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Effect of feeding Mint (*Mentha spicata*) and Indian Bay Leaf (*Cinnamomum tamala*) on Performance, Carcass traits and Nutrient Utilization in Broiler Chicks

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ABSTRACT

A six-week study was carried out to investigate the effect of dietary supplementation of mint powder and Indian bay leaf powder alone and in combination on performance, carcass traits and nutrient utilization in broiler chicks. Three hundred chicks were equally and randomly divided into ten dietary treatment groups having two replicates in each. The T_1 i.e. control group was fed on basal diet while T_2, T_3 and T_4 groups have 0.50%, 1.0% and 1.50% of mint powder and T_5, T_6 and T_7 groups have Indian bay leaf powder @ 0.50%, 1.0% and 1.50% levels, respectively. T_8, T_9 and T_{10} treatment groups were supplemented with 0.25%, 0.50% & 0.75% of both the herbs. Results indicated the inclusion of herbal feed additive alone and in combination increased feed intake ($P<0.05$) and body weight, weight gain, feed conversion ratio (FCR) and performance index ($P<0.01$) as compared to control. Body weight, weight gain, feed conversion ratio and performance index were highest in T_7 treatment group i.e. group supplemented with 1.5% level of Indian bay leaf powder. Similarly, the metabolizability of dry matter ($P<0.05$) and crude protein ($P<0.01$) also increase significantly on supplementation of these herbs alone and in combination. However, no effect was recorded on the protein efficiency ratio; dressed weight percent, eviscerated yield percent and percent yield of giblet, heart, liver and gizzard. Thus, it can be concluded that the supplementation of herbs in broiler feed has increased performance. Further, Indian bay leaf powder at 1.5% level could be suggested for the best broiler performance.

HIGHLIGHTS

- Mint and Indian Bay Leaf used as herbal feed additive in poultry feeding.
- They enhance broiler performance and carcass traits, offering potential benefits in poultry nutrition.

Keywords: Broiler, Herbal feed additives, Indian bay leaf, Mint, Performance.

Poultry accounts for a major share in terms of animal protein supplement in human food. The intensification of poultry industry developed concurrently with use of antibiotics in poultry feed. Antibiotics in feed advantages in prevention of disease and lowers feed conversion ratio. To take these short term benefits poultry farms are using antibiotics indiscriminately. Therefore, antimicrobial resistance (AMR) in humans through contact with animals, consumption of meat or environmental exposure to soil and water contaminated by animal excreta has become a major health threat. In the view of AMR, the requirement for safe protein source is gradually increasing. Several other additives are available with more or less similar effect, viz. herbal plants, plant extract, prebiotic, probiotics, synbiotics, bee pollen, yeast, enzymes etc. Herbs, spices

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as well as fruits and/or their respective extracts such as essential oils and their bioactive components referred as phytogenics additives. They have properties to improve digestibility, antioxidant, antibacterial, anti-fungal, anti-inflammatory and immune-modulatory activity.

Among various herbs, the medicinal plant mint (*Mentha spicata*) and Indian bay leaf (*Cinnamomum tamala*) have several beneficial properties to be exploited in present study. Mint is an herbaceous rhizomatous perennial plant. They used as folk remedy due to its anti-inflammatory, carminative, antiemetic, diaphoretic, antispasmodic, analgesic, stimulant, emmenagogue and anti-catarrhal activities (Padmini *et al*., 2010), and mint extract possessed antibacterial, antifungal, antiviral, antioxidant and anti-hemolytic properties (Rastogi and Mehrotra, 1998). Similarly, Indian bay leaf belongs to Lauraceae (laurels) family. The leaf is sour and fairly sweet and useful in conditions *viz,* vata, pit and cough, scabies. Leaf extracts shows antioxidant, anti-ulcer, antibacterial and antifungal effect. In view of such beneficial properties of these herbs, their effect on broiler performance in term of feed intake, body weight gain, feed conversion ratio, nutrient utilization and carcass traits were studied in present investigation.

MATERIALS AND METHODS

The feeding trial was aimed to assess the effect of 0.5, 1, 1.5% level of mint powder and Indian bay leaf powder alone and in combination on performance of broiler chicks. The investigation was conducted with a total of 300 day-old broiler chicks at Poultry Farm of College of Veterinary and Animal Science, Bikaner for a period of 42 days. Chicks were equally and randomly divided into ten dietary treatment groups and each dietary group was replicated to two sub-groups to make sure uniformity in various treatment groups.

The chicks were vaccinated against Ranikhet Disease (F1 strain) on 4^{th} day and Infectious Bursal Disease on 14^{th} day. Broilers were maintained under standard managemental practices involving brooding, feeding, watering, wing banding and disease control throughout the trial period. Ad libitum access to water and feed was arranged for all the treatments groups.

The ration was formulated as per BIS (1992). The mint powder and Indian bay leaf powder at graded levels were supplemented in basal broiler starter and broiler finisher ration either alone or in combination. The T_1 i.e. control group was fed on basal diet while T_2, T_3 and T_4 treatment groups were supplemented with 0.50%, 1.0% and 1.50% of mint powder in the basal broiler starter and finisher ration, respectively. Likewise, the T_5, T_6 and T_7 group were supplemented with Indian bay leaf powder @ 0.50%, 1.0% and 1.50% in the basal broiler starter and finisher ration, respectively. T_8, T_9 and T_{10} treatment groups were supplemented with 0.25%, 0.50% & 0.75% of both in combination of mint powder and Indian bay leaf powder in the basal broiler starter and finisher ration, respectively.

The ingredient and chemical composition of diets fed during different stages of growth have been presented in Table 1 and chemical composition of mint powder and, Indian bay leaf powder have been presented in Table 2. During feeding trial feed consumption, body weight, body weight gain, FCR, performance index (PI) and protein efficiency ratio (PER) were estimated. Performance index was obtained for each treatment by dividing the average weight gained by the feed conversion ratio. Similarly, protein efficiency ratio (PER) was calculated by dividing the average weight gained by the protein consumed. At the end of six weeks, metabolizability of different dietary principles was conducted and for that six birds from each treatment (three birds from each replicate) subjected to metabolism cages for 5 days. The chicks were offered a weighed amount of experimental ration at a fixed morning hour (7:30 AM) every day during the trial period. The mixed droppings were collected at the end of every 24 hours and pooled to get the total excreta voided during the trial period. The treatment wise metabolizability (%) of dry matter, crude protein and ether extract was determined.

To study carcass traits viz., dressed weight percentage and eviscerated weight percentage, two representative birds from each replicate were sacrificed at the end. Selected birds had live weight similar to the mean live weight of the population concerned. From the sacrificed birds, giblet (heart, liver and gizzard) were separated carefully and represented in term of per cent of live body weight to observe the effect of different dietary treatments on growth and development of certain organs. Data were analyzed statistically as described by Snedecor and Cochran (2004).

Analysis of variance was used to study the differences among treatment means and they were compared by using Duncan's Multiple Range Test (DMRT) as modified by Kramer (1956).

Table 1: Ingredients and Chemical composition (%) of broiler diet on DM basis

Ingredients	Broiler Starter	Broiler Finisher
Maize	56.50	60.50
Soyabean meal	36.40	32.80
Vegetable oil	3.80	4.10
Calcite powder	2.20	1.50
Salt	0.30	0.30
DL-methionine	0.25	0.24
L-lysine	0.17	0.18
Trace mineral*	0.10	0.10
Vitamin and mineral supplement*#	0.22	0.22
Toxin binder**	0.05	0.05
Furazolidone	0.01	0.01
Chemical Composition (%)		
Dry matter	92.56	92.25
Crude protein	22.4	20.60
Ether extract	3.94	4.27
Crude fibre	3.89	4.16
Total ash	6.67	6.39
Nitrogen free extract	63.10	64.58

*Trace minerals: Each kg contains: Copper-15g, Iodine-1g, Iron-60g, Manganese- 80g, Selenium- 0.3g, Zinc- 80g; *#Vitamin and mineral supplement: Each 2 kg contains: Vit. A-50 lakh IU, Vit. B2-2 g, Vit. B6- 0.4 g, Vit. B12- 5600 mcg, Vit. E- 800 IU, Iron- 7.5g, Vit. D3- 6.25 lakh IU, Choline chloride- 10g, Copper- 2g, Iodine- 1g, Zinc- 15g, Manganese- 27.5g, Calcium- 27.25 %, phosphorus- 7.45 %, Calcium pantothenate- 4g; **Toxin Binder: Selected silicates, surfactants, organic acids and salts of organic acids.

Table 2: Chemical composition of Mint powder and Indian bay leaf powder on DM basis

Chemical Composition	Mint powder	Indian bay leaf powder
Dry Matter	97.88	98.25
Crude Protein	21.34	9.23
Ether Extract	2.45	4.78
Crude Fibre	18.54	22.29
Total Ash	12.10	8.06
Nitrogen Free Extract	45.57	55.64

RESULTS AND DISCUSSION

The body weight of broiler chicks at the start of feeding trial was similar (P>0.05) and at the end of experiment i.e. 42 days, the body weight, gain and average daily gain of broiler chicks in different treatment group were significantly higher than T_1 group i.e. control group and highest body weight, gain and average daily gain were found in T_7 group i.e. group supplemented with 1.5% level of Indian bay leaf powder (Table 3). The findings of present study was in agreement with the finding of Al-Ankari (2004) who reported significantly improved body weight gain in broilers supplemented with 25, 100 and 150 g/kg mint in basal diet as compared to control. Similarly, Abu Isha (2018) reported significantly higher body weight gain at 2% level of spearmint in broiler diet. The results of higher in body weight gain due to *tej patta* supplementation were well corroborated with the findings of Ansari (2019). The improvement in body weight of broilers fed herb might be due to increased nutrient utilization in term of dry matter and crude protein due its beneficial effect on the gut flora and digestive enzymes (Chopra *et al*., 1992). Further, feed intake was also higher in different treatment groups as compared to T_1 group. The results regarding feed intake were in accordance with findings of Al-Ankari (2004), who reported significantly highest feed intake in group supplemented with 200 g/kg of *Mentha longifolia*. However, Amasaib *et al*. (2013) and Ansari (2019) also reported non-significant effect of feed intake upon spearmint and bay leaf supplementation, respectively. The increment in feed intake illustrated in this study might be due to the flavour effect of herbs (Deyoe *et al*., 1962) and various bioactive compounds which might stimulate the digestive secretion increase the pancreatic digestive enzymes and improve the function of liver.

Performance index (PI) is based on two relative important economic traits viz., body weight and feed efficiency. The performance index was significantly highest in T_7 treatment group (1.5 % Indian bay leaf powder) which was comparable with rest of the treatment groups except T_1, T_2 and T_8 groups. Better performance index in herb supplemented group agrees with results of Hussein (2013) who recorded improvement in performance by dietary inclusion of *Curcuma longa* in broilers. Further, Ansari (2019) reported that herbal incorporation showed significantly better performance in broiler chickens. Significant improvement in supplemented groups might

Table 3: Effect on Performance of Broilers on Supplementation of Mint Powder and Indian Bay Leaf Powder

Parameters	Treatment Groups										P-value
	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	
Feed Intake	4076^{a}	4247^{b}	4225^{b}	4307^{b}	4283^{b}	4300^{b}	4323^{b}	4366^{b}	4286^{b}	4266^{b}	0.045*
Initial Body Weight	38.3	38.8	38.8	39.1	39.3	39.4	38.9	39.5	39.6	39.6	0.554
Final Body weight	2133.30^{a}	2362.80^{b}	2449.70^{de}	2447.90^{de}	2430.50^{d}	2473.70^{e}	2528.20^{f}	2405.70^{c}	2432.70^{d}	2463.50^{e}	0.00001**
Body Weight Gain	2095^{a}	2324^{b}	2411de	2409de	2391^{d}	2434^{e}	2489^{f}	2366^{c}	2393^{d}	2424^{e}	0.00001**
Average Daily Gain	49.90^{a}	55.30^{b}	57.40^{de}	57.40^{de}	56.90^{d}	58.00^{e}	59.30^{f}	56.30^{c}	57.00^{d}	57.70^{e}	0.00001**
FCR	1.95^{c}	1.83^{ab}	1.76^{ab}	1.79^{ab}	1.80^{ab}	1.77^{ab}	1.74^{a}	1.85^{b}	1.80^{ab}	1.77^{ab}	0.01**
Performance Index	1087.90^{a}	1304.60^{b}	1419.40^{bc}	1374.00^{bc}	1351.10^{bc}	1396.70^{bc}	1448.30^{c}	1312.90^{b}	1354.90^{bc}	1398.10^{bc}	0.0019**
Protein Efficiency Ratio	2.69	2.90	3.00	2.94	2.92	2.93	2.97	2.88	2.89	2.96	0.095
Dressed Weight %	76.22	75.84	77.49	75.82	78	78.44	78.86	77.1	77.13	77.74	0.762
Eviscerated Yield %	63.42	64.08	63.5	63.81	63.36	61.2	61.5	64.79	65.21	64.07	0.932
Giblet %	4.13	4.15	4.32	4.23	4.14	4.04	3.88	3.91	3.83	4.06	0.769
Heart %	0.54	0.6	0.57	0.56	0.54	0.53	0.52	0.52	0.53	0.52	0.347
Liver %	2.05	1.95	2	1.94	1.76	1.84	1.74	1.93	1.92	1.77	0.775
Gizzard %	1.74	1.67	1.67	1.75	1.84	1.74	1.73	1.77	1.68	1.7	0.774

*Mean values bearing different superscripts in a row differ significantly.

Table 4: Effect on Nutrient Utilization of Broilers on Supplementation of Mint Powder and Indian Bay Leaf Powder

Parameters	Treatment Groups										P-value
	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	
Dry Matter %	72.8^{ab}	72.9^{ab}	75.1^{bc}	71.3^{a}	74.0^{abc}	74.4^{abc}	76.6^{c}	75.6^{bc}	73.1^{ab}	76.9^{c}	0.00104*
Crude Protein %	61.9^{a}	62.6^{ab}	72.2^{c}	60.8^{a}	66.2^{abc}	66.5^{abc}	70.5^{c}	70.8^{c}	67.8^{bc}	71.7^{c}	0.000015**
Ether Extract %	77.7	83.9	82.4	79.6	83.9	81.7	81.9	80.9	81.7	82.7	0.652

*Mean values bearing different superscripts in a row differ significantly.

be due to higher body weight gain and better FCR. This could be associated with more efficient nutrient utilization from feed.

Significantly lowest cum best feed conversion ratio (FCR) was recorded in T_7 treatment group which was comparable with all the treatment group except T_8 and T_1 groups. The present observations fall in line with findings of Al-Ankari (2005) reported significantly improved FCR in broiler on supplemented of 150 g/kg mint in basal diet. Similarly, Paraskeuas *et al.* (2017) who reported significantly better FCR in group supplemented with 100 ppm level menthol and anethole phytogenic feed additive. Ansari (2019) and Qotbi (2016) reported significantly improved FCR on tejpatta powder and cinnamon supplementation. Likewise, Shirzadegan (2014) reported significantly improved FCR at 0.50 per cent level of cinnamon. Improvement in FCR might be attributed to increased appetite, stomachic, tonic activity in addition to adaptogenic, immunostimulant, anabolic property of herbs which affect certain functions in the body (Kamel, 2001). No effect was observed on protein efficiency ratio, dressed weight per cent, eviscerated yield per cent and per cent yield of giblet, heart, liver and gizzard

on supplementation of mint powder and Indian bay leaf powder alone and in combination at different levels (Table 3).

Metabolizability of dry matter was significantly higher in different treatment groups as compared to T_1 treatment group i.e. control group. Among different treatment groups highest dry matter and crude protein metabolizability was recorded in T_7 treatment group which was in line the finding of body weight gain, performance and FCR. However, non-significant effect was observed on metabolizability of ether extract (Table 4).

The present finding of nutrient metabolizability was in line with findings of Issa and Omar (2012) and Ratika (2014). Crude protein metabolizability was found to be improved significantly due to supplementation of mint powder and Indian bay leaf powder. These finding are in accordance with the finding of Samarasinghe *et al*. (2003) and Abd EL-galil and Henda (2015). The increase in the metabolizability of dry matter, crude protein and ether extract were well corroborating with the finding of feed conversion ratio. The results of better nutrient metabolizability on herbal supplementation might be due to improved digestive activity, increased digestive secretion (Brugalli, 2003), suppressing the harmful microbial population in intestinal tract (Issa and Omar, 2012), improved gut morphological characteristics (Caspary, 1992) and enhancement of intestinal endogenous enzymes such as trypsin, lipase, amylase (Platel and Srinivasan, 2000).

CONCLUSION

It may be concluded that supplementation of mint powder and Indian bay leaf powder at graded levels either alone or in combination improves performance and nutrient utilization of broiler chicks as compared to control. Further, supplementation of Indian bay leaf powder @ 1.5% (T_7) is effective in term of FCR, body weight gain and performance of broiler farming for meat production.

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