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Effect of Dietary Supplementation of Tejpatta (*Cinnamomum tamala*) Leaf Powder as Feed Additive on Carcass traits and Gut morphology of Broilers

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ABSTRACT: Background: Tejpatta leaves are commonly used for culinary purpose. Due to antioxidant and antibacterial properties, it can also be used as phytobiotic feed additive in poultry nutrition. In relation to the aforementioned qualities, this trial was conducted to evaluate the effect of dietary supplementation of Tejpatta leaf powder on carcass traits and gut morphology of broilers for strengthening poultry production.

Methods: 225 day-old chicks were arbitrarily assigned into five dietary treatment groups (T_1–T_5) using CRD, each consisting of 45 chicks with nearly equal average body weights. Each group of 45 chicks was further subdivided into three replicates (R_1, R_2, R_3) having 15 chicks per replicate. The T_1 group fed basal diet only, while T_2, T_3, T_4 and T_5 groups were fed Tejpatta leaf powder @ 0.25%, 0.75%, 1.25% and 1.75%, respectively, along with basal diet.

Result: Non-significant (P<0.01) effect on carcass characteristics was found in broiler chickens due to dietary supplementation of Tejpatta leaf powder. Although, numerically highest dressing percentage, eviscerated percentage and giblet weight percentage was observed in T_4 group. A statistically significant (P<0.01) effect on villus height, width and crypt depth was observed in birds of T_4 group. Hence, it was summarized that supplementing broiler diet with Tejpatta leaf powder @ 1.25% could be advantageous for improving broiler chick's gut morphology parameters while having no unfavorable effects on other traits of broilers.

Keywords: Broiler, Carcass traits, Gut morphology, Tejpatta leaf powder.

INTRODUCTION

Global increase in human population raises a major concern of making food availability for every person. Demand of animal based products and by-products also increasing proportionately with rise in human populace. While agricultural crop production has increased at the rate of 1.5 to 2% per year, egg and broiler production has increased at the rate of 8 to 10% per year (APEDA, 2020-21) indicating it as major sector growing swiftly. Technological advancements have transformed the role and structure of the poultry industry in India (Vetrivel and Chandrakumarmangalam 2013). Poultry farming is advantageous in terms of rapid growth; high feed conversion efficiency, low capital input, less space requirement, higher returns in a short period of time, and ease of maintenance. Poultry farming is more sustainable and economical because of its delicious taste, relatively low cost, easy access, and acceptance at all levels of society with diverse backgrounds (Wahyono and Utami 2018). To express elite genetic potential of modern day poultry breeds, nutritional practices must be in synchronization so that maximum output, possible in shortest time can be achieved.

To bridge the gap between demand and supply, intensive rearing practices were adopted giving hike to vulnerability to diseases and consequently antibiotic use also elevated to prevent ailments. Stressful environmental conditions along with high stocking density adversely affects the immune system of birds, making them more liable to pathogens, decreasing vaccine responses and consequently results in increased

carcass discarding rates. As a result, there is an elevated health challenge, accompanied by increased consumption of antibiotic growth promoters and coccidiostats in order to enhance the growth potential and subdue pathogen multiplication in intestine of birds. As a precautionary measure, the European Union proscribed the use of antibiotics as growth promoters since 1 January 2006 (Dibner and Richards 2005; Castanon, 2007). Worldwide awareness regarding harmful effects of antibiotic residue and anti-microbial resistance, shifted consumer demand to wholesome food. Herbal formulation is the primary focus of research because it can improve the efficiency of poultry birds in utilizing feed and meet consumer demand for antibiotic residue free poultry meat.

Phytogenic feed additives (PFAs), also referred as phytobiotics or botanicals, are natural bioactive compounds that are derived from plants and incorporated into animal feed to enhance productivity (Windisch *et al*., 2008). Phytogenic feed additives increases productivity of poultry by improving flavor and palatability of feed. In addition to these beneficial effects, PFAs also enhances the physical appearance, nutrient composition, texture and shelf life of broiler meat. Moreover, their easy accessibility, low cost, antimicrobial, immune-modulatory, antiviral properties make them superior in use in comparison to other feed additives.

Tejpatta (*Cinnamomum tamala*) also known as Indian Bay Leaf, is a plant of Lauraceae family and commensurate of cinnamon. Its hypoglycemic, anti-diabetic, anti-bacterial, anti-oxidant and anti-microbial properties (Pravin *et al*., 2013) are attributed to various chemical compounds like alpha-pinene, camphene, myrcene, limonene, eugenol, p-cymene, methyl eugenol, eugenol acetate and methyl ether of eugenol (Smith *et al*., 2002; Saino *et al*., 2003). Particulary antioxidant nature is due to the presence of flavonoid compounds like quercetin, laempferol and quercetrin. Being as a hydrogen donor, cinnamon essential oil protects the intestinal villi from oxidative damage by stimulating the activity of catalase and superoxide enzymes (Windisch *et al*., 2008). To explore aforesaid properties, a feeding experiment was conducted to assess the potential effect of Tejpatta as phytobiotic feed additive in broiler feed.

MATERIALS AND METHODS

Experimental Birds and Design. The trial was carried out on two hundred and twenty five day-old (225), unsexed, seemingly healthy broiler chicks (VENCOBB-400 strain) of same hatch procured from Kewal Ramani Hatchery Pvt. Ltd. Ajmer, in year 2022 for six weeks, at Poultry Unit in Livestock Farm Complex of College of Veterinary and Animal Science, Navania, Vallabhnagar, Udaipur (Rajasthan). Procured chicks were discretely weighed and randomly categorized using completely randomized block design into five dietary treatment groups (T_1-T_5) with 45 chicks each. Further groups of 45 chicks were partitioned into three replicates (R_1, R_2, R_3) having 15 chicks per replicate. The ISO verified feed in the form of broiler starter and broiler finisher was obtained from feed distributer "Udaipur Kukkut Utpadak Sahkari Samiti Ltd.", Udaipur (Rajasthan) in needed quantity. Tejpatta leaf powder was purchased in moisture free form and pulverized to pass through 1mm sieve in Department of Animal Nutrition and stored in air tight plastic bags in order to use in trial. The proximate analysis of broiler starter, broiler finisher and Tejpatta leaf powder (*Cinnamomum tamala*) are presented in Table 1.

The treatment groups were as follows: T_1 group fed basal diet (control), T_2, T_3, T_4 and T_5 group fed Tejpatta leaf powder @ 0.25%, 0.75%, 1.25% and 1.75%, respectively, along with basal diet. Feed and clean water supplied *ad libitum.*

Table 1: Proximate Composition of Broiler Starter, Finisher Ration and Tejpatta Leaf Powder.

Proximate Principle	Starter	Finisher	Tejpatta Leaf Powder (*Cinnamomum tamala*)
1. Dry Matter (%)	91.18	92.35	94.30
2. Crude Protein (%)	22.16	20.36	09.16
3. Ether Extract (%)	04.57	05.17	04.37
4. Crude Fibre (%)	04.52	04.80	22.46
5. Total Ash (%)	08.57	08.23	07.69
6. Nitrogen Free Extract (%)	51.36	53.79	50.62

Carcass Parameters: At the 42nd day of the trial, two chicks per replication and thus a total of six chicks per treatment were haphazardly chosen for evaluating the carcass characteristics. The selected chicks were weighed separately and were fasted for 12 hours to clear the contents of the intestines before slaughter. The broilers were sacrificed by severing the jugular vein and the carotid artery on one side of the neck and allowing it to bleed completely. The chicks were defeated manually and the carcass was eviscerated to obtain different carcass parameters. All measurements were calculated as a percentage of live body weight.

Gut Morphology: The jejunum was removed from 6 chicks per treatment from slaughtered birds and a morphological examination was done. The jejunum was defined as the portion of intestine extending from the bile duct entrance to Meckel's diverticulum. Samples of jejunum (3-cm segments) were obtained at its midpoint and were preserved in 10% Neutral Buffered Formalin for fixation. The formalin fixed tissues were washed overnight in running tap water and processed for paraffin embedding technique (Lillie, 1954). After washing tissues, they were dehydrated in alcohol and then followed by acetone. After dehydration, clearing was done with xylene for 30 minutes and embedded in

paraffin wax for 45 minutes (M.P. 60-62°C). The paraffin blocks were prepared and tissue sections of 4-5 µm were cut by the help of semi-automatic microtome machine (Yorco) and then slides were kept in hot air oven for 30 minutes and after that staining were done with haemtoxyline and eosin. The morphometric variables measured included villus height, crypt depth, and villus width. The sections were analyzed under the light microscope and height of the villus was measured from the top of the villus to the villus crypt junction (top of the lamina propria) of each villus. The villus width was measured as the distance from the outside of epithelial cell along a line passing through the vertical midpoint of the villus. Crypt depth was measured as the distance from the junction to the basement membrane of the epithelial cells at the bottom of each crypt.

Statistical Analyses. The data obtained were analyzed by implementing ANOVA as per Snedecor and Cochran (1994). Mean difference was tested by Duncan's new multiple range test (DNMRT) as modified by Kramer (1957), in results having significant treatment effects. The level of statistical significance was kept at P<0.01.

RESULTS AND DISCUSSION

Carcass Traits. The effect of adding Tejpatta leaf powder in broiler chicks on carcass traits are presented in Table 2. Non-significant effect was observed on carcass traits of broiler due to dietary supplementation of Tejpatta leaf powder. However, numerically highest dressing percentage, eviscerated percentage and giblet weight percentage was observed in T_4 group.

Table 2: Effect of Tejpatta leaf powder on different carcass traits of broiler chicks.

Treatment groups	Parameters					
	Dressing (%)	Eviscerated (%)	Heart(%)	Liver (%)	Gizzard (%)	Giblet (%)
T_1	72.14	62.35	0.46	1.66	1.45	3.57
T_2	72.51	63.68	0.41	1.72	1.38	3.52
T_3	72.98	62.96	0.45	1.71	1.48	3.63
T_4	73.29	64.12	0.42	1.81	1.47	3.69
T_5	72.18	62.46	0.45	1.66	1.43	3.54
SEM	**0.42**	**0.51**	**0.02**	**0.05**	**0.04**	**0.06**

The current findings on dressing percentage, eviscerated weight percentage, giblet and organ weight are in accordance with the findings of Gurjar (2021) who also found non-significant (P>0.05) due to dietary supplementation of Tejpatta leaf powder as feed additive in broiler diet. Ansari *et al*. (2020) also recorded non-significant (P>0.05) effect on dressing percentage, heart and liver weight of broilers as compared to control group supplemented with Tejpatta leaf powder in basal ration. Similarly, Koochaksaraie *et al*. (2011); Sampath and Atapattu (2013); Singh *et al.* (2014) found that feeding cinnamon powder to broilers had no influence on carcass yield (P>0.05). In similar manner, Gomathi *et al*. (2018); Chowlu *et al.* (2019) discovered a non-significant effect of cinnamon oil addition in broiler diets on heart, liver, gizzard, and giblet weight. However, the current findings differed with those of Safa Eltazi (2014), who found significant effect (P<0.05) in carcass features among different treatment groups of cinnamon powder fed broiler chicks.

Gut morphology. Improved intestinal health in broiler birds is necessary for achieving the desired growth rates and feed utilization. The presence of a toxic intestinal bacteria load causes toxin production, which reduces villus height and crypt depth, resulting in a lower efficiency of digested feed utilization. However, antimicrobial drugs can be used to overcome this, but their use on practical grounds challenges food security.

The effect of adding Tejpatta leaf powder in diet of broiler chicks on gut morphology are presented in Table 3. Data analysis demonstrated a statistically significant (P<0.01) effect on villus height, width and crypt depth.

The current findings are consistent with those of Chowdhury *et al*. (2018) found a significant (P<0.05) influence on jejunum villus height when compared to the control group. Solanki *et al.* (2022) observed significant (P<0.05) increase on jejunum villus height and width in a group fed with cinnamon oil as compared to control group. Garcia *et al.* (2007), on the other hand, found no significant (P>0.05) effect on jejunum villus height and crypt depth. In the chicken industry, good intestinal health is essential for meeting target growth rates and feed efficiency (Montagne *et al*., 2003).

Significant effect on jejunal villus height, width and crypt depth might be due to the effect of antimicrobial properties of Tejpatta leaf powder. Antimicrobial drugs are known to reduce the intestinal microbial load, which reduces the presence of toxins at this level, which is related with changes in intestinal architecture, such as shorter villi and deeper crypt depth (Xu *et al.,* 2003). By boosting the activity of the enzymes catalase and superoxide, antioxidants present in cinnamon shield the intestinal villi from oxidative damage, improving the broiler chicks' intestine health (Windisch *et al*., 2008). Improved intestine epithelium morphology and better health aids in optimum nutrient utilization and supports growth of broilers which has overall fruitful effects on economy of broiler rearing.

Table 3: Effect of Tejpatta leaf powder on gut morphology of broiler chicks.

Gut morphology	T_1	T_2	T_3	T_4	T_5	SEM
Villus Height (µm)	1216.93[a]	1293.93[b]	1368.97[c]	1504.20[e]	1474.80[d]	**8.05**
Villus Width (µm)	107.06[a]	112.15[ab]	135.74[bc]	150.19[c]	147.61[c]	**9.32**
Crypt Depth (µm)	269.75[c]	227.39[b]	247.09[bc]	197.27[a]	254.31[bc]	**9.13**

a, b, c, d, e – means superscripted with different letters within a row differ significantly from each other

CONCLUSIONS

Based on the aforementioned results, addition of 1.25% Tejpatta leaf powder as feed additive in the diet of broilers found to be advantageous and could be beneficial for improving gut morphology and thus enhancing overall growth performance of broilers. Nevertheless, the results of conducted trial are explicit and encouraging but further studies are warranted with more number of birds in order to ascertain the amount of Tejpatta leaf powder to be used as feed additive in broilers.

FUTURE SCOPE

With increasing awareness regarding adverse effects of antibiotics as feed additives, phytobiotics plays an important role as alternative. Supplementation of poultry diet with plant derived chemicals or products found to be fruitful with no residual effects in meat as like that with antibiotics. Using phytobiotics as feed additives at commercial level will potentiate production performance of broiler birds. Hence further investigations are recommended for optimizing poultry performance by use of Tejpatta leaf powder.

Conflict of interest. None.

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