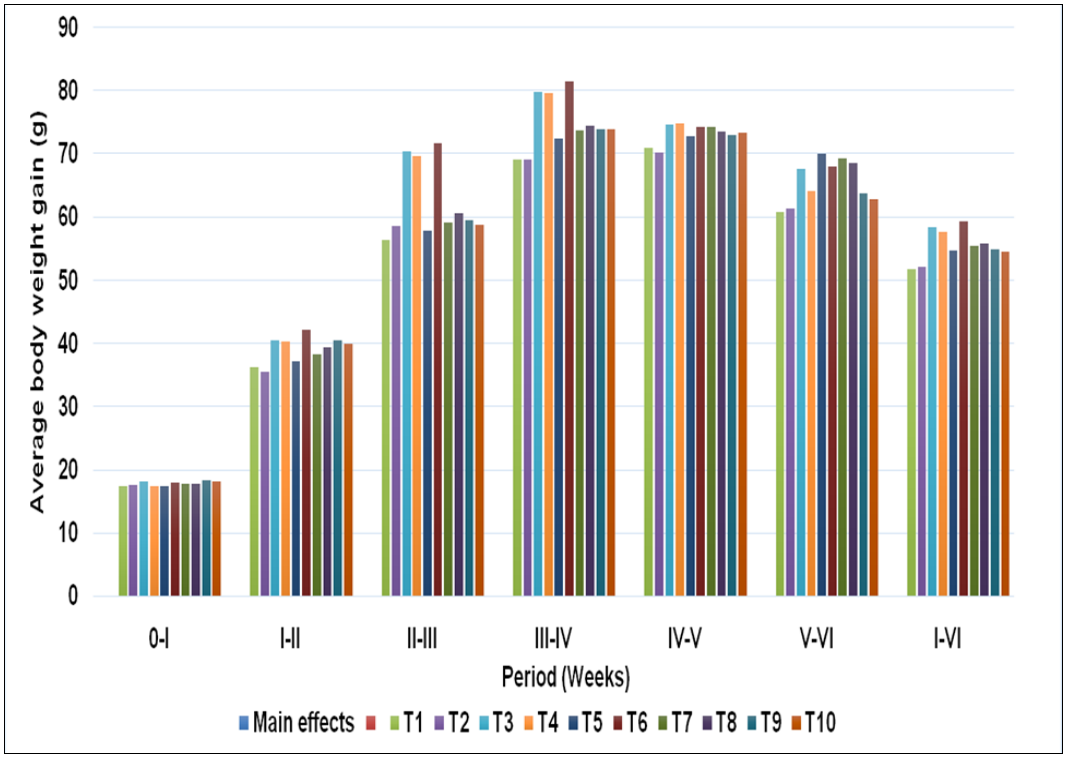

Fig 1: Effect of black pepper and coriander powder on average daily weight gain (g) in broilers at different weeks

Comparison of the means of the treatment groups showed that during week I, T_9 recorded the highest mean daily weight; this was analyzed by comparison with T_3, T_6, T_7, T_8 and T_{10}, as well as other key groups. The T_5 treatment group had the lowest mean daily weight gain at week 1; this was comparable to groups T_3, T_2, T_4, and T_6. During the second week, T_6 recorded the highest average daily weight gain, which was very significant compared to the other treatment groups. The T_2 group had the lowest daily average compared to the T_1 group. In the third week, T6 recorded the highest average daily weight gain, which was very significant compared to the other treatment groups. The control group had the lowest average daily weight. During the fourth week, T_6 recorded the highest average daily weight, which was comparable to T_3 and greater than the other groups. T_1 (i.e. control group) and T_2, IV. Had the lowest daily weight gain of the week. In the fifth week, T_4 recorded the highest average daily increase but was compared to T_3, T_6, T_7, and T_8. In week six, T_5 recorded the highest average daily weight gain compared to T_3, T_6, and T_7. The T_1 group showed the lowest increase compared to the T_2, T_9 and T_{10} groups. T_6 with 2.0% coriander supplementation achieved the highest average daily weight gain.

The beneficial effect of plants on broiler performance may be due to the antibacterial and antioxidant properties of phenolic compounds in the intestine (Nascimento *et al*., 2000) [18].

Based on the above results, it can be said that the amount of food supplements plays an important role in determining the effect of herbal supplements on muscle performance. The content of active ingredients in the diet will eventually be revealed in the growth of broilers.

The addition of coriander provided a significant improvement in the average daily weight gain of broilers (p<0.01). The findings are consistent with those of Gular *et al*. (2005) [11] reported that average daily weight gain (g) increased significantly (p<0.01) when 2.0% coriander was added to the basic diet. Moreover, the effect of black pepper addition is supported by the results of Singh *et al*. (2018) [23], who evaluated the effect of black pepper supplementation as an herb for anti-inflammatory growth in broilers, noted that black pepper supplementation at 0.5% level improved body weight gain in the treatment group.

Conclusion

The effect of black pepper powder added to broiler chicks in addition to alternative growth promotion strategies have been recorded and it has been noted that live weight gain increased in the group applied with the addition of 0.5% black pepper.

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