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Effect of feeding ginger (*Zingiber officinale*) extract on growth performance and economics of improved backyard chicken

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Abstract

The present investigation was carried out on “effect of feeding ginger (*Zingiber officinale*) extract on growth performance, and economics of improved backyard chicken”. The research was conducted in the poultry unit, Department of Animal Husbandry and Dairy Science, College of Agriculture, VNMKV, Parbhani during the year 2020-21. The experimental trial of ten weeks were undertaken for one hundred and sixty, day-old improved backyard chicks divided in four treatments T₁ T₂ T₃ and T₄ containing 40 chicks in each treatment with four replications of ten chicks in each. The control (T₁) bird fed with standard ration and T₂, T₃ and T₄ groups were provided same ration supplemented with 25 ml, 50 ml and 75 ml ginger extract, respectively through drinking water. The duration of experiment was 70 days i.e. 10 weeks. Completely randomised design was used for statistical analysis of means. The body weight, body weight gain, feed intake were recorded weekly and accordingly feed conversion ratio was calculated. The result revealed that inclusion of ginger extract at level of 50 ml improved the body weight, total weight gain, total feed consumption, feed conversion ratio. The level of 50 ml ginger extract (T₃) showed higher net profit.

Keywords: Ginger extract, growth performance, economics improved backyard chicken

Introduction

Indian economy majorly contributed by livestock and poultry sector. Poultry is the crucial place in India, as the eggs and chicken meat are important and rich sources of protein, vitamins, and minerals, like an iron, zinc, selenium, and vitamin B12. Chicken rearing is one of the most suited activities for improving the livelihood of the poor due to the advantage it has in terms of the small amount of capital required and the relative ease set-up such a production system in the rural communities. India is rising as the world's second largest market with annual growth rate of more than 14 per cent generating 6 million tonnes or 3.6 per cent of global egg production. The annual growth rate of egg production is 5-8 per cent apart from this, India ranks 6th in poultry production (Anonymous 2012). The poultry sector contributes roughly Rs 11000/- crores to the national economy. A total of 20 lakh people are employed in the poultry sector, either directly or indirectly. India is now ranked 5th in overall egg production and 15th in total meat production. Ginger (*Zingiber officinale*) is a perennial herbaceous plant belonging to the Zingiberaceae family. Rhizome is the portion of the plant that is utilized. This plant produces an orchid like flower with greenish yellow petals lined with purple colour. Ginger is grown in locations where there is a lot of rainfall. Even though it is native to southern Asia, ginger is also grown in tropical areas such as China, Jamaica, Nigeria and Haiti and it is an important spice crop in India (Bajaj., 1989) [5]. Ginger is a major crop, grown primarily in central Asia, China, India and Pakistan and exported worldwide. Ginger is the natural growth promoters and can be potential alternatives for common artificial growth promoters like antibiotics (Demir *et al.*, 2003). Ginger (*Zingiber officinale*) is a plant whose rhizomes are used as a medicinal, delicacy, or spice. According to preliminary research indicates that nine compounds identified in ginger may bind to serotonin receptors which may influence gastrointestinal function research demonstrates in - vitro shows that ginger extract might control the quantity of free radicals and the per-oxidation of lipids (Al-Amin *et al.*, 2006) [3] and have anti- diabetic properties. (Morakinyo *et al.*, 2011) [13].

Therefore, the present study entitled “Effect of Feeding Ginger (*Zingiber officinale*) Extract on Growth Performance of Improved Backyard Chicken” was conducted at poultry unit, Department of Animal Husbandry and Dairy Science, College of Agriculture, VNMKV,

Parbhani with the following objectives.

1. To study the effect of feeding ginger (*Zingiber officinale*) extract on growth performance of improved backyard chicken.
2. To study the effect of feeding ginger (*Zingiber officinale*) extract on economics of improved backyard chicken.

Materials and Methods

Location: The present investigation was carried out on effect of feeding ginger (*Zingiber officinale*) extract on growth performance and economics of improved backyard chicken. The trial was conducted at poultry unit, Department of Animal Animal Husbandry and Dairy Science, College of Agriculture, VNMKV, Parbhani-431402, (MS) India.

Experimental Bird's management

The trial was conducted with a 160 day-old "Kaveri" Strain improved backyard chicks purchased from Chudawa Nanded district (Maharashtra). All experimental chicks were vaccinated with Marek's disease vaccine on the first day of life (at hatchery). Birds were vaccinated routinely against ranikhet disease (Lasota vaccine) at 7th day by intraocular route, at 14th day Gumboro vaccine by intraocular route, at 21st day Booster dose of Lasota vaccine through drinking water and at 28th day booster dose of Gumboro vaccine through drinking water. All the experimental chicks were individually weighed, wing banded and then the chicks were divided into four dietary treatment groups. Each group again divided into four replications having ten chicks in each replication. All the birds were free from disease and physiological disorders. The brooding temperature was maintained 32-35 °C for first week. A weekly reduction of 3 °C till brooder temperature reaches to 27 °C by third week of

age. Afterward sufficient artificial light was provided during night hours through the experimental period. Housing of bird separately from other birds and animals in clean, well ventilated, fume sterilised, walls disinfected with lime by painting protected pen making compartment using iron net and provided by individual feeders and waterers.

Feeding Treatments

Ginger Extract

Procedure: The ginger (kochin) was peeled, cut into small pieces and dried at oven at 40 °C. For 24 hrs. The dried ginger was crushed by grinder and aqueous extract was prepared (Dieumou *et al.*, 2012) by adding 1 litre of boiled hot water into 14 g of ground ginger in a container. The mixture was left to infuse and cooled at room temperature for 12 hrs. The extract was filtered using muslin cloth, and then administered to the chicks in their drinking water. Fresh infusion was prepared daily. (Joseph *et al.*, 2015)

The ginger extract was administered orally to the chicks of the four dietary treatments via drinking water at concentrations of 0, 25, 50, and 75 ml/L of water to the T₁, T₂, T₃ and T₄ group respectively. All the chicks were fed with ground maize for first two days of age. The chicks were fed with pre-starter ration up to 0 to 14 days, starter ration from 15 to 28 days and finisher ration from 29 to 70 days of ages as per BIS recommendations.

Chemical composition of the experimental diet:

Determination of dry matter (DM), Crude protein (CP), Ether extract (EE), Crude fibre (CF), Total ash, Acid insoluble ash and Nitrogen free extract (NFE) were analyzed for chemical composition by using AOAC (1995) ^[4] which given in Table No. 1

Table 1: Per cent chemical composition of experimental improved backyard chicken ration on dry matter basis

Sr. No.	Nutrients	Per cent in ration		
		Pre-starter	Starter	Finisher
1	Crude Protein	22	20	18
2	Crude fibre	6.0	6.0	5.5
3	Ether extract	4.20	4.50	4.36
4	Total ash	6.5	6.0	5.0
5	Acid insoluble ash	1.5	2.0	2.0
6	Nitrogen free extract	61.30	63.50	67.14
7	Metabolizable energy (kcal/kg)	2600	2700	2800

Data collection

Weekly weight of birds, feed intake and water intake in each group were recorded daily upto 10 weeks period. Weight gain was calculated as per formula (Final weight – initial weight) Feed conversion ratio was calculated as per the ratio between cumulative feed intake to cumulative body weight gain. Economics of production was calculated as per average body weight, average feed intake, feed per kg live weight and cost of feed per kg body weight gain and net profit per bird was calculated cost of feed and sold of birds as per market based on market price. The treatment wise data were subjected to statistical analysis of completely randomised design (CRD) given by Snedecor and Cochran, 1982) ^[20].

Statistical methods: The treatment wise data on cumulative body weight, body weight gain, feed consumption, feed conversion ratio, water intake were subjected to statistical analysis of completely randomized design CRD (Snedecor and Cochran, 1982) ^[20].

Results and Discussion

Body Weight: The effect of feeding ginger (*Zingiber officinale*) extract on growth performance of improved backyard chicken during the experimental period are shown in Table 2 the average cumulative body weight from 1st to 4th week. There was no significant difference, from 5th week there was significant ($P < 0.05$) difference. The average body weight of (1348.61) g obtained in T₃ group was superior as compare to other groups. Similar findings were observed by Ademola *et al.*, (2009) ^[1]; Arkan *et al.*, (2012) and Talukdar *et al.*, (2017) ^[21]. These authors find that increased weight change with broiler chickens fed with ginger meal when supplemented at 2 and 6 per cent levels in the rations. The results obtained in this experiment agreement with the results of Saaci *et al.*, (2017) who observed that the improvement may be due to stimulatory effect of ginger extract on digestive juices, microflora and nutrient assimilation in digestive tract.

Body weight gain: At the end of ten week it may be seen that from Table 2 the average cumulative body weight gain from 1st to 7th week there was no significant difference among treatment group, from 7th week there was significant ($P<0.05$) difference. The total gain in body weight of bird among treatment group T₃ was significantly ($P<0.05$) higher as compared to other groups and lower in T₁ i.e. control group. Similar findings were observed Arshad *et al.*, (2012) and Mohamed *et al.*, (2012) showed that use of ginger to the diet had a significant ($P<0.05$) positive effect on broiler body weight gain as compared to the control. George *et al.*, (2015) reported that there were significant ($P<0.05$) difference in body weight gain. This observations is in agreement with the findings of Shinde *et al.*, (2017) [19] who reported that the total body weight gain (g) of experimental birds supplemented with 1 and 3 percent cardamom powder (T₁ and T₃) and ginger (T₄, T₅ and T₆) showed significant ($P<0.05$) higher value as compared to control (T₀). Belal *et al.*, (2018) [6] reported that the maximum body weight gain of broiler birds fed on ginger.

Feed Consumption: The data from the Table 2 showed that the average feed consumption at 1st to 5th week there were no significant difference among treatment group, from 6th week there were significant difference ($P<0.05$) between the treatment group. At the end of ten week the average total feed consumption of bird among treatment group T₃ was significantly higher ($P<0.05$) as compared to T₁ (control) group and at par with T₂ and T₃ group. Similar observations were found by Ademola *et al.*, (2009) [1] who reported higher feed intake of broilers on diet supplemented with ginger. The results are in reconciliation with different researchers who have reported that ginger powder in the diet of broiler had a

substantial positive effect on feed consumption (Herawati and Marjuki, 2011). George (2015) reported that there were significant difference ($P<0.05$) in feed intake. Result revealed that sometimes the smell and/or taste of ginger and garlic alter the palatability and feed intake of broilers (Belal *et al.*, 2018) [6].

Feed conversion ratio: The mean weekly feed conversion ratio (Table 2) of different experimental groups differed significantly ($P<0.05$) from 4th to 10th week. The average total feed conversion ratio revealed significant difference between treatment group T₃ over T₁ (Control) and group T₂ at par with group T₄. Similar observations were reported by George *et al.*, (2015) reported there were significant ($P<0.05$) difference in feed conversion ratio. The result of present study was in agreement with the findings of Belal *et al.*, (2018) [6] who reported that ginger and garlic had significantly ($P<0.05$) improved feed conversion ratio. Sarap (2020) [18] who reported that feed conversion ratio was significantly ($P<0.05$) better in T₂ fed with 1 per cent ginger powder. Duwa *et al.*, (2020) [7] showed the result that the use of ginger at 6 per cent level as feed additives in broiler fed had significant ($P<0.05$) and positive influence on feed conversion ratio.

Water intake: The mean weekly water intake of different experimental groups differ significantly ($P<0.05$) from 5th to 10th week. It could be seen that highest total water intake of 12107 ml obtained in T₃ group birds receiving 50 ml ginger extract followed by 11723 ml with 75 ml ginger extract in T₄, 11588 ml with 25 ml ginger extract in T₂ and lowest water intake i.e. 11183 ml in T₁ control at the end of 10th week.

Table 2: Effect of dietary incorporation of ginger extract on growth performance of improved backyard chicken

Parameters	Levels of ginger extract				
	0 ml	25ml	50 ml	75 ml	SEM
Initial weight (g)	33.93	32.99	33.47	33.04	0.53
Final weight (g)	1261.09 ^d	1302.81 ^c	1348.61 ^a	1324.06 ^b	6.29
Total weight gain (g)	1227.16 ^d	1289.81 ^c	1315.13 ^a	1291.02 ^b	6.22
Total feed intake (g)	3340.15 ^b	3405.00 ^a	3425.44 ^a	3422.25 ^a	20.17
Total FCR	2.72 ^a	2.68 ^b	2.60 ^c	2.65 ^b	0.01
Total water intake (ml)	11183 ^d	11588 ^c	12107 ^a	11723 ^b	38.74

a,b,c = means with different superscript on the same row differ significantly ($P<0.05$)

SEM = Standard error of mean

FCR = feed conversion ratio

Economics of production: Economics of production (Table 3) of experiment shows that the average feed intake of experimental birds as 3340.15, 3405.00, 3425.44 and 3422.25 g in treatment T₁, T₂, T₃ and T₄, respectively. It means that average feed consumption was higher in group T₃ than other group. There were higher body weight at the end of 10th week observed in T₃ (1348.61) than other. The net profit per bird was highest in T₃ (Rs. 130.39/bird) as compared to other treatment groups. Therefore the treatment T₃ was economically superior. The result was agreement with Elmakki *et al.*, (2013) [9] who reported that the highest cost of

feed was obtained for birds fed 0.75 percent ginger than that the birds fed 0.5 percent ginger and the birds fed 0.25 percent ginger. Birds fed 0.25 percent ginger showed the highest profitability compared to other bird group this may be related to the higher weight gain of this group than others, in conclusion the using of ground ginger root at level 0.25 percent increase return. Sa'aci *et al.*, (2018) [16] showed aqueous ginger extract had effect ($P<0.05$) on total cost of feed consumed and cost/weight gain. Gaikwad *et al.*, (2019) [11] also showed more profit fed with 2 per cent cinnamon and 1 per cent ginger used as growth promoters.

Table 3: Economics of production per bird

Sr. No	Particulars	T ₁	T ₂	T ₃	T ₄
1.	Cost of day old chicks	28	28	28	28
2.	Ginger consumed per bird (g)	0	22.72	45.45	68.18
3.	Cost of ginger (Rs./g)	0	0.07	0.07	0.07
4.	Cost of ginger	0	1.5	3.0	5.0
5.	Avg. Total feed consumed per bird (g)	3340.15	3405.00	3425.44	3422.25
6.	Cost of feed (Rs/Kg)	29	29	29	29
7.	Cost of feed consumed per bird (Rs)	96.86	98.74	99.33	99.24
8.	Total cost of feed consumed per bird (Rs.) (4 + 7)	96.86	100.24	102.33	104.24
9.	Avg. body weight at the end of 10 th week (g)	1261.09	1302.81	1348.61	1324.06
10.	Avg. body weight gain (g)	1227.16	1269.81	1315.13	1291.02
11.	Feed consumption per kg live weight gain (g)	2648.62	2613.58	2539.97	2584.66
12.	Cost of feed per kg live weight gain (Rs.)	78.93	77.76	75.53	76.87
13.	Cost of medicine, vaccine and litter material per bird (Rs.)	09	09	09	09
14.	Cost of production (1+8+13) per bird (Rs.)	133.86	137.24	139.33	141.24
15.	Avg. price realized @ Rs. 200 per Kg live weight (Rs.)	252.21	260.56	269.72	264.80
16.	Net profit per bird (15-13)	118.35	123.32	130.39	123.56

Conclusion

From this experimental study it can be concluded that supplementation of 50 ml ginger extract was useful in improved backyard chicks to improve body weight, body weight gain, feed consumption, feed conversion ratio, water intake and increased net income was recorded by 50 ml ginger extract.

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