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# Growth of Merawangarab Chicken with Arab Chicken Backcross at Starter Periode

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**Abstract**

Indonesian native chickens have a high potency to be developed as egg-produced chickens such as merawang and arab chicken. A study for genetic quality improvement through merawang and arab chicken crossing has been done and showed that their F1 results have a good heterosis effect. This research was conducted to observe the growth performance of merawangarab x arab and with a backcross breeding concept. The parameters of productivity measured were body weight, feed consumption, and feed conversion. A randomized complete block design was used to analyze the research. The average body weight of A-MA chicken were higher than the body weight of MA-A chicken. The statistical test result was insignificant (P>0.05). A-MA chicken were more efficient in converting feed than MA-A chickens. Feed consumption and conversion between A-MA chicken and MA-A chicken were insignificant.

*Keywords: arab chicken, growth, merawangarab chicken, reciprocal*

## INTRODUCTION

Indonesian local chickens have high potential to be developed as superior broilers, layer, dual-purpose chickens or utilization in terms of aesthetics(Liu et al., 2021; Subowo & Saputra, 2019). One other added value for domesticated local chickens from the tropics is the most important food source in the world (National Research Council 1994).

Merawang chicken comes from the *Gallus-gallus* species, the Phasianidae family(Irmaya et al., 2021; Nuraini et al., 2021; Widayanti et al., 2019), which can be developed into broilers while laying hens with egg production of up to 125 eggs/year (Nuraini et al., 2020). Arab chicken (*Gallus turcicus*) comes from jungle fowl which can reproduce with low nutritional feed content. Syafwan and Noferdiman, (2020) and Sahara *et al.*, (2022) stated that Arabic chickens are resistant to disease and weather changes. Thus, Arabic chicken can be developed in Indonesia. Arabian chickens can produce up to 280 eggs each year (Yumna et al., 2013). Crosses between Merawang

chickens and Arabic chickens have the potential to produce superior egg-producing chickens and meat-producing chickens (Ningrum et al., 2018).

The superiority possessed by arab chickens causes these chickens to be crossed with other types of chickens in order to obtain superior livestock breeds, especially in egg production. Another advantage of arab chickens is that they are agile, active, do not have brooding properties and have strong immune systems (Diwyanto et al., 2005).

Efforts to improve genetic quality through crosses between Arabic chickens and Merawang chickens have been carried out in a previous study by Darwati (2017) showed good results to develop in producing offspring that carry a combination of good traits from male and female parents. The results of these crosses productivity indicate an increase in the genetic quality of local chickens. In this study, crosses of male merawangarab (MA) chickens and female arab chickens (A) hereinafter referred to as MA-A and their reciprocals, namely male arab chickens (A) and female merawangarab chickens (MA) hereinafter referred to as A-MA were carried out to produce offspring that have a combination of both traits from their parents.

Maintenance of starter phase chicks will affect productivity in the next phase. Therefore, to determine the potential growth performance of backcross crosses, it is necessary to study the growth performance of backcross crosses in the starter phase. This study aims to examine the growth performance of cruciferous chickens resulting from backcross crosses of merawangarab chickens and arab chickens in the starter phase.

## METHOD

This research was conducted at the IPB Animal Breeding Field Laboratory. The equipment needed for broodstock is a chicken coop made of wire and zinc or a bamboo fence with 6 partitions and each partition is filled with 3 chickens (1 male and 2 females). The cage equipment used is a hanging feeder and a plastic gallon drinker. Cages for DOC and chickens while they are growing are made of zinc, wire or wood, the size of which is adjusted to the number of livestock in it and is equipped with a 40-60 watt lamp, feed trays and plastic drinking gallons for the chicks.

Room for storing eggs, Ohaus scales with an accuracy of 0.1 g, digital calipers with an accuracy of 0.01 mm and an egg tray. The eggs were hatched using a Missouri brand semi-automatic incubator with a capacity of 3,600 eggs equipped with a thermostat, wet and dry bulb thermometers, and 2 water tanks. Furthermore, for measuring body weight and calculating needs and remaining feed, digital scales with a capacity of 5 kg are used.

Material. The broodstock for the backcross cross were 3 merawangarab roosters (MA) with an average age of 44 weeks (mean body weight ± SD (KK%) was 2 058 ± 215 g (10.43%) and 6 female arab chicken of silver type (A) 26 weeks old with an average body weight of 1 586.3 ± 133.3 g (8.40%) to produce DOC MA-A. In addition, 3 male arab chickens (A) are needed with an average age of 35 weeks and an average body weight of 1 733 ± 178 g (10.28%) and 6 merawangarab (MA) hens aged 44 weeks with an average body weight of 1 661.0 ± 210.4 g (12.67%) to produce DOC A-MA.

DOC from this backcross cross, this is MA-A and A-MA, were observed for growth during the starter phase from 1 week to 4 weeks of age, regardless of sex (unsex). For cross chicks at the age of 1-3 weeks, commercial feed is used for broilers (commercial feed for starter phase broilers), chickens aged > 3 weeks are given a mixed feed consisting of 80% commercial feed for starter phase broilers with 20% rice bran. To avoid exposure to ND disease, chicks are given ND vaccines and vitamins to maintain stamina.

Hatching. Egg collection is done every 2 times a day, this is morning and evening. Eggs taken from the cage are then cleaned and coded according to the parent cage.

The hatching eggs are then put into the incubator every week for 7 periods. After 18 days the hatching eggs are binoculars and put into the hatcher machine for 3 days. The resulting DOC is then weighed and numbered with a wing band.

Maintenance. Breeding of crossed chickens was carried out in colony cages for each mating, namely A-MA and MA-A. Chickens are reared for 7 periods or 7 replications. Chickens are not separated by sex (unsex).

Disease prevention is done by giving the ND vaccine through eye drops or can also be done through mouth drops at the age of 3 days and 3 weeks. Vitachick is given until the chicken is 2 weeks old. Furthermore, the provision of vitachick is carried out before and after the weighing process.

Feed is given 2 times a day, morning and evening. Drinking water was provided ad libitum during rearing. Commercial feed for starter phase broilers with PK 21% is in the form of crumble. 100% commercial feed is given to day old chicks (DOC) up to 3 weeks of age. Chickens aged > 3-4 weeks are fed a mixture of 80% commercial feed with 20% rice bran (Table 1).

Table 1 The nutritional content of the feed

| Nutrition | (100K) | (80K:20D) * |
|---|---|---|
| Dry matter (%) | 89.16 | 89.09 |
| Ash (%) | 6.46 | 7.19 |
| Crude protein (%) | 19.21 | 17.74 |
| Crude fiber(%) | 2.52 | 3.56 |
| Crude fat (%) | 8.68 | 10.32 |

K: commercial feed, D: rice bran, *: based on feed analysis at the Feed Science and Technology Laboratory, Faculty of Animal Husbandry, IPB

**Data Analysis.** The design used was a randomized block design (RAK) consisting of 2 types of crosses and 7 periods. Data analysis was used to compare growth between male MA-A chickens and male A-MA chickens, and female MA-A chickens with female A-MA chickens.

Measurements were taken every 1 week for 4 weeks. Data were analyzed for variance with 95% and 99% confidence intervals. The experimental design model according to Mattjik and Sumertajaya (2002) is as follows:

$Yijk= \mu+ Pi+ Kj+ \varepsilon ij$

Information :

Yijk = growth observations in the ith type of chicken (merawangarab x arab and arabian x meraw arab) and the jth period (periods 1, 2, 3, 4, 5, 6, and 7);

$\mu$ = average observed value;

Pi = effect of chicken species at level i (merawangarab x arab and arab x merawangarab);

Kj = period effect on the jth level (periods 1,2,3,4,5,6, and 7); And

$\varepsilon ij$ = effect of experimental error on the i-type chicken (merawangarab x arab and arab x merawangarab) and the jth period (periods 1,2,3,4,5,6, and 7).

**Variable.** The variables measured were body weight, feed consumption and feed conversion. An explanation of these variables is as follows:
1. Body weight (g tail-1), body weight is measured every week of maintenance;
2. Feed consumption (g head-1 week-1), obtained by calculating the difference between the amount of feed given and the remaining feed left in 1 week; And
3. Feed conversion, obtained by comparing feed consumption to body weight gain.

**Result**

The body weight of merawangarab chickens backcrossed with arab chickens in this researsch is presented in Table 2

Table 2 Body weight of MA-A and A-MA crosses at the starter period

| | $\bar{x}$ ± sb (n;KK%) Body Weight (g/bird) | |
|---|---|---|
| Week | MA-A | A-MA |
| DOC | 23.93 ± 2.30 (76;9.62)$^{A}$ | 29.94 ± 2.54 (49;8.48) $^{B}$ |
| 1 | 45.82 ± 9.38 (76;20.47) $^{A}$ | 62.47 ± 10.48(49;16.78) $^{B}$ |
| 2 | 97.61 ±20.05 (76;20.54) $^{A}$ | 114.47±15.26(49;13.33) $^{B}$ |
| 3 | 155.53 ± 26.51 (76;17.04) | 154.29 ± 21.20 (49;13.74) |
| 4 | 216.25 ±56.71 (76;26.22) | 201.59 ± 46.56 (49;23.10) |

A = Arabic, M = Merawang, $\bar{x}$ = mean, sb = standard deviation, KK = Coefficient of variance, DOC = Day Old Chick. Numbers accompanied by superscripts with different capital letters on the same line are very significantly different (P<0.01).

Feed consumption is the amount of feed consumed in a certain period of time. This causes feed consumption to increase during the production period. Feed consumption of MA-A chickens and A-MA chickens in the starter phase up to 4 weeks of age is presented in Table 3.

Table 3 Feed consumption of MA-A and A-MA at starter periode

| | $\bar{x}$ ± sb (n;KK%) Feed Consumption (g/bird) | |
|---|---|---|
| Week | MA-A | A-MA |
| 1 | 42.18±6.03 (14.30) | 47.20±1.49(3.17) |
| 2 | 87.29±10.82(12.40) | 97.14±0.99(1.02) |
| 3 | 134.35±16.81(12.51) | 143.58±2.41(1.68) |
| 4 | 196.32±19.55(9.96) | 180.40±23.60(13.07) |
| ∑(1-5) | 460,10 | 468,30 |

A = Arabic, M = Merawang, $\bar{x}$ = mean, sb = standard deviation, KK = Coefficient of variance

Feed conversion produced by MA-A and A-MA chickens weeks 1 to 6 is presented in Table 4. The lower the ration conversion value means the higher the efficiency of ration use and conversely the higher the ration conversion rate close to one means the lower the efficiency level of the ration (Subekti 2003).

Table 4 Feed conversion of MA-A and A-MA chicken at starter periode

| | x̄ ± sb (n;KK%) Feed Consumption (g/bird) | |
|---|---|---|
| Week | MA-A | A-MA |
| 1 | 2.70±1.42(52.46) | 1.60±0.27(16.99) |
| 2 | 1.97±0.24(12.11) | 2.04±0.28(13.96) |
| 3 | 2.48±0.38(15.11) | 3.80±0.93(24.51) |
| 4 | 6.20±6.41(103.40) | 3.93± 0.64(16.19) |
| Average | 3.34±3.56(106.55) | 2.84±1.19(42.07) |

A = Arabic, M = Merawang, x̄ = mean, sb = standard deviation, KK = Coefficient of diversity

## DISCUSSION

The average body weight of MA-A chickens during DOC was 23.93 ± 2.30 g and that of A-MA chickens was 29.94 ± 2.54 g. The results of statistical analysis showed highly significant differences (P<0.01). This was because the weight of the hatching eggs from the cross between Merawangarab chicken and arab chicken was smaller, 39.20 ± 2.81 g compared to the weight of the hatching eggs resulting from crosses between arab chickens and merawangarab chickens was 48.34 ± 3.86 g. This is in accordance with Rajab (2018) that egg weight has a very real relationship with DOC weight. The heavier the hatching eggs, the heavier the DOC will be.

Based on Table 2, from the time of DOC to the age of 2 weeks the A-MA chickens had a higher average body weight than the MA-A chickens. This is because A-MA genetics comes from mating arab males and merawangarab females, that merawangarab females have experienced the heterosis effect of merawang and arab crosses so that the weight of merawangarab female eggs was heavier than female arab chicken eggs, even though the genetic composition between MA-A chickens and A-MA were the same, that is 75% of arab chicken genetics and 25% of erawang chicken genetics.

The hatching weight of these crosses was lower than the cross between white kedu and black kedu and the reciprocity of black and white kedu in a study by Ikasari, Kurnianto and Sumeidiana (2012) that is 33.02 and 32.35 g. However, the growth of the backcross crosses of merawangarab chickens and arab chickens in this researsch during the starter phase at 4 weeks of age had heavier weights than crosses of black and white kedu with their reciprocity, white and black kedu at 4 weeks of age that is 163.72 g and 154.97 g for males, while for females 173.70 and 147.06 g respctively (Ikasari *et al*. 2012). The genetic potential of merawangarab chickens showed better performance than the second chicken mating. However, the body weight gain of A-MA and MA-A chickens was lower than native chickens in Rajab's study (2018) of 10.96 g per day in the satrter phase, also lower than KUB chickens in the study of Febriyanto *et al*. (2021).

### Feed Consumption

Feed consumption is the amount of feed consumed in a certain period of time. This causes feed consumption to increase during the production period. Feed consumption of MA-A chickens and A-MA chickens in the starter phase up to 4 weeks of age is presented in Table 3.

The results of the study in Table 3 show that the amount of feed consumption for MA-A chickens and A-MA chickens has increased until the 4th week. This is because

feed consumption increases with increasing body weight so that nutritional needs must be met during production (Scanes & Christensen, 2019).

Feed consumption of MA-A chickens was lower than that of A-MA chickens in weeks 1-3. This is because the body weight of MA-A chickens is smaller than that of A-MA chickens so that the feed requirement (basic life) of A-MA chickens will be higher. Statistical test results of feed consumption between MA-A chickens and A-MA chickens in the starter phase aged 1-4 weeks were not different (P>0.05). Widodo (2002) that the feed consumed by poultry greatly determines body weight gain.

**Feed Conversion**

Based on Table 4, the average feed conversion for A-MA chickens was lower, namely 2,843 compared to MA-A chickens, which was 3,339, so that A-MA chickens had better feed conversion at 1-4 weeks of age. The results of the feed conversion statistical test for A-MA chickens and MA-A chickens at the age of 1-4 weeks were not different (P>0.05).

Edjeng and Kartasudjana (2006) said that a low feed conversion rate means less feed used to produce 1 kg of meat. Rasyaf (2012) that feed conversion is influenced by several factors, namely genetics, feed form, temperature, environment, feed consumption, body weight, and sex. Based on genetic factors, MA-A and A-MA chickens have the same genetic composition.

## CONCLUSION

The growth performance of the merawangarab chicken backcross cross with arab chicken (A-MA and MA-A) chickens in the starter phase was same and was good for local chickens.

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