RESEARCH ARTICLE (Open Access)

Broiler Performance Fed on Mash vs. Pellets

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Abstract:

A total of 600 broiler chicks (ROSS-308) were randomly assigned into two analogous groups to one of two treatments: one of the group was fed on mash while the other one on pellet diet in the age duration of 21 to 43 days, aiming to compare the performance of broilers on two dietary groups. Both groups of chicks consumed the same feed ration/formula and were housed in the same building in adjacent rooms, under same environmental conditions and access to feed and water. During the whole period of trial, both body weight and the gained weight resulted to be higher (with significant difference) to the group of chicks fed with pellet feed. A clear trend was noted towards the improvement of feed consumption per unit of gained weight of the chicks under the experimental group ($p \leq 0.05$). For the entire period of the experiment, the experimental group of chicks consumed 0.27g feed/g of live weight, or 9.64% less feed/unit of gained weight compared with the control group. Use of pellet feed influenced the improvement of the performance index to a level of 15, 41%. The group fed on pellet feed during the trial period demonstrated the highest values of PEF (19.69% more) and technical performance. The results of this experiment give an impression that pellet feed is better than mash one for the production of commercial broilers, applied for the age duration of 21 to 43 days.

Keywords: broilers, growth rate, live weight, mash, pellets

Introduction

Feed currently incurs 60-65% of the total cost of broiler production. The physical form of feed (mash, pellet and crumble) is a key factor in meat yield of broiler [14]. Pellets are the primary feed form for commercially-reared broilers. Feeding pelleted feed, improves broiler performance and feed conversion rate compared with feeding a mash form of the diet [9]. The improvements in performance are attributed to: decreased feed waste, reduced selective feeding, decreased ingredient segregation, destruction of pathogenic organisms, improved palatability, etc [4].

Authors [15, 17] observed that feed intake increased as particle size increased, resulting in increased growth rate of birds. Similar results were reported by [3] that feed intake is stimulated through crumbling the feed. Asha Rajini [2] reported that the pelleted feed influences on the FCR improvement at broilers up to 6 weeks of age.

Over the time, industry has moved from a simple measure of chicken weight, to weight for age, mortality, FCR, and more recently production efficiency factor (PEF) and performance index (PI). Together with growth rate, days to market and mortality, feed efficiency has been considered as one of the important parameters in assessing the potential of bird strain or feeding program *etc* [22].

Research has concentrated primarily on the benefits of feeding pellets versus mash feed. In this situation the current study has been undertaken to compare the effect of feeding mash and pellet feeds on growth rate, feed efficiency and on the productive performance of broiler.

2. Material and Methods

Based on the principle of comparative analogy from the standpoint of breed (hybrid), age, productivity and health status, 2 groups of 300 birds each of 21 days old, were established. Throughout the trial period the birds were kept in the same environment (house), all kept on the littered floor (horizontal), and environmental conditions, equal treatment and service (based on "Management Guide Broilers, Ross" 2009). Both groups were treated with the same structure of diet throughout trial period. But while the control group was fed with mash feed, the experiment one was fed on crumbled and/or pelleted feed.

The used feed made available the following nutritive values (table 1).

The following indicators were recorded:

- Consumed feed (in kg) per each group. Based on which, the total feed consumption per bird and per
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kg of the gained weight (Feed Conversion Rate – FCR) was calculated;

- 5 % of the chicken of each group were weighed at the first day of the experiment and at the end of every week. Weighting of the targeted group was done in the same hour, before eating feed, for 15 chicks of each group
- The performance index (PI) for both groups was calculated for each week. The Performance Index [11] was calculated as follows:

  IP = (Live weight / FCR) x100

  Where:

  IP − Performance Index

  FCR − Feed Conversion Ratio
- The production efficiency factor (PEF) was calculated each weeks for each group through the following formula [22]:

PEF = (flock livability x average live weight/average kill age x feed conversion) x 100

The obtained results according to the methodology were statistically processed and average values, variation, the significance of the differences were calculated (through the descriptive statistics methods and ANOVA, while the tTest was applied for the comparisons).

Table 1. Composition of the experimental diet

Ingredients	***Finisher Feed (%)***
Corn 8.5% CP	40.4
Soybean oil	4.1
Wheat 12% CP	25.0
Soybean Meal High-pro 48% CP	26.7
Limestone 36	0.9
Di Calcium Phosphate 18.5P/26CA	0.4
KBFP 2.5	2.5
KBSP 2.5 Sa	0.0
Total	**100**
Calculated composition	
E M (Kcal)	3196.75
Crude protein (%)	19.96
Crude fat (%)	6.74
Crude fiber (%)	2.87
DL-Lys-P (%)	0.89
DL-Meth-P (%)	0.39
Calcium (%)	0.61
P. Total (%)	0.45

Results

Body weight and the weight gain

In Table 2, body weight and weight gain, monitored every week in both groups are presented.

Table 2: Weekly average body weight and weight gain (g/bird/week) of broilers fed on mash and pellet feed

Week (day)	***Control***		***Experiment***	
	Live weight	Weight gain	Live weight	Weight gain
At the start (22 days)	859.67±58.872		874.00±40.143	
4 (29 days)	1211.33±86.344	351.66	1320.33±82.494	446.33
5 (36 days)	1761.33±184.405	550	1959.00±224.350	638.67
6 (43 days)	2617.00±162.698	855.67	2793.33±123.554	834.33
Total (weight gain)		***1757.33***		***1919.33***

As it can clearly be seen at the above table, at the beginning of the experiment groups have weights close to each other. The superiority of the experimental group appears after the fourth week (after 29 days) until the end of it (the difference is statistically significant). These findings in the favor of experiment group can be summarized in figures as following:

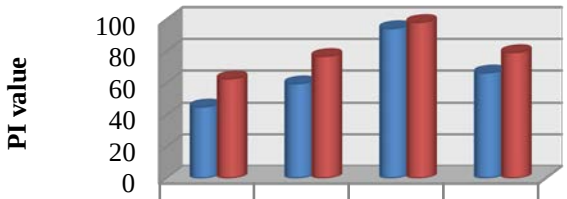
In the fourth week: = 109 g, or 9% more; fifth week: = 197.7 g, or 11.2% more, in the sixth and the last week: = 176.3 g, 6.7% or more. The same thing can also be stated about the gained weight. During the whole growth period, the group fed on pellets performed a body weight gain of 162 gr. higher or 9.2% more than the one fed on mash.

Feed consumption

Table 3: Feed conversion ratio (g feed/g gain) for each group

Week	***Control***	***Experiment***
4	2.68	2.11
5	2.96	2.55
6	2.77	2.84
Total	***2.80±0.15***	***2.50±0.37***

Table 3 shows that, at week 4 and 5 birds fed with pelleted feed have used the feed more effectively. Even at the end, the same thing was concluded, but differences between groups for this indicator are statistically non significant ($p \leq 0.05$), ($t_{Stat} = 1.58$ and $t_{crit} = 2.92$).

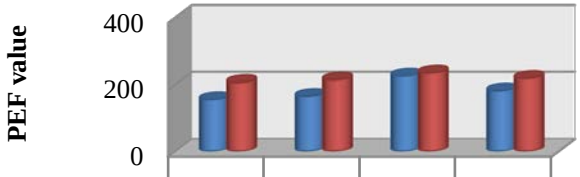


	4	5	6	Total
Control	45.2	59.5	94.48	66.39
Experiment	62.57	76.82	98.36	79.25

Figure 1: Performance index (PI)

During all weeks and in total it can be seen that the group fed with pelleted feed has demonstrated tendency for a better index of performance. The differences in value between the two groups were non-significant (t_{stat} = -2.86 and t_{crit} = 2.91).

The following Graph reflects the PEF Values in weeks for both groups.



	4	5	6	Total
Control	155.86	165.29	224.94	182.03
Experiment	206.01	213.4	234.18	217.86

Figure 2: Production Efficiency Factor (PEF)

From the beginning of the trial until the end of it, higher values in the group fed with pelleted feed were observed. The same thing can also be stated on the average value, which is 19.68% higher in the experimental group compared to the control one. However, even for this indicator, the differences in value between the two groups are statistically non-significant (t_{stat} = -2.69 and t_{crit} = 2.91) for $p \leq 0.05$.

Discussion

Feeding broilers with pelleted feed has clearly shown its positive impact – higher body weight and gain during the trial period until the end of it. The present conclusions also match with ones drawn by [16, 19, 20, 23], who showed a significantly lower performance in birds fed with mash feed. Other authors [12] showed that mash-fed birds had a lower body weight at 41 days than birds fed on crumbled and pelleted feed. Furthermore, [1, 2, 5, 6, 14], reported that the chicks grew faster when fed pellets or crumbles compared with the ones fed on a mash diet.

Feed conversion ratio (FCR) during the whole experimental period differed non-significantly ($P \leq 0.05$), so we can say that there is only a tendency to improve the feed conversion per weight unit of the body weight. For the entire period the trial the average feed saving goes to 0.30g feed/g of live weight, or 11% less feed/unit of weight. Similar results were obtained by some authors [8, 13, 14, 19], who reported that pellets had a better feed efficiency over the mash feed. Authors [10] found that pelleting increases the feed conversion by 5.9%. Researches [7, 20] concluded that the highest FCR value was observed in mash group, which indicated low feed conversion efficiency.

Usage of the pelleted feed influenced on the improvement of the performance index (PI) at a level of 19.4%. The Higher this value is the better the technical performance becomes. This calculation is heavily based by daily gain [21], also referred to as European Efficiency Factor (EEF).

The highest PEF value (217.86) was obtained from pelleted feed-fed group and this was statistically similar with the mash-fed group (182.03) (Table 5). PEF allows to compare individual flocks and to understand the impact of changes in the Key Performance Indicators (KPI), such as average daily gain, livability and feed conversion [24]. A flock acceptable with growth and livability parameters should attain 200 to 225 PEF Values [18]. In the current trial, the values are optimal for both groups.

Conclusion

The results of this trial show that optimal performance was achieved on the pelleted feed. The body weight and body weight gain were highest in pelleted fed group. This group showed a clear trend for better feed conversion efficiency. Profitability parameters (PI and PEF) were not affected *(p>0.05)* by the inclusion of different physical forms of feed.

References

1. Allred JB, Jensen LS and J. Mc Ginnis: **Studies on the growth promoting effect induced by pelleting feed.** Poult. Sci. 1996, 35: 1130-1133.
2. Asha Rajini R, Kumararaj R, Narahari D, Ravindran R, and Sundaresan K: **Influence of season, form of feed, dietary energy, age and**

sex on carcass traits of broilers. Ind. J. Poult. Sci 1998, 33: 346-348.

3. Banerjee GC: **Poultry.** Third edition, Oxford and IBH Publishing Co. Pvt. Ltd. Calcutta, 1998, 120-121.
4. Behnke, K.C: **Factors affecting pellet quality.** Maryland Nutrition Conference. Dept. of Poultry Science and Animal Science, College of Agriculture, University of Maryland, College Park 1994.
5. Bertechini AG, Rostagno HS and Oliveira AIG: **Effect of nutrient concentration on performance of broilers.** Poult. Abst. 1992, 18: 2965.
6. Deaton JW: **The effect of meal feeding on small intestine weight.** Poult. Sci. 1992, 71: 1807-1810.
7. Ghazi *A.M. Zohair, Gameel A. Al-Maktari and Mohamed M. Amer:* **A comparative effect of mash and pellet feed on broiler. Performance and ascites at high altitude (Field Study).** Global Veterinaria 2012, 9 (2): 154-159.
8. Golian, A. and Mirghelenj S.A: **Effects of feed form on development of digestive tract, performance and carcass traits of broiler chickens.** Journal. Animal Veterinary Advance 2009, 8: 1911-1915.
9. Goodband, R.D, Okach M D, and Nelssen J.L: **The effects of diet particle size on animal performance.** Kansas State University Agricultural Experiment Station and Cooperative Extension Service, 2002. MF-2050.
10. Howlider MAR and Rose SP: **The Response of growing male and female broiler chickens kept at different temperatures to dietary energy concentration and feed from.** Anim. Feed Sci. Tec. 1992, 39: 71-78.
11. Jahan MS, Asaduzzaman M.and Sarkar A.K: **Performance of Broiler Fed on Mash, Pellet and Crumble.** International Journal of Poultry Science 2006, 5 (3): 265-270
12. Kim Hyoung Ho and Chung Yuen Hoo: **The effects of crumbled, pelleted and extruded feed on the performance of broiler chicken.** Sustainable Animal Production and the Environment 1994, 3: 211-212.
13. Mirghelenj S.A. and Golian A.: **Effects of Feed Form on Development of Digestive Tract, Performance and Carcass Traits of Broiler Chickens.** Journal of Animal and Veterinary, 2000, 8 (10):1911-1915.
14. Mohamed E. Ahmed and Talha E. Abbas: **The effect of feeding pellets versus mash on performance and carcass characteristics of broiler chicks.** Bull. Env. Pharmacol. Life Sci. 2013, 2 (2): 31- 34
15. Moran ET: **Effect of pellet quality on the performance of meat birds.** Poult. Abst. 1990, 16: 2875.
16. Munt RHC, Dingle JG and Sumpa MG: **Growth, carcass composition and profitability of meat chickens given pellets, mash or free choice diet.** Br. Poult. Sci. 1995, 36: 277-284.
17. Mutetwa L: **Irvin's National Foods and ZIMVET.** Newsletter 2001, 8 (2).
18. Narayanswamy HD, Bhagwat VG: **Evaluating the efficacy of methionine supplementation options in commercial broiler chickens.** Poult. Sci. 2010.
19. Preston CM, Mc Cracken RJ and Mc Allister A: **Effect of diet form and enzyme supplementation on growth, efficiency and energy utilization of wheat based diets for broilers.** Br. Poult. Sci. 2000, 41: 324-331.
20. Reece F N, Lott B D, and Deaton J W: **Effects of environmental temperature and corn particle size on response of broilers to pelleted feed.** Poult. Sci. 1986, 65: 636-641.
21. Ross Broiler Management Manual 2009. Technical Services.
22. Samarakoon S.M.R. and Samarasinghe: **Strategies to improve the cost effectiveness of broiler production.** Tropical Agricultural Research 2012, 23 (4): 338– 346
23. Sinha SC and Digvijoi Singh NN, Pandita: **Effect of feeding grower mash ration on the performance of broilers.** Poultry Today and Tomorrow 1994, 4: 26-30
24. Wilson M: **Right measures needed to boost efficiency.** Poultry World,. J Commun Dis. 2007,34: 65-9. 2002.