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EFFECT OF AZOLLA (*Azolla pinnata*) ON GROWTH AND LIPID PROFILES OF BROILER CHICKENS

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Abstract

The experiment was conducted at Bangabandhu Sheikh Mujibur Rahman Agricultural University Poultry farm to measure the effect of Azolla at different levels on the growth performance, profitability, and lipid profiles of broiler chickens to produce safe and profitable broiler. A total of 180 Cobb-500 day-old straight run broiler chicks were distributed into three dietary groups; D_1 (control-no Azolla), D_2 (diet with 5% Azolla), and D_3 (diet with 10% Azolla) having four replications in each, and 15 chicks/replication for 35 days of age. The significant differences among the diets for live weight ($p<0.05$), FCR ($p<0.01$), and mortality ($p<0.001$) were found. The highest live weight (1662.83g), and the lowest feed intake (2821.22g), and FCR (1.73) were observed in D_1 followed by that in D_2 and D_3, respectively. The highest mortality (4.99%) was found in D_1 and the lowest in D_2 or D_3 (1.65%). There was no significant difference among diets for production cost and net profit ($p>0.05$). However, evidently but not significantly, D_3 performed better than D_1 or D_2 in terms of reducing production cost and improving net profit. Lipid profiles (total cholesterol, TG, HDL, and LDL) were almost statistically similar among the diets. However, evidently but not statistically, the diet D_2 decreased TG, LDL, and increased HDL in the blood of broiler chicken as compared to the diet D_1 or D_3. Therefore, 5% or 10% Azolla could be used in the diet of broiler chickens to produce safe and profitable broiler.

Keywords: Azolla, broiler chickens, growth, lipid profiles, profit.

Introduction

The broiler industry demands a fast growing chick, and good quality feed to support maximum growth within a short period of time, and the production cost should be as minimum as possible to have maximum profit. This is why, farmers are randomly using unexpected growth promoters, antibiotic, hormone, enzymes, heavy metals to have rapid growth of chicken; these additives have harmful effects on poultry as well as humans. This is why poultry scientists are trying to establish alternative unconventional feeds for feeding birds to produce safe and profitable poultry products (Islam and Nishibori, 2017; Almeida and Zuber, 2010). Vadivet and Pugalenthi (2010) suggested to include15.7% and 11% velvet bean in broiler starter and broiler finisher diets, respectively, as an alternative protein source replacing soybean meal. In the previous study, it has been found that Azolla reduced mortality, production cost, and increased profitability (Islam and Nishibori, 2017). It is also inevitable to avoid antibiotics in poultry industry, necessary to create alternatives that would influence improvement

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of healthy production of broiler chicken, and safe poultry products for humans. In the present study, Azolla, was used in broiler diet to produce safe and profitable broiler.

Azolla (*Azolla pinnata*) can easily be cultivated or found available in ponds, rivesr, and lakes or even in the paddy fields. After sun drying it can be used in poultry diet as a cheapest and abundant unconventional plant protein source that improve feed conversion efficiency, energy efficiency, and economic performance without any deleterious effects on birds as well as on human body (Lejeunea *et al.,* 1999; Alalade and Lyayi 2006; Namra *et al.,* 2010; Sujatha *et al.,* 2013). Several investigators suggested to use 5% Azolla in the diet of broiler, because of having improved feed conversion efficiency, dressing yield, profitability, and no mortality (Basak *et al.,* 2002; Balaji *et al.,* 2009; Nagashi *et al.,* 2014). Azolla improved body weight and reduced cholesterol in the blood of broiler chicken as reported by Balaji *et al.,* 2009; Balaji *et al.,* 2010. Prabina and Kumar (2010) reported that 7.5% Azolla increased body weight and the immunity of broiler chickens. *Azolla pinnata* can assimilate atmospheric N_2, due to the presence of algal symbiont in its leaves. This is why, Azolla is rich in protein, essential amino acids (lysine, leucine, arginine and valine), minerals (Ca, P, K, Fe, Mg, Mn, Zinc, Na, etc.), vit A, vitB_{12} and precursor of Beta carotene and chlorophylls (Ali and Leeson, 1995; Kamalasananapillai *et al.,* 2005). Feeding studies revealed that fresh Azolla can replace about 20% commercial feed of chickens (Subudhi and Singh, 1978).

Therefore, the present study was aimed at assessing the effect of Azolla on the growth performance, mortality, profitability and lipid profiles content of broiler chickens for producing safe and cost effective broiler.

Materials and Methods

(a) Approaches

A feeding trial with control (no Azolla), 5% and 10% Azolla (*Azolla pinnata*) was carried out at Bangabandhu Sheikh Mujibur Rahman Agricultural University poultry farm for a period from July/2016 to June/2017 to determine the effect of Azolla on growth performance and lipid profiles of broiler chickens for producing safe and cost effective broiler.

(b) Methodology

Collection and preparation of Azolla meal

Azolla pinnata were cultivated in fresh water pond of the Faculty of Fisheries, Bangabanhu Sheikh Mujibur Rahman Agricultural University (BSMRAU), Gazipur, Bangladesh. During Azolla cultivation, cow dung was used in the pond, and harvested in every week. Fresh Azolla were also harvested from lake and paddy field, and dried in the sun in order to grind using a grinder. Thereafter, it was used in the experimental diet of broiler chickens.

Feeding and management

A total of 180 Cobb-500 day-old straight run broiler chicks were distributed into three dietary groups; D_1 (control-no Azolla), D_2 (diet with 5% Azolla) and D_3 (diet with 10%Azolla) having four replications in each, and 15 chicks/replication.

The iso- nitrogenous and iso- caloric starter diet (0-3 weeks) containing 22% CP and 2900 KcalME/kg, and a finisher diet (4-5 weeks)

containing 21% CP and 3000 KcalME/kg were provided to the experimental broiler chickens. The chicks were reared on a floor management system with a stocking density of 1 sq. ft/chicks for 35 days. Saw dusts were used as litter materials on the floor. The broiler chicks were offered diet, and clean-fresh water *ad libitum,* and exposed to 23.5 hrs lighting regime during experimental period.

Data recording

Live weight and feed intake were recorded fortnightly, and the number of dead bird was recorded when occurred. The feed conversion ratio (FCR) was calculated from feed intake and live weight of broiler at the end of experiment. The production cost (BD Taka/kg live broiler) was calculated considering cost of day-old chicks, feed, labor, litter, vaccine, medicine, and so on. The net profit was calculated from the sale, and production cost/kg live broiler. To measure lipid profiles (Total cholesterol, high density lipoprotein-HDL, Triglyceride-TG, and low density lipoprotein-LDL), 5 ml blood from one broiler chicken/ replication was collected at the end of experiment, and then serum was separated using a centrifuge machine with 3000 rmp for 7 minutes. Individual serum was used to estimate lipid profiles following spectrophotometric methods. The CRESCENT DIAGNOSTICS cholesterol test kits (Cat No. CS 603, Jeddah 21423, Saudi-Arabia) were used to determine lipid profiles of blood of broiler chickens.

The recorded ambient temperature, humidity and rainfall during experimental period were 19.78^0 C, 80.50% and 8.44 mm, respectively.

Statistical analysis

The collected data were analyzed in a completely randomized design using MSTAT-C computer package program.

Statistical model**:** The following statistical model was used for data analysis.

$Y_{ij} = \mu + D_i + e_{ij}$

Where,

Y_{ij} is the observation on jth replication of ith dietary group.

μ is the overall mean

D_i is the fixed effect of ith dietary group ($i = 1, 2$)

e_{ij} is the random error

Results

Growth performance, mortality and profitability of broiler chickens

Live weight ($p<0.05$), FCR and mortality (%) ($p<0.01$) were significantly different among the dietary groups (D_1=control diet-no Azolla; D_2=diet with 5% Azolla, and D_3= diet with 10% Azolla) (Table 1). The highest live weight ($p<0.05$) and the lowest FCR ($p<0.01$) were observed in dietary group D_1 followed by that in D_2 and D_3, respectively. However, the highest mortality (4.99) was observed in D_1 and the lowest in test diets; D_2 or D_3 (1.65%). Statistically no significant differences among the diets were observed for feed intake, production cost and net profit ($p>0.05$). However, evidently but not significantly ($p>0.05$), feed intake was increased in D_3 followed by that in D_2 and D_1, respectively. There was a tendency to decrease production cost and improve net profit in D_3 followed by that in D_2 and D_1, respectively.

Table 1. Effect of Azolla on growth performance, mortality and profitability of broiler chickens at 35 days of age

Traits	Diet (D)			SED or x^2 value and level of significance+
	D_1	D_2	D_3	
Body weight (g/bird)	1662.83	1608.27	1587.49	24.058*
Feed intake (g/bird)	2821.22	2897.25	2908.25	50.869 NS
FCR (Feed intake/live weight	1.73	1.81	1.83	0.022**
Mortality (%)	4.99	1.65	1.65	x^2=44.223***
Production cost (Tk/kg live weight)	109.53	109.42	108.49	2.681NS
Net profit (Tk/kg live weight)	20.47	20.58	21.51	2.681NS

+NS, *p>0.05*; *, *p< 0.05*; **, *p<0.01*, ***, *p<0.001*; Sale (BD taka/kg live broiler)= 130/= D_1= Control diet (No Azolla); D_2= Diet with 5% Azolla; D_3 =Diet with 10% Azolla

Table 2. Effect of Azolla on lipid profiles (Cholesterol, TG, HDL and LDL) of blood of broiler chickens at 35 days of age

Traits	Diet (D)			SED value and level of significance+
	D_1	D_2	D_3	
Total cholesterol (mg/dl))	235.42	245.83	247.92	10.623NS
Triglyceride (TG) (mg/dl)	211.28	200.76	210.98	25.045NS
High density lipoprotein (HDL) (mg/dl)	41.76	59.52	48.16	6.459NS
Low density lipoprotein (LDL) (mg/dl)	151.40	146.16	157.56	10.733NS

+NS, *p>0.05*; D_1= Control diet (No Azolla); D_2= Diet with 5% Azolla; D_3 =Diet with 10% Azolla

Lipid profiles of blood of broiler chickens

Lipid profiles; total cholesterol, Triglyceride (TG), High density lipoprotein (HDL) and low density lipoprotein (LDL) were statistically similar among dietary groups (*p>0.05*) (Table 3). Evidently but not significantly, D_2 performed better than D_1 or D_3, in terms of reducing LDL, TG and increasing HDL content of broiler chickens.

Discussion

Statistically similar feed intake was found between dietary groups, but however improved live weight was observed in D_1 (control diet) compared to that test diets (D_2 or D_3). The test diets; D_2 and D_3 showed 3.28% and 4.53% lower body weight compared to D_1. This is why, the lowest FCR was recorded in D_1 compared to test diets which contradicts with the previous findings of Islam and Nishibori, 2017. They found the lowest FCR in diet with 5% Azolla compared to that control diet (no Azolla). In case of mortality, test diets; D_2 or D_3 showed the lowest mortality (1.65%), whereas control diet showed 4.99% mortality that corroborate the previous findings of Islam and Nishibori (2017); and Nagashi *et al.* (2014). Evidently but not significantly, D_3 was superior to D_1 or D_2 in terms of production cost and net profit supported by Islam and Nishibori (2017); Balaji *et al.* 2009 and Basak *et al*. (2002). Of the test diets, D_2 (5% Azolla) performed better than D_3 in terms of live weight, feed intake and FCR supported by Islam and Nishibori (2017). Therefore, 5% Azolla could be used in the diet of broiler chickens. Similarly 10% Azolla may also be considered in the diet of broiler chickens.

In the current study, the amount of recorded lipid profiles (total cholesterol, TG, HDL and LDL) were statistically similar among dietary groups ($p>0.05$). In the previous study, Islam and Nishibori (2017) reported the lower amount of total cholesterol, TG, LDL and the higher amount of HDL in 5% or 7% Azolla containing diet compared with the control or other dietary groups. Evidently but not significantly, D_2 performed the best in terms of reducing TG, LDL, and increasing HDL in the blood of broiler chicken followed by D_3 and D_1, respectively that corroborate the findings of Islam and Nishibori (2017) and Balaji *et al.* (2009). Therefore, D_2 may be the most suitable dietary group to reduce lipid profiles content of broiler chickens.

Conclusion

The present study reveals that the diet containing 5% Azolla could be used for producing safe and profitable broiler because of reducing mortality, production cost, TG, LDL, and increasing HDL and net profit. The 10% Azolla may also be considered to use in the diet of broiler chicken for that. However, more studies are needed to confirm the level of using Azolla in the diet of broiler as well as need to measure the effect of Azolla on immunity and hematological condition of broiler chickens for producing safe and profitable broiler.

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