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## Effect of dietary incorporation of sahjan (*Moringa oleifera*) and Tej Patta (*Cinnamomum tamala*) leaf powder on growth performance, nutrient utilization, and carcass traits in commercial broiler chickens

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### Abstract

A feeding trial was conducted to discern the effect of dietary incorporation of *sahjan* (*Moringa oleifera*) leaf powder and *tejpatta* (*Cinnamomum tamala*) powder on growth performance, nutrient utilization, carcass traits in commercial broiler chickens. 120, (one day-old) broiler chicks were divided randomly into 4 treatment groups with 3 replicate each i.e. 10 broiler chicks per replicate. Chicks of treatment T<sub>1</sub> (control) were fed basal diet (starter and finisher diet), whereas in treatment groups T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub>, basal diet was incorporated with 0.5% *sahjan* leaf powder, 0.5% *tejpatta* powder and 0.25% *sahjan* leaf powder with 0.25% *tejpatta* powder, respectively. *Sahjan* and *tejpatta* leaf powder feeding resulted in significant ( $P \leq 0.05$ ) increased in final body weight, weight gain and performance index in broilers chicken. Therefore, it could be concluded that incorporation of *sahjan* (*Moringa oleifera*) leaf powder and *tejpatta* (*Cinnamomum tamala*) powder in the diets of commercial broiler chickens had significant positive effect on their growth performance.

**Keywords:** Sahjan and Tejpatta leaf powder, feed conversion ratio, broiler performance

### 1. Introduction

In present day poultry production, antibiotic are extensively use as feed additives. But these antibiotics has negative public health impact because of development of antimicrobial resistant strains of microorganisms, Hence there is herbal products can act an alternative feed additive in poultry production sector as they have positive impact on growth performance under intense system of rearing and more widely accepted by consumers. Poultry industry is one of the industries to meet out the daily protein requirement of human population through the meat and egg. In developing countries like India, the major problem with poultry is the scarcity and economically higher prices of conventional poultry feed.

*Moringa oleifera* known as sahjan in Hindi and drumstick in English belongs to single genus Monogeneric in the flowering. Sahjan is one of the non-conventional feedstuff which can be used for poultry feeding because of its high nutritional value. Sahjan leaves have more amount of vitamins (especially vitamin A), energy, essential amino acids, and crude protein, low amount of tannins, amylase and trypsin inhibitors (Makkar *et al.*, 1996; 1997)<sup>[12, 11]</sup>. Sahjan plant leaves have been reported to have antioxidant activity because of the higher amount of polyphenols (Moyo *et al.*, 2012; Sreelatha *et al.*, 2009)<sup>[14, 18]</sup>. Aqueous leaf extracts of sahjan leaf regulate thyroid hormone and can be used to cure hyperthyroidism and exhibit as an antioxidant effect (Tahiliani *et al.*, 2000)<sup>[19]</sup>. Sahjan leaves are a rich source of vitamins and leaf meal may be a good source of natural antioxidants for broiler meat. Sahjan could be a potential plant to improve immune response and to enhance intestinal health of broiler chicken (Yang *et al.*, 2006)<sup>[20]</sup>.

The leaves of tejpatta are used as spices and also as fodder. The essential oil from the leaves of tejpatta is also used as a flavouring agent of food. The leaf volatile oil has 81 components representing 94.1% of the total constituent present in the oil. The eugenol is the main element (66.1%) followed by spathulenol (4.8%), viridiflorene (2.4%) methyleugenol (1.9%), aromadenendrene (1.5%) with other component in minor amounts (Kapoor *et al.*, 2009)<sup>[5]</sup>. The bark has been used as a substitute for true cinnamon, *Cinnamomum zelanicum* Breyne

(Jackson, 1994)<sup>[3]</sup>. Tejpatta is commonly harvested in a dry and mild weather condition from the month of October to December and in some places, the collection is continued till the month of March (Krishnamurthy, 1996)<sup>[9]</sup>. The average production is 10-25 kg of dry leaves of a tree and the 0.2-0.4% of oil could be extracted from the leaves of tejpatta (Lamichhane *et al.*, 2009)<sup>[10]</sup>.

Presently there is very less information available about feeding *sahjan* (*Moringa oleifera*) leaf powder and *tejpatta* (*Cinnamomum tamala*) powder in broiler chicken diet. Though both of these feed additives have been fed separately in various experiments, but information about combined feeding of these feed additives and /or feed ingredients is not available. Therefore the objective of the present study was to investigate the effect of *sahjan* (*Moringa oleifera*) leaf and *tejpatta* (*Cinnamomum tamala*) on feed intake, growth performance, carcass characteristics in commercial broiler chickens.

## 2. Materials and Methods

A total of 120, day-old commercial broiler chicks were procured and randomly divided into four treatment groups with 3 replication having 10 chicks in each in a completely randomized design. First group was given basal diet, second group was given 0.5% *sahjan* leaf powder while third group was given 0.5% *tejpatta* powder and fourth group was given 0.25% *sahjan* leaf powder plus 0.25% *tejpatta* powder respectively. The feeding trial lasted for 42 days *viz.*, 0-21 days (starter phase) and 21-42 days (finisher phase). The ingredient compositions of diets are presented in Table 1.

### 2.1 Procurement of *sahjan* leaf powder and *tejpatta* powder

*Sahjan* and *tejpatta* leaves were collected from Pantnagar and adjoining areas. These leaves were shade dried to avoid nutrient loss and ground to powder by an electric feed grinder. This grinded material was dried in hot air oven at 70 °C for 48 hours and supplemented in broiler chicken diet.

### 2.2 Growth performance parameters

Daily record of feed offered to birds of different treatment groups was maintained. The birds from each replicate were weighed individually at weekly basis. The body weight gain, feed conversion ratio and performance index were calculated.

### 2.3 Analysis of feed, meat and excreta samples

The representative samples of experimental broiler starter and finisher feeds as well as excreta obtained during metabolism trial and representative meat samples from breast and thigh were collected and proximate analysis was conducted on the samples collected, using the standard principles (AOAC, 2000)<sup>[1]</sup>.

### 2.4 Carcass traits

For the carcass trait studies, two representative broiler chickens from each replicate of all treatment groups was sacrificed at the end of feeding cum growth trial for evaluation of carcass characteristics.

### 2.5 Statistical analysis

The experimental data obtained in the present study were analyzed statistically (Snedecor and Cochran, 1994)<sup>[17]</sup> by using general linear model procedure. Difference between treatments means were compared using Duncan's multiple

range test (Kramer, 1957)<sup>[8]</sup>.

## 3. Results and Discussion

### 3.1 Growth performance

Growth performance of broiler chicks fed the experimental diets is shown in table 2, 3 and 4. During the starter phase, dietary *sahjan* and *tejpatta* leaf powder incorporation in the diet of broiler chicks influenced the body weight and body weight gain, feed intake, feed conversion ratio and performance index. During the finisher phase, incorporation of *sahjan* and *tejpatta* leaf powder in the diet of broiler chicks influenced the body weight, body weight gain and performance index but did not show significant effect on feed intake and feed conversion ratio. There was no significant difference in feed intake among different treatment groups but the feed intake was higher in the treatment groups fed diet supplemented with *sahjan* and *tejpatta* leaf powder alone or with combination along with basal diet. The result showed significant ( $P \leq 0.05$ ) increased final body weight, weight gain and performance index in the group supplemented with *sahjan* and *tejpatta* leaf powder. The average body weight gain of broiler chickens during whole feeding trail was 1555.40, 1596.10, 1577.00 and 1633.60 g in treatment groups T1, T2, T3 and T4, respectively. The overall cumulative performance in broiler chicken in terms of weight gain and performance index was significantly higher in T4 group which were fed 0.25% *sahjan* leaf powder and 0.25% *tejpatta* powder.

The present findings are in agreement with that of Sanchez *et al.* (2006)<sup>[16]</sup> who reported that the incorporation of *sahjan* leaf meal improved the body weight gain and FCR. Melesse *et al.*, (2011)<sup>[13]</sup> also reported improvement in weight gain and feed conversion ratio due to *sahjan* leaf powder incorporation in diet of broiler chickens. Weight gain, feed intake and feed conversion ratio of broilers was improved due to the presence of readily available protein in *Moringa* leaf meal, which is convenient for monogastric animals, and also to the higher levels of methionine and other essential amino acids. Hassan *et al.* (2016)<sup>[2]</sup> found that the effect of different levels of *Moringa oleifera* leaves meal on body weight of broiler chicks, FCR, feed intake, weight gain were increased significantly in treatment groups of *Moringa oleifera* leaf meal (0, 0.1, 0.2 and 0.3%), after 35 days, respectively.

### 3.2 Nutrient utilization

Feeding broilers on diet supplemented with *sahjan* and *tejpatta* leaf powder had no significant affect on nutrient utilization as shown in table 5. The result are in agreement with the findings of Kim *et al.* (1976)<sup>[6]</sup> reported that anti-nutritional factors can have *in vivo* inhibition of brush border dipeptidases which interfere with the transport of nitrogen through the absorptive cells of the gut and contribute to faecal-nitrogen losses.

### 3.3 Carcass characteristics

Average dressing percentage with or without giblet, cut-up parts, organ weights and processing losses of broiler chickens of different treatment groups was not significantly differ due to supplementation of *sahjan* and *tejpatta* leaf powder in the diets as shown in table 6. These results are in agreement with Nkukwana *et al.* (2014)<sup>[15]</sup> who reported that addition of *Moringa oleifera* leaf meal (0.1-2.5%) to broiler chicken diets have no significant effects on carcass weight, dressing percentage and the relative weights of the liver, gizzard, heart

and spleen. Cinnamon powder on organ weights and dressing percentage at 35d of age, the dietary treatments had no influence ( $P>0.05$ ) on the carcass traits. The present results are in agreement with Koochaksaraie *et al.* (2011) [7] who revealed that supplementation of cinnamon powder at the dose rate of 250 to 2000 mg/kg in broiler diets did not have any influence on the carcass parameters.

### 3.4 Meat composition

Dietary supplementation of *sahjan* and *tejpatta* leaf powder significantly ( $P\leq 0.05$ ) decrease the ether extract content of

both breast and thigh muscles as shown in table 7. Significantly ( $P\leq 0.05$ ) lower ether extract content was found in T2 group which were fed 0.5% *sahjan* leaf powder and T4 group fed given 0.25% *sahjan* leaf powder and 0.25% *tejpatta* powder. This result agreed with the findings of Juniar *et al.*, (2008) [4] who indicated that dietary supplementation of *sahjan* leaf powder significantly ( $P\leq 0.05$ ) decreased of ether extract (%) in thigh muscle meat may be due to hypocholestromic property that enhance bile production and fat digestion.

**Table 1:** Ingredient composition (%) of broiler chicks (starter and finisher) basal diets (kg/100kg)

Ingredients (percentage)	Broiler starter (0 -3 weeks)	Broiler finisher (3 – 6 weeks)
Maize	53.0	56.0
Rice polish	04.0	06.0
Deoiled soyabean meal	30.0	25.0
Groundnut cake	10.0	08.0
Vegetable oil	0.725	2.325
Lysine	0.20	0.20
DL-methionine	0.30	0.30
Dicalcium phosphate	01.00	1.40
Trace mineral mixture	0.25	0.25
Common salt	0.30	0.30
Vitamin premix	0.025	0.025
Cocciostat	0.05	0.05
Hepatocare	0.10	0.10
Choline chloride	0.05	0.05
Total	100.00	100.00

**Table 2:** Average growth performance of broiler chicks from 0-21 days fed diets incorporated with *sahjan* and *tejpatta* leaf powder

Parameters	Treatments/ Groups			
	T <sub>1</sub> (Basal diet)	T <sub>2</sub> (Basal diet with <i>Sahjan</i> leaf powder (0.5%))	T <sub>3</sub> (Basal diet with <i>Tejpatta</i> powder (0.5%))	T <sub>4</sub> (Basal diet with <i>Sahjan</i> leaf powder (0.25%) + <i>Tejpatta</i> powder (0.25%))
Initial body weight (g)	40.33±0.33	40.66±0.33	40.66±0.44	40.16±0.44
Body weight at 21 <sup>st</sup> day (g) *	559.29 <sup>c</sup> ±4.85	583.49 <sup>a</sup> ±1.04	570.57 <sup>b</sup> ±2.71	593.30 <sup>a</sup> ±3.74
Weight gain (g) *	518.96 <sup>c</sup> ±4.97	542.82 <sup>a</sup> ±1.38	529.90 <sup>b</sup> ±0.50	553.13 <sup>a</sup> ±4.18
Feed intake (g)	827.80±29.86	825.07±17.94	830.47±6.90	844.89±18.70
Feed conversion ratio	1.60±0.04	1.52±0.03	1.57±0.01	1.53±0.03
Performance index *	325.81 <sup>c</sup> ±5.79	357.49 <sup>ab</sup> ±8.35	338.15 <sup>bc</sup> ±2.28	362.53 <sup>a</sup> ±9.83

a, b, c values bearing different superscripts in a row differ significantly from each other, \* $P<0.05$

**Table 3:** Average growth performance of broiler chicks from 21-42 days fed diets incorporated with *sahjan* and *tejpatta* leaf powder

Parameters	Treatments/ Groups			
	T <sub>1</sub> (Basal diet)	T <sub>2</sub> Basal diet with <i>Sahjan</i> leaf powder (0.5%)	T <sub>3</sub> (Basal diet with <i>Tejpatta</i> powder (0.5%))	T <sub>4</sub> (Basal diet with <i>Sahjan</i> leaf powder (0.25%) + <i>Tejpatta</i> powder (0.25%))
Body weight at 21 <sup>st</sup> day (g)*	559.29 <sup>c</sup> ±4.85	583.49 <sup>a</sup> ±1.04	570.57 <sup>b</sup> ±2.71	593.30 <sup>a</sup> ±3.74
Body weight at 42 <sup>nd</sup> day (g)*	1595.80 <sup>d</sup> ±3.29	1636.70 <sup>b</sup> ±1.25	1617.7 <sup>c</sup> ±1.84	1673.80 <sup>a</sup> ±1.93
Weight gain (g)*	1036.50 <sup>b</sup> ±6.85	1053.20 <sup>b</sup> ±1.62	1047.10 <sup>b</sup> ±4.44	1080.50 <sup>a</sup> ±5.66
Feed intake (g)*	1975.30 <sup>c</sup> ±3.71	1992.40 <sup>b</sup> ±1.45	1979.90 <sup>c</sup> ±1.72	2012.70 <sup>a</sup> ±2.71
Feed conversion ratio*	1.91 <sup>a</sup> ±0.011	1.90 <sup>ab</sup> ±0.002	1.89 <sup>ab</sup> ±0.009	1.86 <sup>b</sup> ±0.009
Performance index*	543.89 <sup>b</sup> ±6.79	556.77 <sup>b</sup> ±1.61	553.83 <sup>b</sup> ±5.06	580.05 <sup>a</sup> ±6.11

a, b, c, d values bearing different superscripts in a row differ significantly from each other, \* $P<0.05$

**Table 4:** Average growth performance of broiler chicks from 0-42 days fed diets incorporated with *sahjan* and *tejpatta* leaf powder

Parameters	Treatments/ Groups			
	T <sub>1</sub> (Basal diet)	T <sub>2</sub> (Basal diet with <i>Sahjan</i> leaf powder (0.5%))	T <sub>3</sub> (Basal diet with <i>Tejpatta</i> powder (0.5%))	T <sub>4</sub> (Basal diet with <i>Sahjan</i> leaf powder (0.25%) + <i>Tejpatta</i> powder (0.25%))
Initial body weight (g)	40.33±0.33	40.66±0.33	40.66±0.44	40.16±0.44
Body weight at 42 <sup>nd</sup> day (g)*	1595.80 <sup>d</sup> ±3.29	1636.70 <sup>b</sup> ±1.25	1617.7 <sup>c</sup> ±1.84	1673.80 <sup>a</sup> ±1.93
Weight gain (g)*	1555.40 <sup>d</sup> ±3.55	1596.10 <sup>b</sup> ±1.34	1577.00 <sup>c</sup> ±2.28	1633.60 <sup>a</sup> ±1.49
Feed intake (g)*	2803.10 <sup>b</sup> ±2.54	2817.50 <sup>b</sup> ±1.28	2810.40 <sup>b</sup> ±3.88	2857.60 <sup>a</sup> ±20.34
Feed conversion ratio*	1.80 <sup>a</sup> ±0.002	1.76 <sup>bc</sup> ±0.008	1.78 <sup>ab</sup> ±0.002	1.74 <sup>c</sup> ±0.012
Performance index*	863.10 <sup>d</sup> ±3.16	904.15 <sup>b</sup> ±1.18	884.94 <sup>c</sup> ±2.17	933.98 <sup>a</sup> ±6.77

a, b, c, d values bearing different superscripts in a row differ significantly from each other, \* $P<0.05$

**Table 5:** Average values of nutrient utilization (%) in broilers during finisher phase fed diets incorporated with sahjan and tejpatta leaf powder

Parameters	Treatments/ Groups			
	T <sub>1</sub> (Basal diet)	T <sub>2</sub> (Basal diet with Sahjan leaf powder (0.5%))	T <sub>3</sub> (Basal diet with Tejpatta powder (0.5%))	T <sub>4</sub> (Basal diet with Sahjan leaf powder (0.25%) +Tejpatta powder (0.25%))
Dry matter	69.77±1.63	71.07±1.92	71.24±1.05	72.02±2.09
Crude protein	76.92±1.93	77.18±5.26	78.19±0.81	79.95±2.63
Ether extract	75.84±4.96	73.62±2.52	74.80±4.98	75.01±4.60
Organic matter	71.57±1.50	72.88±1.75	73.06±0.87	74.10±1.95

**Table 6:** Average values for dressing percentage, cut-up parts, organ weights and processing losses of finisher broilers chickens (% live weight) fed diets incorporated with sahjan and tejpatta leaf powder

Parameters	Treatment/ Groups			
	T <sub>1</sub> (Basal diet)	T <sub>2</sub> (Basal diet with Sahjan leaf powder (0.5%))	T <sub>3</sub> (Basal diet with Tejpatta powder (0.5%))	T <sub>4</sub> (Basal diet with Sahjan leaf powder (0.25%) +Tejpatta powder (0.25%))
Dressing percentage without giblet (%)	63.77±0.35	63.97±0.73	63.79±1.14	63.06±1.30
Dressing percentage with giblet (%)	72.94±0.50	73.22±0.80	72.95±1.19	72.24±1.22
Neck	3.08±0.027	3.17±0.085	3.15±0.137	3.06±0.194
Wing	8.24±0.25	8.28±0.19	8.15±0.14	8.09±0.33
Back	10.07±0.16	9.92±0.22	10.10±0.26	10.11±0.30
Breast	20.08±0.84	20.02±0.60	20.07±0.25	20.18±0.99
Thigh	10.14±0.46	10.16±0.23	10.10±0.24	10.05±0.12
Heart	0.61±0.03	0.62±0.07	0.63±0.03	0.64±0.03
Liver	3.02±0.18	3.04±0.05	3.01±0.05	3.00±0.04
Blood	3.60±0.28	3.58±0.36	3.59±0.48	3.57±0.32
Abdominal fat	0.99±0.08	0.98±0.13	0.95±0.07	0.92±0.04

**Table 7:** Average values of meat composition (on DM basis, percentage) of broilers fed diets incorporated with sahjan and tejpatta leaf powder

Parameters	Treatments/ Groups			
	T <sub>1</sub> (Basal diet)	T <sub>2</sub> (Basal diet with Sahjan leaf powder (0.5%))	T <sub>3</sub> (Basal diet with Tejpatta powder (0.5%))	T <sub>4</sub> (Basal diet with Sahjan leaf powder (0.25%) +Tejpatta powder (0.25%))
<b>Breast muscle</b>				
Crude protein	81.03±1.57	81.30±3.35	81.25±1.54	82.12±0.81
Ether extract *	12.08 <sup>a</sup> ±0.15	11.66 <sup>ab</sup> ±0.21	11.50 <sup>ab</sup> ±0.28	11.16 <sup>b</sup> ±0.27
Total Ash	5.41±0.65	5.33±0.71	5.25±0.97	5.25±0.81
<b>Thigh muscle</b>				
Crude protein	74.36±4.24	74.59±2.65	73.96±2.46	74.54±3.81
Ether extract *	20.08 <sup>a</sup> ±0.37	19.33 <sup>ab</sup> ±0.24	19.33 <sup>ab</sup> ±0.15	19.08 <sup>b</sup> ±0.15
Total Ash	4.25±0.42	4.33±0.70	4.76±1.10	4.58±1.03

<sup>a, b</sup> values bearing different superscripts in a row differ significantly from each other, \**P*<0.05

#### 4. Conclusion

It could be concluded that *sahjan* and *tejpatta* leaf powder alone or with combination supplementation in the basal diet has beneficial effects in the broiler as it increases growth rate of commercial broiler chickens.

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