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Effect of Dietary Supplementation of Amla Fruit (*Emblica officinalis*) Powder and Multienzyme on Growth Performance and Nutrient Utilization of Broiler Chicken

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ABSTRACT

The present study was conducted on broiler chickens to observe the effect of dietary supplementation of amla fruit powder (*Emblica officinalis*) and multienzyme on the growth performance, carcass characteristics, digestibility of nutrients and nitrogen balance. The feeding trial was conducted under standard feeding and managemental conditions with broiler starter (1-21days) and finisher (22-35 days) ration on one hundred and sixty; day old Ven cobb broiler chicks which were randomly divided into 4 treatment groups (T1 to T4) with four replicates of 10 chicks each. The treatment groups consisted of control group (T1) fed only with non-supplemented basal diet, group, T2 was supplemented with 0.75% amla fruit (*Emblica officinalis*) powder, group T3 with 0.05% multienzyme and group T4 with 0.75% amla fruit (*Emblica officinalis*) powder and 0.05% multienzyme in basal feed. The supplementation of amla fruit powder (*Emblica officinalis*) and multienzyme alone and in combination showed highly significant ($P<0.01$) effect on body weight gain, feed conversion ratio, performance index, dry matter digestibility, ether extract digestibility and nitrogen balance. Significant effect ($P<0.05$) was found on protein efficiency ratio and crude protein digestibility. Therefore, based on results obtained, the present study revealed that the inclusion of amla fruit powder (*Emblica officinalis*) @ 0.75% and multienzyme @ 0.05% enhanced the overall performance of broilers.

KEY WORDS: Amla, Broiler, Growth, Multienzyme, Performance

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INTRODUCTION

Poultry sector has emerged out as an organized, scientific, most active, profitable and one of the fastest growing sector of livestock economy. As per the 2020 report, the poultry industry has become an important economic activity and contributing about Rs. 1.3 lakh crores to the national GDP (Singh, 2020). India shares 3.17% of total poultry in the world and ranks 5th in the poultry population (DADF, 2019). Antibiotics are used in broiler's ration to improve the productivity, but it negatively affects the animal and human health (Noman et al., 2015). Therefore, now-a-days, the emphasis is being directed towards the search of herbal formulations which could be effective for amelioration of stress and leads to increase in poultry production. The use of feed additives have shown promising effects regarding weight gain, feed efficiency, lowered mortality and increased livability in poultry (Ansari et al., 2008).

Amla or Indian gooseberry (*Emblica officinalis*) is a medium-sized deciduous tree and belongs to *Euphorbiaceae* family and widely available in most of the tropical and sub-tropical countries. In poultry *Emblica officinalis* has been widely used as growth promoter, immunomodulator and antioxidant (Priya et al., 2010 and Elizabeth et al., 2011). The active ingredient "Phyllemblin" has significant pharmacological action. The fruit is rich in quercetin, phyllemblic compounds, gallic acid, tannins, flavonoids, pectin, vitamin C and various polyphenolic compounds. The antioxidant action of amla is due to vitamin C, tannins and flavonoids (Kaur et al., 2002). The presence of saponins, phenols and tannins in amla fruit have potent antimicrobial activity against

both Gram positive and Gram negative bacteria (Saradha et al., 2011). Amla fruit powder also possess adaptogenic, antistress, immunogenic and various other properties resulting in better performance of broilers (Wadhwa et al., 2007). It also exhibits antibacterial (Verghese et al., 2013), antifungal (Hossain et al., 2012) and anti-inflammatory properties (Jeevangi et al., 2013).

Poultry does not produce enzymes like cellulase, xylanase, phytase etc., required to digest non-starch polysaccharides (NSPs) and phytase (Slominski, 2011). Hence supplementing poultry feed with enzymes enhances feed utilization and can eliminate the negative effect of non-starch polysaccharides (NSPs) on broiler performance. The dietary use of multienzymes also reduces anti-nutritional effects of NSPs (Attia et al., 2008). Addition of enzymes in poultry diet also brings down the gut viscosity, increases effectiveness of endogenous host enzymes, reduces the incidence of sticky excreta, increases the availability of phosphorus and energy and enhances the digestibility of nutrient (Abdel et al., 2017). Therefore present study was conducted on broiler chickens to observe the effect of dietary supplementation of Amla fruit (*Emblica officinalis*) powder and multienzyme on the growth performance, digestibility of nutrients and nitrogen balance in broiler chicken.

MATERIALS AND METHODS

Birds and diet

160 day old, unsexed apparently healthy Ven Cobb broiler chicks were procured from a commercial supplier. Broiler chicks were equally and randomly divided into four dietary treatments groups (T1-T4) of 40 chicks each having almost similar average body weight. Each dietary group was further subdivided into four replicates (R1-R4) having 10 chicks in each replicate and reared up to 5 weeks of age. Similar managemental practices like vaccination, feeding, watering, lighting etc. were followed in all the test groups throughout the experiment. They were supplied with fresh drinking water daily ad lib. Dry sawdust was used as bedding material. The ISO certified basal feed in the form of broiler starter (0-3 weeks) and broiler finisher (3-5 weeks) was procured as per the BIS (2007) from commercial supplier. Good quality amla fruit powder was procured from the local market. The commercially available multienzyme formulation was procured from "Meteoric biopharmaceuticals Pvt. Ltd." Ahmedabad, Gujrat. The proximate analysis of broiler starter, broiler finisher and amla fruit powder were carried out according to the standard method of analysis (AOAC, 2005). The nutrient composition of starter, finisher feed and amla fruit powder is given in Table 1. Four different treatment diets were prepared for the feeding of broilers under different dietary groups. The treatment groups consisted of control group (T1) fed only with non-supplemented basal diet, group, T2 was supplemented with 0.75% amla fruit (*Emblica officinalis*) powder, group T3 with 0.05% multienzyme and group T4 with 0.75% amla fruit (*Emblica officinalis*) powder and 0.05% multienzyme in basal feed.

Table 1. Proximate composition of amla fruit (*Emblica officinalis*) powder, broiler starter and finisher ration on DM basis

Proximate principles (per cent)	Broiler starter	Broiler finisher	Amla fruit (*Emblica officinalis*) powder
Dry Matter	90.4	89.9	88.4
Crude Protein	22.4	20.2	5.05
Ether Extract	3.28	3.90	1.98
Crude Fibre	1.45	3.28	14.62
Total Ash	5.54	6.05	6.08
Nitrogen Free Extract	67.2	66.5	72.2

Growth and digestion trial

A five weeks feeding trial was conducted commenced from 29 July to 2 September, 2022. Each diet was offered ad libitum to the respective four replicated groups of chicks. The data on feed consumption and body weight gain was recorded weekly. Feed conversion ratio (feed:gain), performance index (gain: FCR) and protein efficiency ratio (protein intake: gain) were calculated. The mortality, if any, was recorded as and when it occurred, weighed and sent for post mortem examination.

A metabolic trial of five days was conducted after the end of feeding trial to assess the digestibility of various nutrients and balance study of nitrogen. Four birds (one bird per replicate) under each treatment were randomly selected for metabolic trial. During the five days metabolic period, the group wise daily feed intake and quantum of excreta voided were recorded at fixed morning hours (9:00 A.M.) every day. Samples of feed offered under different treatments and excreta voided were analysed for proximate principles as per AOAC (2005). The total nitrogen content of feed and excreta was determined through Kjeldahl's method using Kel plus Automatic Nitrogen Analyzer equipment.

Statistical analysis

The experimental data were subjected to statistical analysis (SPSS Ver. 24.0) using one way analysis of variance as described by Snedecor and Cochran (2004) to test for significant variation between treatment groups. Probabilities values of less than 0.05 ($P<0.05$) and 0.01 ($P<0.01$) were considered significant. Comparison of mean values was carried out by Duncan's Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

Growth performance

The statistical analysis of data revealed no significant difference of supplementation of amla fruit powder and multienzyme on cumulative feed consumption in broilers. The results are in accordance with Sandeep (2020) who reported that feed intake was not affected on dietary supplementation of amla fruit powder at the level of 0.5, 1.0 and 2.0 per cent. Patel et al. (2016) also reported nonsignificant differences in the amount of feed intake on supplementation of amla powder inclusion of 0.4 and 0.8 per cent. Regarding addition of multienzyme, the results of the study are similar with finding of Khan et al. (2006), Zakaria et al. (2010) and Effiong et al. (2019) who reported that feed intake did not differ significantly on supplementation of 0.05 per cent multienzymes in diets of broilers.

A highly significant ($P<0.01$) effect on overall body weight gain by inclusion of amla powder and multienzyme was observed and highest cumulative body weight gain was recorded in T2 group and lowest body weight gain was recorded in T1 group. The statistical analysis also revealed that body weight gain in T2 and T3 groups was comparable with T4 group. The results of present study are in accordance with Naik et al. (2020) who fed chicks with amla at the level of 0.5 per cent and Dalal et al. (2018) who reported that dietary supplementation of amla powder at the level of 0.75 per cent has significant effect on body weight gain. Regarding addition of multienzyme, the findings are in agreement with that of Khan et al. (2006), Pourreza et al. (2007) and Attia et al. (2020) who reported that supplementation of enzyme improved body weight gain significantly ($P<0.05$) in broiler chicks.

Cumulative feed conversion ratio was found to be highly significant ($P<0.01$) on supplementation of amla fruit powder and multienzyme. The results are supported by Begum et al. (2019) and Dalal et al. (2018) who reported that dietary supplementation of amla powder at the level of 0.5 and 0.75 per cent significantly improved the feed conversion ratio. Gaikwad et al. (2016) found in their results that addition of amla fruit powder at the level of 1 per cent to the diet had significantly superior feed conversion ratio. Regarding addition of multienzyme Attia et al. (2012) reported that supplementation of

phytase and multienzyme in broiler chicks showed significant improvement in FCR as compared to control. Ahmed et al. (2015) observed significantly increased FCR with supplementation of multienzyme (300 g/ton) in feed of broilers and Pucci et al. (2010) also observed an improvement (P<0.05) in feed conversion ratio in broilers.

A highly significant (P<0.01) effect of supplementation of amla powder and multienzyme was found on performance index in broiler chickens. The cumulative mean performance index was significantly (P<0.01) higher for T2 group and lowest for T1 group. The results are in accordance with Kumari et al. (2012) who reported that dietary supplementation of amla pomace at the level of 0.75% had significant effect on performance index. Tanwar et al. (2021) also reported similar results when supplemented diet with herbal products. Regarding multienzyme supplementation, Nizamuddin et al. (2013) reported that values of performance index were significantly (P<0.05) higher in dietary enzyme treated groups as compared to control.

Protein efficiency ratio revealed highly significant (P<0.01) effect on supplementation of amla powder and multienzyme. Further protein efficiency ratio was significantly highest in T2 group and lowest in T1 group. The results are in accordance with Singh et al. (2015) who reported that all the herbal growth promoting additive treatments had better protein efficiency ratio (PER) than control. Karnani et al. (2018) found significant improvements in protein efficiency values for the groups fed diets supplementation of curry leaves powder. Regarding addition of multienzyme, Effiong et al. (2019) observed that enzyme supplementation significantly (P<0.05) improved protein efficiency ratio in broilers. Hajati (2010) also noticed significantly (P<0.05) increased PER in corn-soybean meal-wheat based diet by supplementation with 0.05% multi-enzyme. The mortality, occurred during third and fourth week of rearing, was very less and post mortem findings showed some signs of heat stroke.

Digestibility of nutrients and nitrogen balance

A significant (P<0.01) effect was observed on dry matter digestibility and ether extract digestibility; while significant (P<0.05) effect was found on crude protein digestibility due to dietary supplementation of amla fruit powder and multienzyme. The highest digestibility coefficient of dry matter was observed in T2 group. The lowest digestibility coefficient of dry matter was found in T1 group. The highest digestibility of ether extract was observed in T3 group which was similar with T2 group. The lowest value was recorded in control group T1. The results are in accordance with Dalal et al. (2018) who reported that dietary supplementation of amla at the level of 0.75 and 1.0 per cent significantly (P<0.05) improved nutrient digestibility. Islam et al. (2020) also reported that inclusion of aqueous amla extract at 0.5 and 1 per cent level significantly improved crude protein and dry matter digestibility. Regarding addition of multienzyme, Attia et al. (2020) reported that dietary addition of multienzyme caused a significant increase in the digestibility of dry matter, crude protein, crude fiber and ether extract. Moftakharzadeh et al. (2019) also stated that dry matter digestibility of diet significantly (P<0.05) improved with multienzyme supplementation.

A highly significant difference (P<0.01) was found due to supplementation of amla fruit powder and multienzyme on nitrogen balance. Significantly (P<0.01) higher nitrogen balance was found in T2 and T4 groups. All broiler chickens in various treatment groups were found to have positive nitrogen balance. Results are in accordance with Dalal et al. (2018) who also reported that supplementation of amla powder at the level of 0.75 and 1.0 per cent had significant effect on nitrogen retention. Similarly Kumar et al. (2019) observed significantly (P<0.05) improved effect on nitrogen balance with phytobiotics supplementation. Regarding addition of multienzyme, the results of the study are similar with finding of Omojola et al. (2014), Taheri and Shirzadegan (2017), Alagawany et al. (2018) who also reported significant(P<0.05) effect on nitrogen balance.

Table 2. Effect of amla (*Emblica officinalis*) fruit powder and multienzyme on performance of broiler chickens

Attributes	Treatments				P value
	T1	T2	T3	T4	
Feed consumption (g/bird) (0-5 wk)	2598±56.27	2577±31.19	2618±68.28	2530±53.07	NS
Body weight gain (g/b)	1745^{a}±15.30	1887^{b}±20.64	1885^{b}±25.10	1796^{ab}±43.68	**
Feed conversion ratio	1.49^{b}±0.02	1.37^{a}±0.01	1.39^{a}±0.03	1.41^{a}±0.01	**
Performance index	1317^{a}±21.12	1381^{b}±18.04	1359^{b}±27.27	1275^{a}±37.35	**
Protein efficiency ratio	3.21^{a}±0.05	3.47^{b}±0.02	3.41^{b}±0.07	3.36^{b}±0.02	**
Digestibility of DM (%)	79.5^{a}±0.39	82.1^{c}±0.25	80.8^{b}±0.23	80.1^{ab}±0.22	**
Digestibility of EE (%)	85.5^{a}±0.56	89.4^{b}±0.24	86.5^{a}±0.41	89.0^{b}±0.33	**
Nitrogen retention (g/bird)	2.73^{a}±0.02	2.81^{b}±0.02	2.76^{ab}±0.02	2.78^{b}±0.02	**

a, b, c- Means superscripted with different letters within a column differ significantly from each other.
** P<0.01, *P<0.05, NS= Non-significant

CONCLUSION

It can be concluded that dietary supplementation with amla fruit powder @0.75 per cent and multienzyme @0.05 per cent, enhanced the growth performance of broiler chicken.

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