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RESEARCH ARTICLE

COMPARING THE PERFORMANCE OF BROILER CHICKENS FED PELLETIZED AND RE-GROUND PELLETIZED FEED UNDER DEEP LITTER HOUSING SYSTEM

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ABSTRACT

A total of one hundred and fifty day old broiler chicks were used to comparably evaluate the performance of birds fed pelletized diet and those fed re-ground pelletized feed. At the end of brooding, the birds were grouped into three of fifty birds each, with each treatment group having five replicates of ten birds per replicate. The first group of birds were fed on 100% whole pelletized feed, the second group were fed on 100% reground pelletized feed, while the third group of birds were fed on 50% whole pelletized feed and 50% reground pelletized feed. The results showed significant ($P<0.05$) differences in the final weight, initial weight, feed conversion rate, weight gain and daily weight gain. The feed intake showed no significance ($P<0.05$) difference. Also there were significant ($P<0.05$) differences in the live weight, defeathered weight, dressed weight, wing weight, thigh weight, drumstick weight, chest cavity weight and backcut weight. There were no significant ($P<0.05$) differences in the cut parts expressed as percentage of the dressed weight. Furthermore, there were significant ($P<0.05$) differences in the weight of the liver, heart, gizzard and proventriculus. There were no significant ($P<0.05$) differences in the weight of the spleen and kidney. For the organs expressed as percentage of the defeathered weight, the heart, spleen and kidney were not significantly ($P<0.05$) different; while the liver, gizzard and proventriculus were significantly ($P<0.05$) different.

INTRODUCTION

For over eight decades, researchers have sought ways of enhancing feed efficiency, such that growth rate may be improved to boost up broiler meat yield (Gadzirayi *et al.,* 2006). Many researches have been carried out on improving feed intake using mash and pelletized feed.

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In a work, it was observed that feed intake increases as particle size increases resulting in increased growth of birds (Mutetwa, 2001). He also reported that there was no significant difference in terms of growth and feed consumed between birds fed on mash and pellets during the first two weeks; however, when the chickens were two to three weeks of age, there was a consumption of 40%

more of pelletized feed than mash feed. In a study, Mcdonald (1987) reported that mash feed tends to stick to the inside of the chicken's beak, resulting in a fall in food intake and consequently reduced rate of growth. Banerjee (1987) reported that feed intake is stimulated by granulation of the feed. Birds fed on pelletized ration consumed their feed in a shorter time than birds fed on mash feed. Hussar and Robblee (1962) reported that reground pellets did not affect early bird performance; however, as the birds mature, birds fed whole pellets had better growth and feed conversion. Hull et al., (1968) reported that birds fed pelletized diets had a 5% better feed conversion, but regrinding the pellets resulted in lower feed conversion than the meal diet. A field study conducted by Scheideler (1991) indicated that birds fed 75% whole pellets as compared to 25% whole pellets had better feed conversion.

Pelletizing was introduced into Europe about 1920 and into United States of America (USA) in the late 1920s (Schoeff, 1994). Today, the process is widely used because of both the physical and the nutritional benefits it provides. The physical benefits include improved ease of handling, reduced ingredient segregation, less feed wastage, and increased bulk density. As a rule, feeding pelletized feed improves animal performance and feed conversion compared with feeding a mash form of a diet. The improvements in performance have been attributed to decreased feed wastage, reduced selective feeding, decreased ingredient segregation, less time and energy expended for prehension, destruction of pathogenic organisms, thermal modification of starch and protein, and improved palatability (Behnke, 1994). Adhesion is the process by which materials are held together by a physical to chemical interaction of the material. This is accomplished by joining the surfaces of the material by melting the materials together or by applying an adhesive between them. An adhesive is defined as a material which, when applied to surfaces, can join them together and resist separation (Wake, 1976). It should be obvious that in pelletizing, we seldom apply an adhesive; however, we do try, through temperature and moisture control, to activate the natural adhesives that are typically found in the feed ingredients. As a rule, the finer the grind, either pre- or post-grind, the better the pellet quality. The addition of fat to the mash pre-pellet usually results in decreased pellet quality (Richardson and Day, 1976; Headly and Kershner, 1968); however, the addition of protein and fibrous materials increase pellet quality. Fahrenholz (1989) reported an increase in the pellet durability of swine diet pellets as the level of wheat middlings increased from 0 – 45%. McKee (1988) increased pellet quality and water stability of catfish diets by increasing the level of wheat gluten from 0 – 10%. Lopez (1993) also reported the addition of vital wheat gluten resulted in a positive effect on pellet quality and water stability, but the addition of cassava meal had a negative effect. Lawton (1990) reported a linear increase in tensile strengths as the amount of protein in a tablet increased at the expense of starch.

High levels of heat and moisture are needed to achieve proper pelletizing of grain-based diets that are high in starch (MacBain, 1966). According to Reimer and Beggs (1993), the purpose of heat in feed pelletizing is to gelatinize the starch portion of the feed. Other benefits of heat are to destroy pathogens and other micro-organisms, and to promote drying of pellets in the cooler. Smallman (1996) explains that the moisture contribution from steam forms a cohesive bridge between particles and has a profound effect on pelletizing. This moisture soaks into materials to soften them, and has been found to act as a lubricant to reduce friction between the mash and the walls of the die (Skoch et al., 1981). To optimize the conditioning process, the proper balance of heat and moisture must be obtained. Steam has the ability to provide this combination, however, it exhibits a wide variety of properties that must be understood and correctly utilized to produce high quality pellets.

MATERIALS AND METHODS

This experiment was conducted at the poultry unit of the Teaching and Research Farm of College of Veterinary Medicine, Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria. Umudike is located at latitude 5^{o} 29$^{!}$ North and longitude 1.7^{o} 32$^{!}$ East in the rain forest zone of Nigeria. The climate of the region is characterized

Table 1. Values of Growth parameters of birds fed on pelletized and reground pelletized feed

Parameters	100% Pelletized	100% Reground Pelletized	50% Pelletized & 50% Reground pelletized	SEM
Av. Final wt (g)	1870.00^{a}	1600.00^{b}	1750.00^{a}	55.85*
Av. Initial wt (g)	380.00^{b}	330.00^{c}	730.00^{a}	12.27*
Av. Wt gain (g)	1490.00^{a}	1270.00^{b}	1020.00^{c}	54.40*
Feed intake (g/day/bird)	126.00	117.00	121.00	8.86^{ns}
Wt gain (g/day/bird)	53.21^{a}	45.36^{b}	36.43^{c}	1.87*
FCR	2.37^{b}	2.58^{b}	3.32^{a}	0.21*

*a – c on the same column with different superscripts are significantly different (P < 0.05)
* * = significant; *ns = not significant; *SEM = standard error of mean

Table 2. Carcass values of birds fed on pelletized and reground pelletized feed

Parameters (parts expressed as % of dressed wt.	100% Pelletized	100% Reground pelletized	50% Pelletized & 50% reground pelletized	SEM
Live wt (g)	2300.00^{a}	1500.00^{b}	2100.00^{a}	114.15*
Defeathered wt (g)	2100.00^{a}	1300.00^{c}	1800.00^{b}	63.33*
Dressed wt (g)	1400.00^{a}	900.00^{b}	1300.00^{a}	118.37*
Wing wt (g)	155.45^{a}	113.30^{b}	152.30^{a}	13.17*
Wing (%)	11.04	12.58	11.73	1.05^{ns}
Thigh wt (g)	219.55^{a}	140.95^{b}	216.50^{a}	15.77*
Thigh (%)	15.59	15.65	16.67	1.47^{ns}
Drumstick wt (g)	213.90^{a}	118.70^{b}	190.20^{a}	13.04*
Drumstick (%)	15.19	13.18	14.65	1.35^{ns}
Chest cavity wt (g)	461.10^{a}	326.45^{b}	416.80^{a}	22.48*
Chest cavity (%)	32.74	36.24	32.09	2.11^{ns}
Backcut wt (g)	350.00^{a}	200.60^{b}	324.20^{a}	26.42*
Backcut (%)	24.85	22.27	24.96	1.88^{ns}

*a – c on the same column with different superscripts are significantly different (P < 0.05)
* * = significant; *ns = not significant; *SEM = standard error of mean

Table 3. Organ weights of birds fed on pelletized and reground pelletized feed

Parameters (organs expressed as % of defeathered wt.	100% Pelletized	100% Reground pelletized	50% Pelletized & 50% reground pelletized	SEM
Liver wt (g)	50.55^{b}	32.60^{c}	56.50^{a}	1.28*
Liver (%)	2.43^{b}	2.51^{b}	3.16^{a}	0.12*
Heart wt (g)	9.25^{a}	5.65^{c}	7.00^{b}	0.38*
Heart (%)	0.44	0.44	0.39	0.05^{ns}
Spleen wt (g)	1.85	1.25	1.30	0.29$_{ns}$
Spleen (%)	0.09	0.10	0.07	0.02^{ns}
Kidney wt (g)	16.30	12.85	16.00	1.72^{ns}
Kidney (%)	0.78	0.99	0.90	0.16^{ns}
Gizzard wt (g)	41.70^{a}	28.00^{b}	27.20^{b}	2.35*
Gizzard (%)	2.00^{a}	2.16^{a}	1.52^{b}	0.15*
Proventriculus wt (g)	14.00^{a}	5.30^{c}	8.40^{b}	1.08*
Proventriculus (%)	0.67^{a}	0.41^{b}	0.47^{b}	0.09*

*a – c on the same column with different superscripts are significantly different (P < 0.05)
* * = significant; *ns = not significant; *SEM = standard error of mean

by a mean daily temperature of between 27^{o}C and 35^{o}C all through the year. Average rainfall of Umudike is about 2000mm per annum. A total of ne hundred and fifty day old broiler chicks were purchased for the study. The chicks were weighed and brooded together for three weeks. At the end of brooding, the birds were grouped into three of fifty birds each, with each treatment group having five replicates of ten birds per replicate. The first group of birds were fed on 100% whole pelletized feed, the second group were fed on 100% reground pelletized feed, while the third group of birds were fed on 50% whole pelletized feed and 50% reground pelletized feed. Feed and water were provided ad-libitium.

The basal starter diet consisted of 24% crude protein and 3,000 Kcal/Kg of metabolizable energy. The finisher diet consisted of 19% crude protein and 2,900Kcal/Kg of metabolizable energy. The starter diet which was in mash form was fed during the brooding phase, while the pelletized and reground pelletized feeds were fed from the fourth to the eight week. Daily weight gain of each of the replicates was recorded. At the end of eight weeks experimental period, a bird was selected from each of the replicates, fasted overnight and weighed before slaughtering for organoleptic studies. The defeathered and dressed weights were recorded. The body parts and internal organs were removed and weighed individually. The percentage body parts of the dressed weight and percentage organ parts of the defeathered weight were also determined. All the collected data were subjected to statistical analysis using Analysis of Variance (ANOVA) according to Steel and Torrie (1980). Differences between the treatments means were separated using Least Significance Difference (LSD). Table 1 shows the mean values of the growth parameters. From the table, there were significant ($P<0.05$) differences in the final weight, initial weight, feed conversion rate, weight gain and daily weight gain. The feed intake showed no significance ($P<0.05$) difference. Table 2 shows the carcass values of the birds. From the table, there were significant ($P<0.05$) differences in the live weight, defeathered weight, dressed weight, wing weight, thigh weight, drumstick weight, chest cavity weight and backcut weight. There were no significant ($P<0.05$) differences in the cut parts expressed as percentage of the dressed weight. Table 3 shows the organ weight value of the birds. It shows significance ($P<0.05$) differences in the liver, heart, gizzard and proventriculus. There were no significant ($P<0.05$) differences in the spleen and kidney. For the organs expressed as percentage of the defeathered weight, the heart, spleen and kidney were not significantly ($P<0.05$) different; while the liver, gizzard and proventriculus were significantly ($P<0.05$) different.

DISCUSSION

Birds fed 100% pelletized feed had better growth values than 100% reground pelletized feed and 50% pelletized and 50% reground pelletized feed. Though there was no significant ($P<0.05$) difference in the daily feed intake, the superior value of thee 100% pelletized was in agreement with the findings of Mutetwa (2001). 100% pelletized had the best feed conversion rate which is in accordance with Hussar and Robblee (1962). It was also observed that birds that were fed 100% reground pelletized feed had better performance than birds fed 50% pelletized and 50% reground pelletized feed. The equal percentage composition of pelletized and reground pelletized feed may have affected the positive effect of the pelletized feed; hence there will be need to try pelletized and reground pelletized feed at different percentages. In conclusion, 100% pelletized feed is recommended for broiler production, as against 100% reground pelletized or 50% pelletized and 50% reground pelletized feed. But it should be borne in mind that the beneficial effect of 100% pelletized feed is seen after the third week of production.

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