



ISSN: 2456-2912

VET 2024; SP-9(1): 544-548

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www.veterinarypaper.com

Received: 21-10-2023

Accepted: 25-11-2023

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Effect of gradual addition of black pepper and coriander seed powder on body weight (gm) of broilers different weeks

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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 metabolic trial was conducted under standard feeding and managemental conditions on 360, day old Vencobb broiler chicks randomly divided into 10 treatment groups (T₁-T₁₀) with three replicates of 12 chicks each. The feeding was done as per standards of 'ICAR (2013)'. Significant effect of black pepper and coriander powder alone or in combinations was observed on overall feed intake, live body weight, body weight gain. The statistical analysis of data revealed highly significant ($p < 0.01$) effect of feeding of black pepper and coriander on body weight at II to VI weeks and non-significant effect at I week. Further, the comparison of means at II week for different treatment groups revealed highest body weight in T₆ group which was though significantly higher from T₁, T₂, T₅, T₇ and T₈ but was comparable with T₃, T₄, T₉ and T₁₀ in statistical terms. In III- and IV-weeks highest body weight was observed in T₆ group which was significantly higher than all other treatment groups. In V- and VI-weeks highest body weight was observed in T₆ group which was comparable with T₄ but significantly higher than rest of treatment groups.

Keywords: Black pepper, broiler, coriander, body weight

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, probiotics, prebiotics and plantbased feed additives such as herbs and spices (Banerjee, 1998). 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, anti-inflammatory, lower cholesterol, growth promoters (Eevuri and Putturu, 2013) [10]. When multiple herbs are mixed together, they are often referred to as a "polyherb" due to their wide variety of properties (such as anti-inflammatory, hepatoprotective, and many other benefits without side effects) and have received international attention (Kale *et al.*, 2003; Chowdhury *et al.*, 2009) [16, 7]. 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) [15].

Powdered seeds or dry extract, tea, tinctures have been recommended for the treatment of indigestion, loss of appetite, convulsion, insomnia and anxiety (Emamghoreishi, Khasaki & Aazam, 2005) [12]. Coriander essential oils and various extracts have been shown to have antibacterial properties (Burt, 2004, Kubo *et al.*, 2004) [5, 19], antioxidant (Wangensteen, Samuelsen, & Malterud, 2004), antidiabetic (Gallagher, Flatt, Duffy, & Abdel-Wahab, 2003) [13], anticancerous, hypolipidemic, antimutagenic (Chithra & Leelamma, 2000) [6] and antimicrobial (Delaquis *et al.*, 2002; Singh *et al.*, 2002 & Elgayyar *et al.*, 2001) [8, 24, 11] activities. It is widely used in folk medicine for its antimicrobial, antianxiety, analgesic, anticonvulsant, carminative, antifertility, antiasthmatic 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) [22]. 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) [20]. Black pepper (*P. nigrum* Linn) has been shown to rich in glutathione peroxidase and glucose-6-phosphate dehydrogenase (Karthikeyan and Rani, 2003) [17]. Research shows that piperine can increase absorption of selenium, vitamins. Other nutrients include B complex, beta carotene and curcumin (Khalaf, 2008) [18]. Piperine improves lipid thermogenesis and accelerates energy metabolism in the body (Malini *et al.*, 1999) [21] 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 procured from a reputed commercial hatchery. The experimental broiler chicks were wing banded and weighed individually before starting of feeding trial. The broiler chicks were assigned randomly to various experimental 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 T₁ i.e., control group was fed on basal diet while T₂, T₃, T₄ and T₅ 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 T₆, T₇ and T₈ treatment group were supplemented with 1.0%, 2.0% & 3.0% of coriander in the basal broiler starter and finisher ration, respectively. The T₈, T₉ and T₁₀ 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 replicated to three sub-groups (R₁-R₃) 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 Infectious Bursal Disease on 14th day. Broilers were maintained under standard managerial practices involving brooding, feeding, watering and disease control throughout the trial period. The 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.

Growth Performance Parameters

Weekly Body Weight

Chicks were weighed individually at the beginning of the trial and then weekly for six weeks. Weigh the birds using an electronic measuring device in the morning before feeding.

Statistical Analysis

The experimental data were analysed using one way ANOVA (SPSS Ver. 20.0) described by Snecdor and Cochran (2004) [26] 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) [9].

Results and Discussion

The average body weight of broiler chickens recorded weekly for the different treatment groups is listed in Table 1. The average body weight found to be increased in six weeks from 41.78 to 2218.62 g in T₁, 41.67 to 2229.64 g in T₂, 41.89 to 2466.14 g in T₃, 42.28 to 2499.5 g in T₄, 42.2 to 2338.42 g in T₅, 42.28 to 2532.75 g in T₆, 41.81 to 2370.31 g in T₇, 41.95 to 2383.2 g in T₈, 42.2 to 2347.12 g in T₉ and 42.78 to 2332.56 g in T₁₀.

Analysis of the data in Table 2 shows that the consumption of black pepper and coriander in periods II to VI. It shows that there is a significant effect on body weight ($p < 0.01$) in weeks 1, but the effects in week 1 are not significant. Further, the comparison of means at II week for different treatment groups revealed highest body weight in T₆ group which was though significantly higher from T₁, T₂, T₅, T₇ and T₈ but was comparable with T₃, T₄, T₉ and T₁₀ in statistical terms. In III- and IV-weeks highest body weight was observed in T₆ group

which was significantly higher than all other treatment groups. In V- and VI-weeks highest body weight was observed in T₆ group which was comparable with T₄ but significantly higher than rest of treatment groups. Significant improvement in body weight in coriander addition group supports our hypothesis of beneficial effect of coriander as a potent herbal feed additive at optimum dose in broilers as natural growth promoters in poultry feed.

Table 1: Effect of black pepper and coriander powder on body weight (g) in broilers at different weeks

Treatment Groups	Period (weeks)						
	0	I	II	III	IV	V	VI
T ₁	41.78	164.23	417.89 ^a	812.73 ^a	1296.28 ^a	1792.87 ^a	2218.62 ^a
T ₂	41.67	165.23	413.81 ^a	824.56 ^a	1308.17 ^a	1799.50 ^a	2229.64 ^a
T ₃	41.89	164.56	447.09 ^{cd}	934.55 ^e	1492.37 ^d	2016.95 ^d	2466.14 ^e
T ₄	42.28	169.42	452.87 ^{de}	940.31 ^e	1503.84 ^d	2026.56 ^{de}	2499.50 ^{ef}
T ₅	42.20	164.39	425.06 ^{ab}	830.59 ^{ab}	1338.14 ^b	1847.92 ^b	2338.42 ^{bc}
T ₆	42.28	168.28	463.39 ^e	965.12 ^f	1535.67 ^e	2056.12 ^e	2532.75 ^f
T ₇	41.81	166.50	435.00 ^{bc}	848.78 ^{bc}	1364.87 ^c	1884.53 ^c	2370.31 ^{cd}
T ₈	41.95	166.87	442.31 ^{cd}	866.39 ^{cd}	1387.67 ^c	1903.09 ^c	2383.20 ^d
T ₉	42.20	170.23	453.73 ^{de}	870.42 ^d	1388.62 ^c	1899.98 ^c	2347.12 ^{bcd}
T ₁₀	42.78	169.62	449.56 ^{cde}	861.73 ^{cd}	1378.75 ^c	1892.81 ^c	2332.56 ^b
SEM	0.44	2.08	5.54	7.16	9.24	10.72	12.45

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

Table 2: Analysis of variance for body weight of broilers at different weeks

Period	Source of Variation	DF	SS	MSS	F-Value
0 Week	Treatments	9	35.413	3.934877	0.57 ^{NS}
	Replicate	2	21.738	10.86944	1.58 ^{NS}
	Remainder	348	2383.452	6.84917	
I Week	Treatments	9	1748.177	194.242	1.24 ^{NS}
	Replicate	2	64.205	32.10278	0.205 ^{NS}
	Remainder	348	54441.739	156.4418	
II Week	Treatments	9	88951.956	9883.551	8.95 ^{**}
	Replicate	2	176.6	88.300	0.07 ^{NS}
	Remainder	348	384197.84	1104.017	
III Week	Treatments	9	909992.17	101110.2	54.76 ^{**}
	Replicate	2	265.05	132.525	0.07 ^{NS}
	Remainder	348	642540.76	1846.381	
IV Week	Treatments	9	2257227	250803	81.55 ^{**}
	Replicate	2	665.51	332.7583	0.108 ^{NS}
	Remainder	348	1070161.9	3075.178	
V Week	Treatments	9	2779511	308834.6	74.64 ^{**}
	Replicate	2	444.28	222.1444	0.053 ^{NS}
	Remainder	348	1439888.4	4137.61	
VI Week	Treatments	9	3534653.2	392739.2	70.42 ^{**}
	Replicate	2	3747.90	1873.953	0.336 ^{NS}
	Remainder	348	1940769.5	5576.924	

NS = Non-Significant ($p > 0.05$) ** = Significant at 1% level ($p < 0.01$)

The results of the present study are in close agreement with Al-Jaff *et al.* (2011) [1] who reported significantly higher final body weight of one day-old broiler chicks supplemented with 2% coriander seeds. The significant improvement in body weight (g) of broilers because of additions of 2% coriander has also been reported by Hamodi *et al.* (2010) [14] and Hosseinzadeh *et al.* (2014) [27]. Significant increase in body weight recorded with 1.0% black pepper additions in present study corroborate well with the finding of Al-Kassie *et al.* (2011) [2] who also supplemented black pepper @ 0.50, 0.75

and 1% level in broiler diet and observed increase in body weight as compared to control. The weekly body weight gain of broilers recorded in various treatment groups have been listed in Table 3 and analysis of variance in Table 4. The mean values of weekly body weight gain in T₁ (Control), T₂, T₃, T₄, T₅, T₆, T₇, T₈, T₉ and T₁₀ treatment groups were recorded to be 2176.84, 2187.98, 2457.23, 2424.25, 2296.23, 2490.48, 2328.5, 2341.25, 2304.92 and 2289.78 g respectively.

Table 3: Effect of black pepper and coriander powder on body weight gain (g) in broilers at different weeks

Treatment Groups	Period (weeks)						
	I	II	III	IV	V	VI	I-VI
T ₁	122.45	253.67 ^{ab}	394.84 ^a	483.56 ^a	496.59 ^a	425.75 ^a	2176.84 ^a
T ₂	123.56	248.59 ^a	410.75 ^{bc}	483.62 ^a	491.34 ^a	430.14 ^{ab}	2187.98 ^a
T ₃	127.14	283.45 ^e	487.45 ^e	563.53 ^{de}	522.73 ^{bc}	472.95 ^d	2457.23 ^{ef}
T ₄	122.67	282.53 ^e	487.42 ^e	557.87 ^d	524.59 ^c	449.20 ^c	2424.25 ^e
T ₅	122.20	260.67 ^{bc}	405.53 ^b	507.56 ^b	509.78 ^b	490.50 ^f	2296.23 ^{bc}
T ₆	126.00	295.12 ^f	501.73 ^f	570.56 ^e	520.45 ^{bc}	476.64 ^{de}	2490.48 ^f
T ₇	124.70	268.50 ^{cd}	413.78 ^{bc}	516.09 ^{bc}	519.67 ^{bc}	485.78 ^{ef}	2328.50 ^{cd}
T ₈	124.92	275.45 ^{de}	424.09 ^d	521.28 ^c	515.42 ^{bc}	480.12 ^{def}	2341.25 ^d
T ₉	128.03	283.50 ^e	416.70 ^{cd}	518.20 ^{bc}	511.37 ^{bc}	447.14 ^c	2304.92 ^{bc}
T ₁₀	126.84	279.95 ^{de}	412.17 ^{bc}	517.03 ^{bc}	514.06 ^{bc}	439.75 ^{bc}	2289.78 ^b
SEM	1.75	3.93	3.15	3.86	4.32	3.89	12.17

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

Table 4: Analysis of variance for body weight gain (g) in broilers at different weeks

Period	Source of Variation	DF	SS	MSS	F-Value
I Week	Treatments	9	1436.51	159.613	1.94 ^{NS}
	Replicate	2	79.37	39.6861	2.99 ^{NS}
	Remainder	348	38572.71	110.841	
II Week	Treatments	9	71832.111	7981.35	14.31 ^{**}
	Replicate	2	71.33	35.6694	0.06 ^{NS}
	Remainder	348	193969.61	557.384	
III Week	Treatments	9	519979.58	57775.5	162.02 ^{**}
	Replicate	2	191.15	95.575	0.26 ^{NS}
	Remainder	348	124094.04	356.592	
IV Week	Treatments	9	308383.89	34264.9	63.90 ^{**}
	Replicate	2	171.26	85.6333	0.159 ^{NS}
	Remainder	348	186591.82	536.183	
V Week	Treatments	9	39092.011	4343.56	6.45 ^{**}
	Replicate	2	1061.90	530.953	0.78 ^{NS}
	Remainder	348	234130.87	672.29	
VI Week	Treatments	9	187206.07	20800.7	38.10 ^{**}
	Replicate	2	4644.23	2322.12	4.25 ^{NS}
	Remainder	348	189944.48	545.817	
I-VI Week	Treatments	9	3526844.1	391872	73.48 ^{**}
	Replicate	2	3201.65	1600.82	0.30 ^{NS}
	Remainder	348	1855713.2	5332.51	

NS = Non-Significant ($p > 0.05$) ** = Significant at 1% level ($p < 0.01$)

Data analysis showed that the effect of consuming black pepper and coriander was highly significant ($p < 0.01$) from weeks 2 to 6 and non-significant effect at I week. Comparing the averages of several weeks showed that T₆ had the highest weight gain in weeks 2 and 3; this was highly significant compared to other treatment groups. At IV-week, highest body weight gain was recorded in T₆ group which was comparable with T₃ group. Lowest gain was reported in control group which was comparable with T₂ group. At V week, highest body weight gain was reported in T₄, which was comparable with T₃, T₆, T₇, T₈, T₉ and T₁₀. T₁ i.e. control group and T₂ group had lowest body weight gain at V week. At VI-week, highest body weight gain was recorded in T₅, which was comparable with T₇ and T₈. Lowest gain was recorded in T₁ i.e. Control group and T₂ group. The highest mean body weight gain recorded for entire period of experiment i.e. for I to VI weeks in T₆ (2490.48 g) containing 2.0% coriander which was though statistically comparable with T₃, but significantly higher ($p < 0.01$) than rest of the groups. The present observation are in accordance with findings of Hamodi *et al.* (2010) [14] who reported significant effect on body weight gain when fed on diets containing 1.0%, 2.0% and 3.0% coriander seeds and highest gain was showed by broilers having 2% coriander seed in diets. The obtained results of study on inclusion of black pepper are in line with

the findings of Al-Kassie *et al.* (2011) [2] who reported significant improvement in body weight gain on supplementation of 1.0% black pepper. Barad *et al.* (2016) observed significantly ($p < 0.05$) higher final body weights (g) in treatment groups supplemented with coriander (2.0%) as compared to control group and highest total body weight of experimental birds was observed in coriander seed supplemented group followed by black pepper and control group. Factors which could have contributed to the positive effects of the black pepper and coriander on the performance of birds are their antibacterial, antioxidant and gastric stimulatory effects of natural phenolic compounds in the intestine (Nascimento *et al.* 2000) [23].

Conclusion

Significant improvement in body weight in coriander supplemented group supports our hypothesis of beneficial effect of coriander as a potent herbal feed additive at optimum dose in broilers as natural growth promoters in animal feed.

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