

EFFECT OF PHYSICAL FEED STRUCTURE ON THE PERFORMANCE OF BROILERS

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ABSTRACT

The effect of physical structure of broiler's feed (pelleted vs. mash feed) on their performance was studied in this trial. Two groups of 300 commercial broilers each (ROSS-308) were created. The control group was fed with mash feed, while the experimental group was fed crumbled feed during the starter phase first three weeks (0-3 weeks) and then pelleted feed until the end of the life (slaughtering). Both feeds were of identical composition and formulation as well as same environmental and management conditions were provided for both groups. At the end of this trial, it was observed that broilers fed with pelleted feed had a 6-7% higher body weight, a higher carcass weight and a higher meat yield ($P < 0.01$). The same conclusion was drawn on the flock uniformity. The pelleted feed fed group demonstrated a more efficient feed conversion rate (1.81kgfeed/kg live weight). These results clearly demonstrate the advantages of using the crumbled/pelleted feed vs the mash one, since the production parameters of commercial broilers show it.

Keywords: broilers; crumbles; live weight; mash feed; pellets.

INTRODUCTION

Feed comprises about 60-70% of the total cost of broiler meat (Banerjee, 1998). The physical form of feed (mash vs. pelleted) plays an important role in the production of broilers' meat and affects both the cost of meat and the performance of broiler production. The pelleted feed is a better alternative compared to the mash form of it. It consists of mechanical pressing of the mash feed into pellets, which are more compact as such (Banerjee, 1988). The main advantage of using pelleted feed consists in the fact that it minimizes feed losses, while its disadvantage is that it is about 10% more expensive than mash feed. Asha Rajini *et al.* (1999) reported that the pellets influence to improve the feed conversion rate for chicks up to 6weeks. On the other hands Moran (1990), studied and concluded that the use of pelleted feed improved chicken's body weight.

Recently broilers grower successfully used crumbled feed. Choi *et al.* (1986) concluded that the crumbled feed fed broilers consumed more feed. Application of each physical structure of feed has several advantages and disadvantages. Efficiency, digestibility, and feed conversion for each form of feed used are also different. As far as the above statement is concerned, a modest study was carried out, in order to be able to test the effect of physical structure of feed (mash, crumbled and pelleted) on broilers' performance.

This trial was aimed at observing the effect of using the pelleted feed on the dynamics of growth, the homogeneity of the flock, FCR, and other indicators of broiler production.

MATERIALS AND METHODS

The experiment was conducted in a broiler farm in Kaduna. The flock was made of 308 day old chicken. Based on the principle of comparative analogy from the stand point of breed, age, productivity and health status, 2 groups of 300 birds each were established. Throughout the trial period the chicks were kept in the environment (house), raised on deep litter, and under the same environmental conditions, equal treatment and service.

During the growth period, both groups were fed with two kinds of feeds (starter 0-3 weeks. But while the control group was fed with mash feed, the experiment one was fed crumbled feed for the first stage (0-3 weeks) and pelleted one for the finisher stage. All the feed was produced at the "AGROTEK" feed-mill.

Table 2: Feed formulas and respective composition applied for both groups (%)

Ingredients	Starter & Grower Stage Feed	Finisher Feed
Maize 8.5% CP	38.5	40.4
Soy bean oil	2.5	4.1
Wheat 12% CP	20.0	25.0
Soya Hipro 48% CP	33.8	26.7
Limestone 36	1.2	0.9
Dicalcium phosphate 18.5P/26CA	1.1	0.4
KBFP 2.5	0.0	2.5
KBSP 2.5 Sa	2.5	0.0
Total	100	100

Calculated composition

ME (Keal/Kg)	3000	3196.75
Crude protein (%)	22.64	19.96
Crude fat (%)	5.14	6.74
Crude fiber (%)	3.02	2.87
Dlys-P (%)	1.05	0.89
dMeth-P (%)	0.44	0.39
dM+C-P (%)	0.74	0.67
calcium (%)	0.90	0.61
P. Total (%)	0.60	0.45

The following indicators were recorded and or measured:

- Day old chicks' body weight at the beginning of the experiment, which was monitored every week until the end of the experiment. For this purpose, 5% (15 chickens) of the randomly selected chicken were weighed at the same day and time before eating.
- Flock uniformity: for this purpose the Cv was calculated based on the relevant tables of Ross Guide and based on this, the flock's uniformity was evaluated. The coefficient of variation was calculated as follows:

$$CV, \% = \left[\frac{\text{standard deviation (g)}}{\text{average Body weight(g)}} \right] \times 100$$

Feed consumption per each group (in kg). at the end of each period, the quantity of the used feed by each group was calculated. These data were used to calculate the Feed Conversion Rate per kg of live weight.

Calculation of the total feed consumption/bird and per kg of gain weight.

Carcass traits: at the end of the experiment, 10 broilers/group were sampled and the following indicators were measured and/or calculated: live weight, carcass weight, meat yield, heart weight, liver weight, the gizzard weight. All chicks were manually slaughtered, in order to get a more accurate assessment of the above-mentioned indicators.

For each stage of growth (starter + grower and finisher) the relevant Vitamin and Mineral Premix was applied. The obtained results according to described methodology were statistically processed through the descriptive statistics methods and ANOVA.

RESULTS AND DISCUSSION**Body weight**

In table 2, the average body weight, monitored week after week for both groups is evidenced. At the table above, it can be seen that starting from the fourth week, the group fed with crumbled feed (during the first stage of growth) and pelted feed (during the second stage) shows the highest body weight. These findings regarding the superiority of the experimental group can be synthesized in the figures as following: in the second week 7.6kg, or 2.1% more, in the third week, 34.3g, or 4% more,

in the fourth week, 109g, or 9%. Moreover, in the fifth week 197.7 or 11.2% more, in the sixth and the last week 176.3g or 6.7% more.

These results are similar to studies carried out by Preston (2000) and Munt ? (1995), who presented a significantly weaker performance in birds fed with mash feed. Kim and Chung (1994) showed that birds fed with mash feeds at the age of 41 days had a lower body weight than those fed with crumbled and pelleted feed. Reece etc. (1985). Auckland and Fulton (1972), Runnels, ?? (1976) and Choi, etc. (1986) also claimed that the crumbled feed gave better results in the growth of broiler than that in other forms.

Table 2 (use insert table to prepare table as in table 3): Average body weight (g) of broiler birds according to their age in weeks for each group

Week	Control	Experiment	Level of significance
Day 1	46.73 ± 4.184	46.67 ± 5.589	NS
1	181.33 ± 5.815	180.87 ± 9.433	NS
2	358.67 ± 9.537	366.33 ± 9.537	NS
3	859.67 ± 58.872	897.00 ± 40.143	NS
4	1211.33 ± 86.344	1320.33 ± 82.494	S
5	1761.33 ± 184.405	1959.00 ± 224.350	S
6	2617.00 ± 162.698	2973.33 ± 123.554	S

Note: The sign “S” indicates that the differences between groups were statistically significant, while “NS” indicates the fact that the differences are statistically non-significant.

Table 3. Comparison of uniformity of birds among the groups by weeks

Week	Control			Experiment		
	M±SD	CV (%)	Uniformity(%)	M±SD	CV (%)	Uniformity (%)
Day 1	46.73 ± 4.2	8.95	(73.3)	46.67 ± 5.59	11.13	(63.7)
1	181.33 ± 5.8	3.20	(over 95)	180.87 ± 9.43	5.22	(95.4)
2	358.67 ± 9.5	2.66	(over 95)	366.33 ± 9.54	2.60	(over 95)
3	859.67 ± 58.9	6.85	(84.7)	897.00 ± 40.14	4.49	(95.4)
4	1211.33 ± 86.34	7.13	(84.7)	1320.33 ± 82.49	6.25	(90.4)
5	1761.33 ± 84.41	10.47	(68.3)	1959.00 ± 224.35	9.92	(68.3)
6	2617.00 ± 62.69	6.22	(90.4)	2973.33 ± 123.55	4.42	(Over 95)

As shown in the table 1, both flocks of birds under this trial, did not have a satisfactory homogeneity. During the first and the second week, this homogeneity is significantly improved by taking the optimal value for both groups. In subsequent weeks the experimental group noted the superiority for this indication. An exception is made in the fifth week, where surprisingly the two groups had an average uniformity. So we can conclude that although both groups observed a satisfactory uniformity, the group fed with pelleted feeds seems to be more superior for this index. High flock uniformity, gives growers better chances of efficient feed use. Many managers recognize the value of 80% (± 10%) or 85% (± 15%) as a standard of uniformity (S. Leeson, J.D. Summers, 2000). Table 4 shows the average weight gain per bird per week and per day.

Table 5: Weekly and daily weight gain for birds of each group by weeks

Control	Experiment			
1	134.6	19.23	134.2	19.17
2	177.34	25.33	185.46	26.49
3	501.00	71.57	527.67	75.38
4	351.66	50.24	426.33	60.90
5	550.00	78.57	638.67	91.24
6	855.67	122.24	834.33	119.19

If the gain (weekly and daily) for the first week was similar for both groups, we cannot say the same for the coming weeks. Respectively for the third, fourth and fifth week the superiority of the experimental group can be easily noted. This fact is significant, since it was also clearly evidenced at the time of the slaughter. So, feeding the broilers with crumbled and later on pelleted feed has shown its effect, through making possible higher gain and eventually, highly body weight at the end of growth.

Sihna *et al.* (1994) and Reece *et al.* (1985) reported that mash feed application, leads to a lower gain compared to the crumbled. Asha Rahini *et al.* (1998), Deaton *et al.* (1992). Kamar *et al.* (1974) and Bertechini *et al.* (1992) reported that birds fed with pelleted feed reached higher body weight than those fed on mash fees. Allred *et al.* (1996) also reported that birds grew faster when fed with crumbled and/or pelleted feed compared with those who received the same diet but in a mash form.

Table 5: Feed conversion according to the age in weeks for each group

Week	Control	Experiment	Value of P	F	F Critical
1	1.00	1.00			
2	1.49	1.43			
3	0.88	0.83			
4	2.68	2.21			
5	2.96	2.55			
6	2.77	2.84			
Total	1.96±0.95	1.81±0.84	0.78	0.09	4.96

Table 5 clearly indicates that the group of experiment indicates a tendency towards the improvement of feed conversion rate, starting from the second week of life until the end of the growth cycle. For the entire growth period the average or 7.7% less feed per unit of weight.

As stated in the Ross's Broilers Management Guide, 2009, we see that the coefficient of utilization of feed has a value of 1.75%, while we see that the best rate achieved in the experiment group was 1.81, or 3.4% higher than standard. A more accurate correction of micro climate parameters, particularly temperature and a better ratio between air temperature and humidity, could contribute to reducing feed consumption and therefore to improvement of the economic efficiency.

According to Moran (1990) and Reece *et al.* (1986), the pelleted feed had a better efficiency of feed utilization/conversion than the mash feed. How Lieder and Rose (1992) concluded that the pelleted feed increased the extent of conversion with 5.9%. In the same way, Reece (1984) reported that the use of crumbled feed improved the conversion rate to a level of 1.5%.

Table 6: Slaughtered sample analysis of both at the end of the experiment (M±SD)

Parameters	Control	Experiment	Value of P	F	F Critical
Body weight (g)	2492.5 ± 318.83	2773.5	± 0.025	5.949	4.414
Carcass weight (g)	1782 ± 230.65	176.29	0.004	10.632	4.414
Meat yield (%)	71.51 ± 2.20	2055.5	± 0.008	8.91	4.414
Heart weight (g)	14.5 ± 2.84	130.97	0.441	0.621	4.414
Liver weight (g)	70 ± 12.47	74.13 ± 1.69	0.704	0.144	4.414
Stomach weight (g)	7.5 ± 2.37	15.5 ± 2.84	0.388	0.783	4.414
Gizzard weight (g)	37 ± 5.37	72 ± 10.59	0.857	0.033	4.414
Gut weight (g)	168.5 ± 34.16	8.5 ± 2.42	0.255	1.385	4.414
Abdominal fat (g)	42.37 ± 5.42	37.5 ± 6.77	0.852	0.031	4.414

The above table clearly shows the difference in weight between the two groups. The difference is statistically significant in favour of the experiment group. The same thing is observed for carcass weight, even higher differences. In birds of the experiment group the meat yield is significantly improved at a rate of 2.65%. In terms of weight of internal organs, mentioning the weight of the heart,

stomach, liver, gizzard, abdominal fat and intestinal weight, differences are not statistically significant. Of course, slightly higher weight was observed in the relevant broilers fed with pelleted feed, but these can only be considered a trend.

CONCLUSION

Broilers fed with crumbled and later on pelleted feed showed a better performance as far as the body weight and daily gain, compared with the ones fed with mash feed; Broilers fed with pelleted feed showed a tendency for a better flock uniformity; Application of crumbled/pelleted feed in broilers influenced towards as-light improvement of the Feed Conversion Rate (FCR).

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