**CHAPTER I: INTRODUCTION**

Poultry production has emerged as having an unquestionable propensity to close the existing gap in animal protein consumption in the country. This is because of their short gestation and generation interval, large number, fast growth, greater afford ability, ease of raising, absence of taboos to production and consumption and absence of barriers to production in any climatic zone in the country (Ibe, 2004). Further stated that poultry enjoys a relative advantage over other livestock in terms of its easy management, high turnover, quick return to capital investment and wide acceptance of its product for human consumption (Haruna and Hamidu, 2004).The poultry industry in Bangladesh is expanding rapidly and broiler production is an important aspect of the industry. The main factor militating against this rapid expansion of the industry is the problem of inadequate supplies of feed stuff at economic prices. Feed cost is perhaps the most expensive input in poultry production as it constitutes about 70-80 percent of the real cost of production for intensively reared stocks (Omeje *et* *al.,* 1999; Ijaiya *et al.,* 2004). It had earlier observed that a major solution to the problem of rising costs and scarcity of energy and protein sources for monogastrics is seeking new and non-conventional feed resources which are able to replace certain proportions of maize in broiler rations without any deleterious effect on performance (Onyimonyi and Onukwufor, 2003). The feeding value of such non - conventional feed resources as Palm kernel cake, Bambara offal and Rice husk are well documented (Fetuga and Tewe, 1975; Fetuga *et al.,* 1977; Iyayi *et al.,* 2005; Onyimony and Ugwu, 2007). Rice husk is a by product of rice mill. During milling of paddy about 78% of weight is received as rice, broken rice and bran, the rest 22% of the paddy is received as husk. Presently, it is used as fuel for boilers, the ash from the husk can be used as fertilizer and the high silica content could be of use in steel industry.

Traditionally, rice husk has been used as ingredient in ruminant and poultry feeds but the problem of low nutrients digestibility, high silica/ash content and abrasive characteristics are limiting factors in its utilization. Rice husk is composed of crude protein 2.9-3.6%, oil 8-12%, crude fibre 39-42% and ash 15-22% (Oyenuga, 1968). Several workers have reported that high crude fiber (39-42%); mainly lignin and low protein contents have resulted in reduced voluntary feed intake and low utilization of poultry feeding (Awesu *et al.,* 2002). This high fiber concentration results in poor nutrient utilization and consequence poor growth performance due to the presence of non-starch-polysaccharides and phytate when fed to broiler chickens without any form of treatment. However, It has been shown that the presence of crude fiber improves growth and feed efficiency and gives beneficial effects on feathering and on protection from cannibalism in chicks (Hetland *et al.,* 2003). Methods suggested at reducing limiting factors in rice husk utilization includes soaking in hot water, irradiation, acid and alkaline hydrolyses, ensiling, fermentation and use of enzymes and antibiotics (Longe, 1988 and Dierick *et al.,* 1989). Ensiling is the anaerobic fermentation process used to preserve immature green corn, legumes, grasses, grains and plant by-products with about 70-80% moisture and put in air tight environment or the preservation of forages (or crop residue or by-products) of high moisture content-based on lactic acid (ideally) fermentation under anaerobic condition (Moran, 2005). To take correct step in ensiling any plant by-product like rice husk, it is important to know the ensilability characteristics which have resulted from its chemical and microbial composition. The high DM content of rice husk about 90% assisted in its easy ensilability. The colour and odour of the ensiled rice husk at different weeks indicated that it can be preserved for longer periods. This implies that the activity of yeast has been reduced to improve preservation.

The ensiling of plant by-product is the most suitable method of conservation for long periods (Lien *et al.,* 1994). Ensiling improves palatability, reduces significantly toxic substances present in fresh leaves or plant by-products to safe level concentrations such as cyanogenic glycosides in fresh cassava leaves. Ensiling also increases digestibility of crude protein by breaking linkages between protein and fibre. It destroys harmful microorganisms possibly present in poultry litters or fish waste to be used as feed (Lee and Kayouli, 1998). It increases dry matter, lactic acid contents and NH3-N (Hang and Preston, 2007).

This study was undertaken to investigate the effects of fermented rice husk in broiler diets with 10% inclusion level by closely observing the growth performance of broiler.

The present study was designed with following objectives:

1. To asses the growth rate of growing broiler on fermented rice husk diet.
2. To find the effect of rice husk on carcass characteristics in growing broiler.

**CHAPTER II: MATERIALS AND METHODS**

The study was conducted on ten growing broilers of same age (22 days) and reared in poultry shed of department of dairy and poultry science for 7 days. The experimental broilers were grouped in 3 replications where R1 and R2 contained 3 broilers respectively and R4 contained 4 broilers.

**2.1 Preparation of fermented rice husk**

Rice husk was collected from local rice mill. Then this husk was sun dried properly. Mixtures of the rice husk and molasses were prepared using a ratio of 2 litter of water to 2 kg of rice husk and 100 ml of molasses (Fig. 1). The mixtures were packed in a polythene bag and gently compressed into 30 liter plastic bucket. The empty portion of the bucket was filled with soil to create anaerobic condition and allowed 7 days for fermentation (Fig. 2). After 7 days fermented rice husk was collected and sun dried properly.

Table 1: proximate composition of fermented rice husks at 7 days (A.O. Fasuyi and T. A. Olumuyiwa, 2013)

|  |  |
| --- | --- |
| **Parameters** | **Percentage** |
| Moisture | 10.6 |
| Crude protein | 4.8 |
| Crude fibre | 42.5 |
| Ether extract | 1.7 |
| Nitrogen free extract | 32.0 |
| ASH | 19.0 |

**ME (Kcal/100kg) is 2200**

**2.2 Feed formulation**

Table 2: Feed was formulated by following proportion (Fig. 3)

|  |  |
| --- | --- |
| **Ingredients** | **percentage** |
| Maize | 59 |
| Rice polish | 2 |
| Fermented rice husk | 10 |
| Soybean meal | 21 |
| Protein concentrate | 5 |
| Oil | 2 |
| Limestone | 1 |
| Enzyme | Trace amount |

**ME (Kcal/100kg) was 3025.45 and CP was 18.6%.**

Table 3: Feed cost per kg

|  |  |  |  |
| --- | --- | --- | --- |
| **Name of ingredients** | **Percentage of ingredients** | **Rate of ingredients/kg (TK)** | **Cost of ration (TK)** |
| Maize | 59 | 23 | 1357 |
| Rice polish | 2 | 20 | 40 |
| Fermented rice husk | 10 | 8 | 80 |
| Soybean meal | 21 | 58 | 1218 |
| Protein concentrate | 5 | 80 | 400 |
| Oil | 2 | 110 | 220 |
| limestone | 1 | 8 | 8 |
| Total | 100 |  | 3323 |

**So, feed cost per kg 33.23 Taka.**

**2.3 Housing**

House was cleaned and old litter material was removed. Rice husk was used as litter material (Fig. 5). Then broilers were purchased from a farmer and placed in the modern poultry shed which was made with wood, net and tin. Proper lighting was provided at night by 100 watt bulb.

**2.4 Feeding and watering**

Adlibitum feed and water was supplied to the birds throughout the experimental period. Fresh clean and cool drinking water was supplied all times in drinker. For each cage one feeder and one waterer were given. Before giving these cleaning and washing were done. Morning and evening we changed the feed and water. Feed residue was measured daily.

**2.5 Ventilation and curtain management**

Ventilation was facilitated to maintain good air quality for poultry and appropriate litter moisture for a healthy environment. It was confirmed by cross ventilation system to remove carbon dioxide and ammonia from poultry houses and to bring in oxygen.

**2.6 Sanitation**

Proper hygienic measure and sanitation program was followed during the experimental period. Feeder and drinker was cleaned regularly to prevent infection.

**2.7 Working procedure**

***2.7.1 Weight measuring***

Before placing in the house weight of the broilers were measured (Fig. 4) at 22nd days old and marking was given. After 7 days of rearing another weight was measured and recorded in the sheet.

***2.7.2 Processing of broilers***

After weighing the broilers were slaughtered by halal method (Fig. 6) and blood was removed. Feathers, skin and viscera was removed manually. Then dressed weight was recorded (Fig. 7). Abdominal fat was also removed and weighed in the balance (Fig. 8).

Fig 2: Ensiled rice husk

Fig 1: Addition of 5% molasses in rice husk

Fig 4: Weight measuring of broiler

Fig 3: Mixing of ingredients

Fig 6: Slaughtering of broiler by halal method

Fig 5: Broilers in shed

Fig 8: Weight measuring of abdominal fat

Fig 7: Weight measuring of dressed carcass

**CHAPTER III: RESULTS**

Table 4: Recorded body weight and feed intake per bird

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Replications** | **Serial No.** | **Body weight at 22 days old (gm**) | **Body weight at 29 days old (gm)** | **Weight gain (gm)** | **Feed intake(gm) in 7 days** |
| R1 | 1 | 790 | 1070 | 280 | 735 |
| 2 | 590 | 920 | 330 | 735 |
| 3 | 720 | 1050 | 330 | 735 |
| Average | 700 | 1013.33 | 313.33 | 735 |
| R2 | 4 | 700 | 1020 | 320 | 735 |
| 5 | 600 | 980 | 380 | 735 |
| 6 | 650 | 970 | 320 | 735 |
| Average | 650 | 990 | 340 | 735 |
| R3 | 7 | 750 | 1040 | 290 | 735 |
| 8 | 780 | 1050 | 270 | 735 |
| 9 | 740 | 1030 | 290 | 735 |
| 10 | 620 | 920 | 300 | 735 |
| Average | 722.5 | 1010 | 287.5 | 735 |

Table-4 shows that average body weight (gm) at 22 days old were 700, 650 and 722 respectively; average body weight (gm) at 29 days old were 1013.33, 990 and 1010 respectively; average weight gain (gm) were 313.33, 340 and 287.5 respectively and average feed intake was 735gm in R1, R2 and R3.

Table 5: Recorded dressed weight and fat weight per bird

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Replications** | **Serial No.** | **Live weight (gm)** | **Dressed weight (gm)** | **Dressing %** | **Fat weight (gm)** | **Fat %** |
| R1 | 1 | 1070 | 645 | 60.28 | 20 | 1.87 |
| 2 | 920 | 540 | 58.70 | 10 | 1.08 |
| 3 | 1050 | 640 | 60.95 | 20 | 1.90 |
| Average | 1013.33 | 608.33 | 59.98 | 16.67 | 1.62 |
| R2 | 4 | 1020 | 610 | 59.80 | 18 | 1.76 |
| 5 | 980 | 560 | 57.14 | 17.5 | 1.79 |
| 6 | 970 | 550 | 56.70 | 17 | 1.75 |
| Average | 990 | 573.33 | 57.88 | 17.5 | 1.77 |
| R3 | 7 | 1040 | 640 | 61.54 | 21 | 2.01 |
| 8 | 1050 | 650 | 61.90 | 21 | 2.00 |
| 9 | 1030 | 630 | 61.17 | 19 | 1.84 |
| 10 | 920 | 520 | 56.52 | 16 | 1.74 |
| Average | 1010 | 610 | 60.28 | 19.25 | 1.90 |

Table-5 shows that average live weight (gm) were 1013.33, 990 and 1010 respectively; dressed weight (gm) were 608.33, 573.33 and 610 respectively; average dressing percentage were 59.98, 57.88 and 60.28 respectively; average fat weight (gm) were 16.67, 17.5 and 19.25 respectively and average fat percentage were 1.62, 1.77 and 1.90 respectively in R1, R2 and R3.

Table 6: Production performance of growing broiler fed on diets containing fermented rice husk

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Age (days)** | **Replications** | | **Traits** | | | | |
| **Initial body weight (gm)** | **Final body weight (gm)** | **Weight gain (gm)** | **Feed intake (gm)** | **Adjusted FCR (Feed intake/Weight gain)** |
| 22 | R1 | | 700 |  |  |  |  |
| R2 | | 650 |  |  |  |  |
| R3 | | 722.5 |  |  |  |  |
| 29 | R1 | |  | 1013.33 | 313.33 | 735 | 2.35 |
| R2 | |  | 990 | 340 | 735 | 2.16 |
| R3 | |  | 1010 | 287.5 | 735 | 2.56 |
| Average |  | 690.83 | | 1004.44 | 313.61 | 735 | 2.36 |

Table-6 shows that average initial body weight was 690.83gm, average final body weight was 1004.44gm, average live weight gain was 313.61gm and average adjusted feed conversion ratio (FCR) was 2.36 in 3 replications.

Table 7: Carcass characteristics

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Traits** | **Replications** | **Live weight (gm)** | **Dressed weight (gm)** | **Dressing**  **% (live weight basis)** | **Fat weight (gm)** | **Fat % (Live weight basis)** |
| Dressing yield | R1 | 1013.33 | 608.33 | 59.98 |  |  |
| R2 | 990 | 573.33 | 57.88 |  |  |
| R3 | 1010 | 610 | 60.28 |  |  |
| Fat yield | R1 |  |  |  | 16.67 | 1.62 |
| R2 |  |  |  | 17.5 | 1.77 |
| R3 |  |  |  | 19.25 | 1.90 |
| Average |  | 1004.44 | 597.22 | 59.38 | 17.81 | 1.80 |

Table-7 shows that average live weight was 1004.44gm, average dressed weight was 597.22gm, average dressing percentage was 59.38, average fat weight 17.81gm and average fat percentage was 1.80 in 3 replications.

Table 8: Cost analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Replications** | **Adjusted FCR** | **Feed cost/kg (Taka)** | **Feed cost/kg live weight (Adj. FCR\*Feed cost/kg) in Taka** | **Revenue/kg live weight (Market price/kg live weight-Feed cost/kg live weight) in Taka** |
| R1 | 2.35 | 33.23 | 78.09 | 51.91 |
| R2 | 2.16 | 33.23 | 71.78 | 58.22 |
| R3 | 2.56 | 33.23 | 85.07 | 44.93 |
| Average | 2.36 | 33.23 | 78.31 | 51.69 |

Market price of broiler was 130 taka/kg live weight.

Table-8 shows that average gross revenue was 51.69 taka.

**CHAPTER IV: DISCUSSION**

It has been reported that the addition of molasses at 4-6% inclusion in silages increased palatability (McDonald *et al.,* 2002). This was manifested in the uniformity of feed consumption for all the experimental birds. The length of ensiling seemed to have significant effect on the overall performance of experimental chicks. There seemed to be a favorable and beneficial disposition to increased ensiling duration particularly at the 21-day fermentation of rice husk. The uniformity in feed consumption of all chicks indicated that the rice husk fibre was not a major limitation to feed intake by chicks and that ensiling of rice husk might have successfully broken down complex linkages between fibre and protein. Addition of molasses at 4-6% level of inclusion might have contributed to the increased palatability of fermented rice husk as corroborated by earlier report (McDonald *et al.,* 2002). However, further prolonged fermentation of rice husk had a deteriorating effect on the overall performance characteristics in spite of the highest crude protein and crude fibre compositions in rice husk 5.26 and 43.3%, respectively. This was in agreement with earlier reports (McDonald *et al.,* 2002; Fasuyi *et al.,* 2010). Ensiling materials for longer periods than necessary causes decrease in crude protein content due to the denaturation of the proteins by excess organic acids. Adding molasses at 4% of ensiled material and later ensiling for a period of 7 days appeared optimum and most suitable for effective ensiling of Tithonia diversifolia (Fasuyi *et al.,* 2010). This agreement sharply support the present study.

Increased dietary fibre levels may also be contributory to poor nutrient utilization. It was observed that high fibre content of diets caused decrease nutrient utilization by chicken (Savory and Gently, 1976). The high fibre content in diet must have reduced its utilization since high crude fibre feed have been found to depress feed efficiency through the impaction of the intestinal tract (Clark and Myra, 1977). The performance characteristics investigated such as weight gain, feed consumption, feed conversion ratio all indicated that chicks on diet had the poor performance indices in the present study. The utilization of Ensiled Rice Husk (ERH) based diets by growing broiler at the levels of inclusion without any visible side effect or mortality showed that the fibre content of Ensiled Rice Husk was within tolerable level for growing broilers. The ensiling process was effective in breaking the linkages between the fibre and protein (Hang and Preston, 2007). This was confirmed by increase in crude protein level as the ensiling length increased (A.O. Fasuyi and T.A. Olumuyiwa, 2013). The favourable carcass characteristics in birds on might be due to the successful breakdown and conversion of fibre in the ensiled rice husk to more soluble and easily utilized sugars. Cellulose and lignin might have been converted to hemicellulose and pectin. Prolonged fermentation of rice husk had a deteriorating effect on the overall performance characteristics including carcass/organ characteristics of the experimental chicks in spite of the highest crude protein and crude fibre compositions in rice husk fermented for long days as corroborated (McDonald *et al.,* 2002; Fasuyi *et al.,* 2010). It was suggested that the carcass cuts with the highest weight in broilers are the drumstick, thigh and chest and that this weight cuts depends on dressed weight, sex, size and age of the bird (Leeson and Summers, 1980). This experiment seemed to agree with this report since the birds used for carcass characteristics were similar in age and sex. The source of variation in their carcass cuts might only be due to their body size.

Feed cost is the most expensive input in poultry production as it constitutes about 70-80 percent of the real cost of production for intensively reared stocks(Omeje *et al.,* 1999; Ijaiya *et al.,* 2004). So reducing feed cost is one of the challenges in broiler production. A major solution to the problem of rising feed costs is using some non-conventional feed resources like rice husk in ceratain proportions in the broiler ration (Onyimonyi and Onukwufor, 2003). So fermented rice husk was used in the study to reduce feed cost.

**LIMITATIONS**

The limitations of my study were small population size and short rearing period. Feed (mash feed) intake of the experimental broilers were not adlibitum because they used to intake pellet feed in the farm. As a result body weight gain and feed conversion ratio was not satisfactory.

**CONCLUSION**

Ensiling rice husk before incorporation into broilers diet had a nutritionally beneficial effect. Rice husk ensiled for 7 days with 5% molasses additive had the most beneficial effect on the growth and other performance and carcass characteristics of the experimental broiler chickens.Economy of production also favoured the use of rice husk ensiled for 7 days and incorporated at 10% inclusion level. It therefore suffices to conclude that broiler birds can perform well on diets in which rice husk is ensiled for a period of 7 days and fed at inclusion levels not exceeding 10%.

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I am Mizanur Rahman, son of Mr. Rashid Ahmed and Mrs. Amena Khatun. I passed Secondary School Certificate examination in 2008 (G.P.A-5.00) followed by Higher Secondary Certificate examination in 2010 (G.PA-4.80). Now I am an intern veterinarian under the Faculty of Veterinary Medicine in Chittagong Veterinary and Animal Sciences University. In the future I would like to work as a veterinary practitioner and do research on clinical animal diseases in Bangladesh.