Study on Effect of Ginger Incorporated Broiler Feed on Body Weight Gain, Feed Conversion Ratio and Feed Intake of Broiler Chicken

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Introduction

Modern intensive poultry production has achieved phenomenal gains in the efficient and economical production of high quality and safe chicken meat, eggs and poultry bio-products (George, 1996). At the same time as making gains in production and efficiency, the industry had to maximize the health and well-being of the birds and minimize the impact of the industry on the environment. The use of feed additives has been an important part of achieving this success. Many additives have been a normal part of diets for animals and humans. It is only recently that we have come to recognize and understand their importance in achieving high production and efficiency, maintaining health and wellbeing, improving product quality.(Windisch *et al.*, 2008) However, the feed additives have negative impacts on the consumers due to their residues which mostly remain in the broiler products. Thus, it is important to explore the potential of natural feed additives to replace the chemical ones.(Scott,2004) Probiotic and medicinal plants as natural feed additives are recently used in poultry diet to enhance the performance and the immune response of birds. One of the natural feed additives is ginger. Ginger contains bioactive substance such as oleoresin and ginger which give effect to optimize the body organ. Ginger also contains vitamins and minerals as the peculiar plant. Ginger extracts function as the anti inflammation and anti bacterial. Ginger is one of natural plants which can be used as phytobiotic to improve broiler's performance. The major component of ginger is Zingiberen and Zingerol that can stimulate the digestive systems by controlling the digestive pH and the activity of digestive enzyme and the microbial activity. Ginger extracts could immune the gastric and improve poultry appetite. (Achyad *et al.*, 2000) Studies show that the ginger spice has two types of digestive enzymes; one is protease enzyme that is used to break apart the protein and lipase enzyme that is used to break apart the fat. Both enzymes improve nutrients digestion and absorption by animals. Ginger is also as bacteria static that reduce pathogenic microorganisms in the digestive tracts. The gingerol also protect the liver on it activity, especially on hold the toxic of carbon tetrachloride. The ginger works as vaccination by stimulate an organ of bursafebrisius to make an antibody of viral attack such as ND. Ginger as a natural material is good as additive because it has no residual that threat the body organ and safe for the consumer's health. (Peter *et al.*, 1999)

Methodology

Broiler starter and finisher feed were supplied by CIC feed (Pvt) Ltd, and these feeds were taken as basal diets. Ginger was taken as feed supplement with basal diet. Raw

ginger was brought in the same place to avoid composition variation. Ginger flour was prepared by washing the ginger under water and then it was slashed and sun-dried for 1-2 days. Dry ginger was then ground to get ginger flour. The ginger flour was stored in a plastic container to avoid chemical and microbiological damages. Ninety nine day-old female Hubbard flex broiler chicks were used for feed trial they were divided into three treatment groups, consisting 33 birds in each. The initial body weights of the birds were almost similar in all three treatments and average weight was 0.0484 kg.The chicks were reared until day seven in electrical brooder which has been divided into three separate compartments. Each compartment consisted forty watts (40 W) bulbs to provide heat, and each group was provided with around 6360 cm^2 floor spaces. Artificial light was provided until third day during the day time and night. Thereafter, the lights were switched off by considering the behavior pattern of the chicks and environmental conditions to avoid over heating during the day time,. On the day seven, each treatment was replicated. Each treatment consisted of three replicates, and each replicate consisted of eleven birds. The experimental poultry house for growing birds (for day 7 to 42) consisted of nine cages. The replicates were arranged randomly within the nine cages. Each cage was equipped with separate feeder and drinker. Each cage provided 13500 cm^2 of floor space and the height of the cage was 90 cm. The chicken in each group were given different feed as treatments. The feed were G-0 (control feed without ginger), G-1.0, and G-2.0 which were control feed with 1.0, and 2.0% ginger, respectively. The feed amount was changed according to the mortality. Ginger supplemented diets were provided separately within treatment groups. Broiler starter ration was given up to 28^{th} day and the finisher ration was started from the 26^{th} day. Birds were provided ad libitum clean drinking water throughout the study except in vaccination protocol. Multi vitamin mixture (Vita light) was given with drinking water in first five days of the study and after vaccination. The birds were vaccinated with ND vaccine on 3^{rd}, 14^{th} day and Gumboro (Infectious Bursal Disease –IBD) vaccine on 14^{th}, 21^{st}, 28^{th} day. Mortality and reasons for deaths were recorded throughout the period of study. During the brooding period (day 1 to 7), daily group feed intakes were recorded and weekly live body weights were measured on day eight. Following replication, body weights and feed intakes were recorded on replicate basis. In each replicate, daily feed intakes were recorded and weekly body weights were recorded on 15^{th}, 22^{nd}, 29^{th}, 36^{th}, and 43^{rd} day. Average body weight gain and feed conversion ratio (FCR) were calculated using above measurements. Each variable was analyzed using Completely Randomized Design (CRD). Data were analyzed according to the General Linear Model (GLM) of ANOVA incorporated in Minitab 14. Three ginger samples were taken from three lots of ginger powder to prepare composite sample for the analysis. The ginger sample was subjected to sieve analysis and proximate analysis (crude protein, crude fat, crude fiber, moisture, and total ash).

Results and discussion

Proximate analysis indicated that the feed contained moisture 15.83%, ash 4.9%, crude protein 16.27%, crude fat 6.79% and crude fiber 6.87%. Weekly body weight gain, feed intake and FCR of the treatments are given in Table 1.

Table 1: Weekly body weight gain, feed intake, and FCR of Broiler birds

Parameter	Period (days)	Basal diet-BD (Control)	BD + 1% Ginger	BD + 2% Ginger
Body Weight Gain (g)	1-7	152.73	149.52	152.91
	8-14	363.28	368.49	372.14
	15-21	796.57	790.19	753.88
	22-28	1276.18	1251.52	1249.94
	29-35	1660.75	1666.24	1679.87
	36-42	1828.15	2021.06	2099.62
Feed Intake (g)	1-7	121.18	114.51	114.30
	8-14	412.39	402.17	400.59
	15-21	951.54	923.92	917.15
	22-28	1705.11	1643.20	1633.27
	29-35	2660.44	2558.04	2550.88
	36-42	3744.47	3584.55	3586.88
FCR	1-7	0.60	58.00	0.57
	8-14	1.00	97.00	0.95
	15-21	1.13	1.10	1.15
	22-28	1.29	1.26	1.26
	29-35	1.56	1.49	1.48
	36-42	1.99	1.73	1.67

The particle size of ginger used in the experiment varied between 16 μm and 30 μm. According to the Table 1 the body weight gain of the chicks fed with ginger supplement diet has started to enhance at 5th week and in the 6th week it has become significantly different from the control. According to the ANOVA analysis (Table 2), the weight gain also showed a significant difference ($p<0.05$) with 2% ginger supplement.

Table 2: Results of ANOVA analysis for weight gain

Source	*DF*	*Seq SS*	*Adj SS*	*Adj MS*	*F*	*P*
Treatment	2	117082	117082	58541	14.92	0.005

Table 1 shows that the control group had higher feed intake than the groups which were supplemented with ginger throughout the study. According to the ANOVA analysis (Table 2), the feed intake indicated a significant difference ($p<0.05$) with 2% ginger supplement.

Table 3: Results of ANOVA analysis for total feed intake

Source	*DF*	*Seq SS*	*Adj SS*	*Adj MS*	*F*	*P*
Treatment	2	50412	50412	25206	43.38	0.000

According to the Table 1 FCR was higher in control group than ginger supplemented group. The FCR of the chicks t fedwith diet supplemented with ginger has enhanced at the 6th week and showed a significant difference ($p<0.05$) with 2% ginger supplement (Table 3).

Table 4: Result of ANOVA analysis for feed conversion ratio

Source	*DF*	*Seq SS*	*Adj SS*	*Adj MS*	*F*	*P*
Treatment	2	0.176156	0.176156	0.088078	23.66	0.001

Conclusions

Dietary supplementation of ginger powder into broiler feed improves the Body Weight Gain, and decreases Feed Intake and Feed Conversion Ratio in an effective manner. There was different between 1% and 2% ginger supplementation for the effect body weight gain, total feed intake and FCR.

Based on the research, it can be concluded that adding ginger as the supplement in the ration of broiler up to 2.0% gave a good effect on feed intake, total body weight gain and feed conversion. So, using 2% ginger supplement as phytobiotic additives in broiler diets will give higher body weight gain by consuming lower feed within 42 days.

There is a potential to add value to nationally available ginger through the broiler feed industry. However, further studies are needed to investigate new phytogenic feed additives with more available herbs and medicinal plants in Sri Lanka, and to investigate the effect of ginger on the meat quality parameters such as color, drip loss, pH, cholesterol level, microbiological analysis and strength of meat.

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