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Study the effect of dietary supplementation of garlic (*Allium sativum*) tulsi (*Ocimum sanctum*) leaf powder on growth performance of broilers

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Abstract

An experiment was conducted to assess the effect of different levels of dietary garlic (*Allium sativum*) and tulsi (*Ocimum sanctum*) leaf powder supplementation on growth performance of broilers. This experiment was conducted in 210 broilers from day-old to six weeks of age. Experimental broiler chicks (Vencobb-400) were randomly distributed into seven treatments; each treatment had three replicates with ten chicks in each replicate. The control group T₁ was fed a basal diet formulated as per BIS (2007) while in treatment groups T₂ and T₃ basal diet with garlic powder supplementation @ 0.5% and 1% T₄ and T₅ basal diet with supplementation of tulsi leaf powder @ 0.5% and 1%; T₆ and T₇ were fed basal diets with combinations of garlic powder and tulsi leaf powder supplementation @ 0.5% and 1% of each, respectively. The body weight gain was ($P < 0.05$) higher in broilers fed diet supplemented with combination of garlic powder and tulsi leaf powder as compared to other treatment groups. Feed conversion ratio improved ($P < 0.05$) in supplemented groups with combinations of garlic powder and tulsi leaf powder at 0.5% and 1% of each as compared to other groups. The garlic and tulsi leaf powder and their combination at 0.5% and 1% levels did not influence the carcass characteristics of broilers. It was concluded that supplementation of garlic and Tulasi leaf powder combination at 0.5% level in broiler diets showed better growth rate and feed conversion ratio compared to other treatment groups.

Keywords: Broilers, garlic, tulasi, bodyweight, feed conversion ratio, livability

Introduction

Growth and development of the commercial broiler farming in the country during the last three decades has been spectacular. The prophylactic use of antibiotics as growth promoters in broiler feed in commercial farming possible, improved efficiency of feed utilization and controlled the diseases in these birds. There is a huge outcry both from the consumer and health sector to ban antibiotic growth promoter (AGP) use in poultry feeds due to developing antibiotic resistance and residues in meat. Phytogetic feed additives are used as an alternative to antibiotic growth promoter in poultry nutrition to improve feed efficiency and disease resistance. Phytogetic feed additives are plant-based feed additives or botanicals and these are derived from herbs, spices, plants and their extracts, like essential oils. Natural herbs and plants have been widely used as an alternative to antibiotic growth promoters. Herbs are natural, non-toxic and residue free. They have multiple beneficial effects on poultry including appetite stimulator, enhance digestive secretion, immune stimulant, bactericidal, antiviral, antioxidants Among the herbs, Garlic (*Allium sativum*) and Tulsi (*Ocimum sanctum*) has been widely used herbs in poultry feed additives.

Garlic (*Allium sativum*) contains at least 33 sulfur compounds, several enzymes, 17 amino acids and minerals such as selenium. The major active ingredients in garlic are allicin, ajoene, dialkyl polysulfides, s-allylcysteine etc which may be responsible for the various properties of garlic. Garlic possesses antibacterial, antifungal, antiparasitic, antiviral (Ankri and Mirelman, 1999) [2] and antioxidant (Prasad *et al.*, 2009) [9] properties. Due to its antimicrobial property, garlic was considered to be one of the alternatives to antibiotics as growth promoters in poultry industry. As garlic contains a sulfur volatile active component that has antibacterial, anti-inflammatory and antioxidant biological properties (Wilson and Demming-Adams, 2007) [14], it has been explored as a potential alternative to antibiotics in poultry production. Garlic had been used worldwide to fight bacterial infections as it exhibited a broad antibiotic spectrum against both Gram positive and Gram negative bacteria.

Tulsi (*Ocimum sanctum*) is considered to be the “Queen of herbs” due to its greater medicinal values. Tulsi, known for its bactericidal, immuno-modulatory, narcotic, anti-inflammatory,

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anti-pyretic, anti-asthmatic, antidiabetic, anti-hypertensive and pain reliver activities. Chaudhary *et al.*, (2010)^[3] reported the main constituents responsible for these properties are eugenol, ascorbic acid, b-carotene, b-sitosterol, palmitic acid and tannins.

Material and Methods

This experiment was conducted in 210 commercial broilers chicks from day-old to six weeks of age. Experimental broiler chicks (Vencobb-400) were randomly distributed into seven treatments; each treatment had three replicates with ten chicks in each replicate. The control group T₁ was fed a basal diet formulated to meet the requirements of the broilers as per the standards recommended by the Bureau of Indian Standards (BIS, 2007). The proximate composition of the basal diet for starter and finisher phase was analyzed by Association of Official Analytical Chemists (AOAC) and is presented in Table 1. The treatment groups T₂ and T₃ were supplemented with 0.5% and 1% garlic powder in the experimental broiler starter and finisher ration, respectively; Likewise, T₄ and T₅ treatment groups were supplemented with 0.5% and 1% tulsi leaf powder in the experimental broiler starter and finisher ration, respectively; T₆ and T₇ treatment groups were supplemented with 0.5% and 1% of both garlic and tulsi leaf powder combination, respectively. Garlic and tulsi leaf powder used in the experiment were purchased from the local market. The proximate composition of garlic and tulsi leaf powder were analysed by AOAC method and their values are presented in Table 2.

The commercial broiler chicks were reared in deep litter system under standard managemental practices throughout the experimental period. All the birds were reared in uniform management conditions. The experiment was approved by the Institutional Animal Ethical Committee. Experimental rations were fed to the respective treatment groups from day-old to six weeks. The experiment was conducted according to the completely randomized design. Individual bird body weight and total feed consumption in each replicate group were recorded at weekly intervals in the morning before feeding and watering till termination of the experiment i.e. upto at 6 weeks of age Based on these data, weekly body weight gain and feed efficiency were calculated. The mortality was recorded and livability percentage was worked out. Statistical analysis was done on completely randomized block design as per Snedecor and Cochran, (1994)^[11].

Results and Discussion

The effects of dietary garlic and tulsi leaf powder at the level of 0.5% and 1% supplementation in broilers on body weight

gain, feed consumption, feed conversion ratio and livability percentage are presented in Table.3

The body weight was higher in herbal supplemented groups than the control group indicating positive effect of garlic and tulsi leaf powder in broilers. The significant ($P<0.05$) highest mean body weight gain was observed in combination of garlic powder and tulsi leaf powder @ 0.5% each and 1.0% each supplemented groups as compared to rest of the treatment groups. Similar finding are in agreement with Singh *et al.* (2015) by garlic supplementation and while, Lanjewar *et al.* (2008)^[6], Swathi *et al.* (2012)^[12] and Hasan *et al.* (2016)^[5] with tulsi leaf powder supplementation. On the other hand, a contradictory report of no significant effect on body weight was observed by Fadlalla *et al.*, (2010)^[4].

The improvement in body weight gain might be due to the presence of antimicrobial, antioxidant properties in garlic and anti-stress factors in tulsi leaf powder supplementation. Garlic significantly enhanced villus and goblet cell numbers in the duodenum, jejunum and ileum of birds. As a result of these intestinal morphological changes, the entire absorptive process in the birds is better activated. In this way nutrient absorption is enhanced with the resultant growth promoting effect.

Feed consumption of treatment groups did not show any significant difference. The average feed consumption by broilers during the whole experimental period showed only numerical difference. The above results are in agreement with the findings of Toghiani *et al.* (2011)^[13] they reported that supplementation of garlic powder have no significant effect on feed intake of broilers. Similar non-significant effects of tulsi leaf powder supplementation on feed intake in broilers were also reported by Kumar *et al.* (2013)^[7], Singh *et al.* (2015) Hasan *et al.* (2016)^[5]

In present experiment feed conversion ratio (FCR) significantly ($P<0.05$) improved in T7 group as compared to other treatment groups. This study indicated that, the birds fed rations supplemented with garlic and tulsi leaf powder utilized their feed more efficiently than those fed ration without addition. These findings are in agreement with Fadlalla *et al.* (2010)^[4] and Swathi *et al.* (2012)^[12]

Conclusion

On the basis of the results of the present study, it can be concluded that supplementation of garlic and leaf powder @ 1% level improves the performance of broilers. Thus, garlic and tulsi leaf powder supplementation in the broiler rations may be useful for the safe, economical and efficient production of broiler and this formulation could be used as an alternative to antibiotic growth promoters in broilers.

Table 1: Ingredient (%) and chemical composition (% DM basis) of starter and finisher feed

Feed ingredients (per cent)	Starter feed (0-3 weeks)	Finisher feed (4-6 weeks)
Maize	53	58
Deoiled rice bran	5	4
Soyabean meal	39	35
Mineral Mixture ¹	3	3
Feed Additives (g/100kg)		
Vitamin Mixture ² AB ₂ D ₃ k (gm)	20	20
Aminoacids	100	100
Coccidiostat	50	50
Lysine	50	50
DL- methionine-80 g	80	80
Chemical Composition		
Metabolizable energy (Kcal/kg)	3020	3245
Dry matter %	91.50	90.20

Crude protein %	22.25	20.60
Crude fibre %	3.65	3.94
Crude fat %	7.59	7.21
Total ash %	6.15	5.98

¹ Mineral mixture supplied per kg of feed: Calcium 6.4g, Phosphorus 1-2 g, Manganese- 55mg, Iodine 2mg, Zinc 52 mg, Copper 2mg and Iron 20mg

² one gram of Vitamin AB2D3K supplement contain vitamin A 82500 IU; B2 50mg; D3 12000 IU; K 10mg

Table 2: Proximate composition of Garlic (*Allium sativum*) and Tulsi (*Ocimum sanctum*)

	Garlic (<i>Allium sativum</i>)	Tulsi (<i>Ocimum sanctum</i>)
Dry matter %	90.40	89.70
Crude protein %	17.45	7.65
Crude fibre %	3.46	16.72
Crude fat %	2.85	6.25
Total ash %	5.64	4.82

Table 3: Effect of dietary supplementation of garlic and tulsi on productive performance of broilers

Treatment groups	Body weight gain (g)	Feed Consumption (g)	Feed Conversion ratio	Livability %
T ₁ -Basal diet (Control)	2047±12.21 ^a	3486±23.25	1.70±8.24 ^a	100
T ₂ -Basal diet + 0.5% Garlic	2159±17.32 ^b	3561±19.29	1.65±3.52 ^b	100
T ₃ -Basal diet + 1% Garlic	2192±21.49 ^b	3616±18.43	1.63±4.22 ^{bc}	100
T ₄ -Basal diet + 0.5% Tulsi	2115±19.52 ^{ab}	3554±26.56	1.68±7.35 ^{ab}	100
T ₅ -Basal diet + 1% Tulsi	2145±15.56 ^{ab}	3625±21.21	1.69±9.42 ^{ab}	100
T ₆ -Basal diet + Combination 0.5% Garlic and 0.5% Tulsi	2245±10.31 ^c	3640±18.47	1.62±4.21 ^c	100
T ₇ -Basal diet + Combination 1% Garlic and 1% Tulsi	2276±12.24 ^c	3642±16.32	1.60±3.27 ^c	100

The value given in each cell is the mean of thirty observations

Means in the same row with no common superscript differ significantly ($P < 0.05$)

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