The effect of different feed forms on the performance and carcass yield of broiler chickens

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Abstract. The aim of the research was to prove that the different feed forms affects the performance and carcass production. In total 240 New Lohmann MB 202 day-old chickens were randomly divided into five groups of treatment for 35 days of rearing period. There were 6 replications with 8 birds per pen. The chickens were fed starter feed at 1-21 days and finisher feed at 22-35 days with different feed forms: mash-mash (MM), mash-crumble (MC), mash-pellet (MP), crumble-crumble (CC), and crumble-pellet (CP). The data were obtained and statistically analyzed by ANOVA, then followed by Duncan’s New Multiple Range Test. Feed form did not give any effect to feed consumption and weight gain but it affected feed conversion (P>0.05). MP kept the highest rate of feed conversion by the end of rearing period. Carcass yield showed that various feed form on days 0-21 did not affect carcass percentage of broiler chickens. The birds which ate pelleted feed on days 22-35 have higher (P>0.05) carcass weight than those consumed mashed and crumbled feeds. It is concluded that chicken fed with mash-pellet feed had the best feed conversion. Besides, the birds which ate pelleted feed on days 22-35 had highest carcass weight.

1. Introduction
The main aim of the broiler chicken industry is to fulfill the protein requirement of humans. To optimize the broilers’ production, determining the appropriate feed for the chicken is necessary. Proper feeding program results the improvement of production efficiency; because the cost for the feeding the chicken is about 60-70% of total production cost. However, the programmed feeding management should meet the nutrient requirements with suitable form of the feed. The current industry of commercial feed remains to produce the feed for broiler chicken in form of mash, pellet, and crumble.

The 3-to-6-weeks broiler chicken which consumed mash feeds had smallest both feed intake and weight gain [1]. Moreover, feed form is crucial factor that specify the performance and carcass production of broiler chicken [2]. The weight gain was significantly greater in broilers fed crumble-pellet diets as it has highest weight gain and gives the best FCR [3]. Besides, the performance of broiler chicken is related to the carcass produced [4]. Carcass is obtained after slaughtering, releasing the blood out, removing the inner organ and feather, and separating the head, the neck, and the leg [5]. The aims of this study to identify the effect of different feed forms on the chicken’s performance and carcass production.
2. Material and methods

2.1. Material
The research was conducted on July to August 2018 in the research facility of Laboratory of Poultry Science, Faculty of Animal Science, Universitas Gadjah Mada. This research used 240 Lohmann MB 202 day-old-chicks that were kept for 35 days. The experimental feed was separated into 2 periods, which were the starter period (0-3 weeks) and grower-finisher period (4-5 weeks). The nutrient composition of the feeds is showed in Table 1.

| Nutrient content | Starter | Grower - finisher |
|------------------|---------|--------------------|
| Water (%)        | Max 12  | Max 12             |
| Crude Protein (%)| Min 21  | Min 19             |
| Crude Fat (%)    | 3-7     | 3-8                |
| Crude Fiber (%)  | Max 5   | Max 5              |
| Ash (%)          | Max 7   | Max 7              |
| Calcium (%)      | 0.9-1.1 | 0.9-1.1            |
| Phosphor (%)     | 0.6-0.9 | 0.6-0.9            |
| Metabolize Energy (Kcal/kg) | 2,950-3,050 | 3,050-3,150 |

2.2. Methods
This experiment used 240 broiler chickens that were kept in the 1x1m\(^2\) sized cage with 8 birds within each pen. They were divided into 5 different treatments, which were (1) MM, chickens were fed with mash in 1-21 days old, and remained to consume mash at 22-35 days old; (2) MC, chickens were fed with mash in 1-21 days old, then chickens consumed crumble at 22-35 days old; (3) MP, chickens were fed with mash in 1-21 days old, then chickens consumed pellet at 22-35 days old; (4) CC, chickens were fed with crumble in 1-21 days old, then chickens remained to consume crumble at 22-35 days old; (5) CP, chickens were fed with crumble in 1-21 days old, then chickens consumed pellet at 22-35 days old. All the treatments were conducted with 6 replications. All chickens were fed \textit{ad libitum} from 1 to 35 days of age. The data that were gathered are feed intake (g/bird/week), weight gain (g/bird/week), feed conversion ratio, carcass weight (g), and percentage of carcass weight (%). All the weight of carcass part data was taken in 21 and 35 days. The data were obtained and statistically analyzed by One Way Analysis of Variance, then followed by Duncan’s New Multiple Range Test by using SPSS (SPSS for Windows, 16.0, SPSS Inc.).

3. Results and discussion

3.1. Feed Intake
Table 2 shows that feed intake from week 1 to week 5 is not significantly different (P>0.05). The statistical analysis also shows that feed intake of broiler chicken fed with mash has the same number with chicken consumed crumble and pellet. Another finding 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 [1]. Mash is more difficult to be consumed by the birds since it tends to stick at the beak, then it will fall down and will affect inefficiency of feed intake.

3.2. Weight gain
The weight gain data in Table 3 shows that from week 1 to week of weight gain of broiler chicken is not significantly different (P>0.05). The feed forms do not influence the weight gain of broiler chicken. It is expected that the mash, crumble, and pellet feed have the same quality because of the conditioning process [6-8]. Conditioning is able to eliminate the inhibitor nutrient contained in the feedstuffs, so the protein and energy availability in the feed ration rises [9].
### Table 2. Weekly feed intake of broiler chicken (g/bird)

| Treatment | 1       | 2       | 3       | 4       | 5       |
|-----------|---------|---------|---------|---------|---------|
| MM        | 109.99±7.07 | 368.65±9.65 | 717.33±23.94 | 1000.77±202.5 | 1304.7±115.94 |
| MC        | 111.11±17.26 | 356.78±23.71 | 769.25±26.36 | 989.97±62.72 | 1146.04±40.45 |
| MP        | 110.40±6.58 | 377.30±31.08 | 701.81±75.33 | 1016.87±136.5 | 1316.75±132.68 |
| CC        | 110.37±6.96 | 398.75±46.23 | 694.42±77.82 | 1002.7±143.37 | 1258.10±170.73 |
| CP        | 109.66±6.78 | 351.49±62.38 | 733.72±124.75 | 1095.13±171.34 | 1300.07±142.59 |

### Table 3. Weight gain of broiler chicken every week (g/bird/week)

| Treatment | 1       | 2       | 3       | 4       | 5       |
|-----------|---------|---------|---------|---------|---------|
| MM        | 119.41±10.23 | 302.09±24.58 | 547.19±52.65 | 587.92±130.83 | 629.03±73.73 |
| MC        | 123.02±17.26 | 300.77±23.71 | 542.73±26.36 | 631.75±62.72 | 643.58±40.45 |
| MP        | 117.67±5.56 | 316.16±28.76 | 545.70±35.50 | 673.09±71.81 | 702.74±187.72 |
| CC        | 118.83±8.21 | 309.95±14.66 | 533.47±70.66 | 612.19±106.43 | 728.45±40.65 |
| CP        | 121.96±9.30 | 322.74±29.37 | 549.17±40.76 | 622.33±98.51 | 682.46±34.43 |

### 3.3. Feed conversion ratio

There is a significant difference of the Feed Conversion Ratio (FCR) among the treated chickens (Table 4). The MP treatment shows that it has the lowest FCR in the week 5, which indicates that chickens fed with MP feed tend to have the best FCR. There are some findings wrote that chickens fed with crumble and pellet feed have the best FCR compared with chickens fed with mash feed [9].

### Table 4. Feed conversion ratio of broiler chicken every week (g/bird/week)

| Treatment | 1       | 2       | 3       | 4       | 5       |
|-----------|---------|---------|---------|---------|---------|
| MM        | 0.90±0.13 | 1.35±0.25 | 1.34±0.08 | 1.57±0.26 | 2.14±0.34 ab |
| MC        | 1.00±0.13 | 1.26±0.25 | 1.45±0.33 | 1.63±0.25 | 1.82±0.20 ab |
| MP        | 0.95±0.07 | 1.21±0.07 | 1.32±0.18 | 1.54±0.24 | 1.72±0.42 a |
| CC        | 0.99±0.91 | 1.40±0.28 | 1.54±0.49 | 1.72±0.14 | 1.80±0.24 ab |
| CP        | 0.94±0.13 | 1.22±0.40 | 1.46±0.19 | 1.84±0.24 | 2.00±0.26 ab |

ab - The different superscripts in the same column shows the significant difference (P>0.05)

There is no difference of FCR in the week 1 to week 3 (starter phase) because the chickens had the beak that proper to consume any forms of feed. However, during the finisher phase, the beak had developed, then it will be difficult to take on the mash feed. Hence, the FCR seems to be different after finisher phase passed. The beak of the chicken influences the preference of feed forms. The mash and crumble feed are recommended to be given in the starter phase. However, pellet is recommended for 25-days-old chicken as the beak is easy to take the pellet form in that age [10].

### 3.4. Carcass weight

Table 5 presents that carcass weight of 21-days old chicken is not significantly different. However, there is significant difference of carcass weight of chicken slaughtered at day 35. It showed that chicken fed with pellet and crumble produced higher carcass weight compared with chicken fed only mash feeds. The chicken consumed pellet feed is able to increase the gizzard and intestine weight. The pellet feed helps the broiler chicken to increase the feed intake, that is strongly correlated with digested feed quantity in both gizzard and intestine. The digested feed quantity firmly affects the digestibility, which further it will be utilized to fulfill the basic needs and meat production. The higher meat production, the higher carcass weight can be obtained from broiler chicken [10].
Table 5. Weight average of broiler chicken carcass (g/bird)

| Treatment | Age          |
|-----------|--------------|
|           | Starter (Day 21) | Finisher (Day 35) |
| MM        | 689±63.2      | 1584.5±112.14*    |
| MC        | 679.83±41.71  | 1758.5±27.85b     |
| MP        | 682.83±21.57  | 1818.2±83.6b      |
| CC        | 718±62.27     | 1829.7±57.77b     |
| CP        | 731.5±57.42   | 1937.2±104.77     |

The different superscripts in the same column show the significant difference (P>0.05)

4. Conclusion

It is concluded that chicken fed with mash-pellet feed showed the best feed conversion among other treatments. Moreover, the birds which ate pelleted feed on days 22-35 have higher carcass weight than those consumed mashed and crumbled feeds.

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