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Egg Production of Local Merawangarab with Different Genetic Composition

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Abstract

Chicken eggs are the most widely consumed poultry product. Eggs have high protein value and are affordable for the public. Demand for local chicken eggs continues to increase every year. Merawang chicken and Arabian chicken are local Indonesian chickens. It is hoped that crossing the two chickens will produce superior offspring in egg production. The research was conducted to evaluate egg production in local chickens of the merawangarab cross with different genetic compositions of the merawang (M), namely 25% M, 50% M, 62.5% M, and 75% M, totaling 31 birds consisting of 21 adult females and 10 males. This research used a randomized block design (RAK). Egg production has achieved quite good results. The genetic composition affected egg index ($P<0.05$), but egg weight, hen day production, and feed conversion were the same. The four types of merawangarab chickens have the potential to be local egg-producing chickens. The egg production performance of 25%M, 50%M, 62.5%M, and 75%M was the same and all four could be developed as local laying hens.

Keywords: different genetic composition, egg production, merawangarab chicken

INTRODUCTION

The most popular poultry product is eggs. Eggs are a commodity that has high nutritional value as a source of animal protein that is easily obtained at an affordable price. Therefore, the demand for consumption eggs continues to increase every year. According to the Ministry of Agriculture Data and Data Center (2022), the average per capita weekly consumption of local chicken eggs has increased by 6.1% from 2018-2022.

The increase in consumption must be followed by an increase in the production and quality of consumed chicken eggs. Production can be influenced by internal (genetic) and external (environmental) factors.

Genetic improvement of local chickens and providing a suitable environment is an effort to increase local chicken egg production. Local chickens have a significant contribution to national egg needs, even though local chickens have lower production than purebred chickens. One of the efforts to develop chickens is by crossing local chickens to obtain traits that are useful for increasing their productivity.

Local crossbred chickens have great potential to improve the quality of free-range chicken eggs. The genetic composition of superior broodstock can produce chickens with the production traits

produced by their parents. Crossing merawang chickens with arab chickens is expected to produce offspring whose egg production is higher than their parents. The egg production of Merawang chickens is 125 eggs per year (Nuraeti *et al*. 2019) and the production of Arab chickens is 190-250 eggs per year with an egg weight range of 30-35 (Alwi *et al*. 2019). The potential of both can be developed through crossing to improve the genetic quality of local chickens.

The research aimed to evaluate egg production in local Merawangarab crossbred chickens with different genetic compositions of Merawang (M), namely 25% M, 50% M, 62.5% M, and 75% M.

METHOD

Time and Place

This research was carried out from July to September 2022. This research was carried out at the Breeding and Genetics Field Laboratory, Faculty of Animal Husbandry, Bogor Agricultural Institute.

Tools and Materials

The tools used in the research were individual cages, colony cages, feed containers, drinking containers, and digital scales. Other tools are egg trays, flat glass, calipers, and writing utensils.
Other ingredients used were 21 adult female chickens and 10 adult males from the merawangarab cross. Other ingredients are commercial feed for egg-laying hens, rice bran, antibiotics, vitamins, vaccines, husks, and water. Feeding consists of a mixture of commercial egg-laying stage chicken feed and rice bran with a ratio of 60:40. The crude protein of the feed is 14.58%

Procedure

Chickens are kept in colony cages with a male-to-female ratio of 1:2 for each type of chicken. Feeding is carried out in the morning at 09.00 WIB. The feed used is a mixture of commercial feed for laying hens and rice bran with a ratio of 60:40.
Providing drinking water *ad libitum.* Feed and drink areas are cleaned every day before feeding and drinking. Egg collection was carried out twice a day in the morning and evening. Eggs are coded according to the chicken's genetic composition and collected in egg trays to measure their weight and index.

Data Analysis

The design used in this study was a randomized block design (RAK) consisting of 4 genetic compositions of Merawangarab crossbred chickens in crossbred chickens (M), namely 25% M, 50% M, 62.5% M, and 75% M. Statistical analysis according to Mattjik and Sumertajaya (2013) with a randomized block design model.
The data were analyzed for variance with a confidence interval of 95% and 99% and if the results were significantly different, Tukey's multiple comparison test was carried out.

$$Yij= \mu+\tau i+\beta j+ \varepsilon ij$$

Yij: observation of body measurements on the i-th type of chicken (raw 25%, 50%, 62.5%, and 75%) and the jth period (periods 1,2,3…6);
μ: average observation value;
τi: influence of chicken type at level I;
βj: effect of the period on the jth kef level;

εij: influence of experimental error on the ith type of chicken and the jth period.

Variables

1. Egg weight (g).
2. Egg index = (Egg width)/(Egg length).
3. Egg production (hen-day production) is the percentage of eggs produced from the number of chickens available (%).
4. Feed conversion is the ratio of feed consumption to the total weight of egg production.

RESULT

The results of the research are the results of measuring several variables, namely; Egg weight, Egg index, Hen Day Production, and Feed Conversion are listed in Table 1.

Table 1 Egg production of local chickens from merawangarab crosses with different genetic composition

Variable	Mean±St.Dev			
	Genetic Composition			
	25%M	50%M	62,5%M	75%M
Egg Weight (g)	43,12±3,03	43,85±2,41	44,03±1,70	43,96±1,53
Egg Index	0,75±0,02^{b}	0,76±0,03^{ab}	0,77±0,01^{ab}	0,78±0,02^{a}
Hen-Day Production (%)	47,02±0,28	43,25±0,17	44,56±0,28	41,67±0,12
Feed Conversion	8,53±8,36	7,44±6,40	9,44±7,81	6,06±2,13

St.dev: standard deviation; KK: coefficient of variation; M; merawang, numbers accompanied by different superscript letters on the same row are significantly different (P<0.05)

In Table 1, egg production variables were only significantly different for egg index (P<0.05). Other variables egg weight, hen day production, and ration conversion were not statistically significantly different.

DISCUSSION

Egg Weight

The average egg weight of local merawangarab cross-breed chickens ranges from 43.12 to 43.96 g. The classification of egg weight can be according to SNI 3926:2008 concerning the consumption of chicken eggs, namely a weight of less than 50 g is considered small, a weight of 50 to 60 is considered medium, and a weight of more than 60 g is considered large. Local chicken eggs from the merawangarab cross are included in the small category.

Differences in the genetic composition of chickens had no significant effect on egg weight (P>0.05). This may be influenced by the genetic stability of the results of crossing merawang and arab chickens (merawangarab) so that the weight of the eggs produced was not different. According

to Yuwanta (2008), egg weight is influenced by several factors such as genetic characteristics, level of sexual maturity, ration, medicines, age, and weight of the chicken.

This weight value is following research reported by Darwati *et al*. (2019) that the average egg weight of merawangarab chickens is 39.14-48.59 g. The weight of this egg is relatively the same as the weight of black kedu chicken eggs in Nataamijaya's (2008) research, namely 43.44 g. This value was smaller than the egg weight of Lohmann brown chickens in the research of Dirgahayu *et al.* (2016) and Millenia *et al*. (2022) of 60.82 g and 63.03 g. This difference is caused by genetics, namely merawang and arab hens which have small to medium egg weights, namely 40-50 g.

Egg Index

Local merawangarab cross-breed chickens had an average egg index value of 0.75-0.78 in the egg category with a normal egg shape. Yuwanta (2004) reported that the egg index value ranges from 0.65-0.82 with the ideal value being 0.70-0.75. This value is relatively the same as research by Darwati *et al.* (2019) in which the egg index of the merawang and Arabian cross was 0.75-0.78. This egg index is relatively as same as the Lohmann brown strain of chickens in the research of Dirgahayu *et al*. (2016), namely 75.94%.

The analysis of various egg indices obtained significantly different results ($P<0.05$). Differences in genetic composition influence the chicken egg index. According to John-jaja *et al*. (2016), the heritability value of the egg index in Bovan Nera Black chickens was 0.629. This value indicates that the trait was very high (>0.4) to be passed on to offspring. Genetic differences can cause morphological differences in reproductive organs and egg formation. This difference was still within the ideal value for the chicken-egg index.

Hen Day Production

Daily egg production (hen-day production) of local merawangarab cross chickens ranged from 41.67% to 47.02%. This egg production was smaller compared to research by Darwati *et al*. (2019) namely 52.38%-59.52%. The hen-day production value of this chicken was greater than the value of the black kedu chicken in Nataamijaya's (2008) research, namely 32.48%. This value was smaller than the Lohmann brown strain of chickens in the research of Millenia *et al.* (2022) namely 91.84%.

The low hen-day production value in this study was due to the high crude fiber content in the feed. High fiber feed can disrupt the absorption of nutrients in chickens, resulting in hampered egg production.

The results of the hen-day production variance analysis showed that the results were not significantly different ($P>0.05$). Daily egg production of local merawangarab cross chickens was not influenced by differences in genetic composition. This is caused by genetic stability between merawangarab crossbreed chickens. According to Utomo (2017), the high and low productivity of chicken eggs is influenced by several genetic factors, quality and quantity of rations, environmental temperature, livestock health, and handling of the livestock being kept. Furthermore, the result research of Yuwanta (2008) showed that egg production is influenced by several factors, such as the originality of the chicken, age of the chicken, age at sexual maturity, weight of the chicken, moulting, and environmental factors such as temperature and lighting, feed and feed restrictions.

Feed Consumption

Chicken feed consumption in this study averaged 700 g per week. Feeding in research was by feeding standards. This feed consumption value follows research by Darwati *et al*. (2019) namely 685.96-700 g head^{-1} week$^{-1.}$

Feed consumption results from the analysis of variance were not significantly different (P>0.05). Differences in genetic composition did not affect feed consumption. Feed consumption is influenced by the age and environment of the chicken. Feed consumption does not differ because age and feed are uniform. Daily chicken feed consumption requirements were 90-110 g depending on age. Apart from genetic factors, feed consumption, according to Utomo (2017), is influenced by feed palatability, environmental temperature, lighting, and health status. The results of this research showed that the palatability of the four types of chicken was the same, thus feed consumption was not different.

Feed Conversion

The feed conversion value in this study was 6.06-9.44. This feed consumption value was greater than the research of Darwati *et al*. (2019) namely 3.72-6.89. This feed conversion was greater than research by Millenia *et al*. (2022) namely 2.07. The smaller the feed conversion value was more efficient. The high feed conversion in this study was due to the low quality of the rice bran used. Rice bran used as feed contains a large mixture of husks. High levels of coarse husks can reduce the chicken's digestibility. Decreased chicken digestibility can inhibit the nutrients absorbed from low feed, reducing chicken productivity.

Differences in genetic composition did not affect feed conversion value (P>0.05). This is due to relatively similar feed consumption and the same environmental factors. It is the same with the research of Indra *et al*. (2013) that feed conversion is influenced by genetics, feed quality, and environmental temperature.

CONCLUSION

Different genetic compositions influenced the egg index. The shape of the eggs in the four types of genetic composition was normal. Egg weight, hen day production, and feed conversion were the same. The local merawangarab cross-breed of chicken has great potential as a local egg-producing chicken.

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