Growth of Merawang Chicken with Arab Chicken Crossing and Its Reciprocal at 1 to 10 Weeks of Age

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ABSTRACT

The diversity of local chickens in Indonesia is considerably high and very potential to be developed. Arab chickens are well known for their high egg production. Meanwhile, merawang chickens produce lower egg than arab chickens. Concerning their production capacity, arab and merawang chickens are crossed to evaluate the genetic potency through the heterocyst effect. A total of 147 MA DOC and 63 AM chickens were used and observed for bodyweight, growth rate, feed intake, and feed conversion in growth phase from 1 to 10 weeks of age. This experiment was randomized complete block designed with hatching periods as block. The average of bodyweight of MA chickens was higher than AM chickens. Meanwhile, the growth of MA and MA males was the same. At 10 weeks the average of bodyweight of MA and AM males were 846.5 g and 818.2 g, respectively, and not significant different (P>0.05). Meanwhile, at weeks 6-8 there was significant different (P<0.05) on bodyweight of MA and AM females but did not differ at 10 weeks. The average of bodyweight of MA and AM females at 10 week were 748.50 g and 733.73 g, accordingly. Meanwhile, bodyweight of AM and MA females differed only in week 6 to 8. Feed intake and conversion was the same between these two chickens. Growth rate of MA and AM chickens was the same. MA chickens were much efficient in converting feed than AM chickens. However, it was not significantly different as well as feed intake. In general, growth rate of MA and AM chickens was the same.

Keywords: Arab Chicken, Growth, Merawang Chicken, Reciprocal

INTRODUCTION

The diversity of Indonesian local chickens is considerable high and potential to be developed. Local chickens in rural communities are strategic commodity and has potency in economics and social aspects. They are relatively not to complex to manage as they do not demand complex inputs and need relatively low cost. Recently, local chickens are purified and maintained much intensively to utilize them as animal protein provider (Sulandari *et al*., 2007). The common problem of local chickens that is traditionally maintained is low productivity, slow grow, poor egg production and high broodiness due to low genetic quality and poor feeding quantity and quality (Kusuma 2002). Crossbreeding becomes an alternative to improve their productivity by crossing low productivity chickens with superior productive chickens.

Merawang hens produce in average of 165 eggs year^{-1} that is much higher than other local hens which only produce 40-60 eggs year^{-1} (Abubakar *et al*., 2005). Therefore, merawang hens are potential to develop as egg producer. On the other hands, arab chickens are more tolerant to disease and climate change (Yusdja *et al*., 2005). It indicates that arab chickens possess good adaptability to tropical environment. Therefore, arab chickens are well developed in Indonesia and intensively raised as laying hens. This chicken becomes a good alternative to cross with other Indonesian local chickens to produce offspring which has better laying capacity with better meat quality (Sulandari *et al*., 2007). Crossing between merawang and arab chickens can lead to result as a new hybrid of local chicken with improved genetic quality.

This study was conducted to evaluate the growth of merawang males with arab females (MA) cross and arab males with merawang females (AM) in the growing phase of 1-10 weeks of age.

MATERIALS AND METHODS

The research was conducted in the Animal Breeding and Genetics Field Laboratory, Faculty of Animal Science, Bogor Agricultural University. The study was conducted in November 2016 until March 2017. The materials used were 147 DOC (Day Old Chick) of MA and 63 DOC of AM, commercial feed for broiler in form of crumble for starter phase, rice bran, ND vaccine, and vitamin (Vita Chick).

Maintenance. Maintenance of crossbred chickens was done in colony cages. Chickens were reared in seven periods or seven replications depending on the hatching batches. Chickens were then sex separated after 4 weeks of age. ND vaccine through eyedrops was applied at the age of 3 days and 3 weeks to prevent ND disease. Vitmin was regularly given until 2 weeks of age. Vita chick was also given at the time before and after weighing.

Feeding and Drinking Water. Feed was offered two times a day in the morning and the afternoon. Water was freely available. Broiler commercial feed was given from day old chicks (DOC) until weeks 3 weeks. Chicken was fed a mixture of commercial feed and rice bran in ratio of 80% and 20%, 70% and 30% at the age of 3-4 weeks and 5-6 weeks, respectively. Afterwards, chickens were then fed a mixture of 60% commercial feed with 40% rice bran until 10 weeks of age.

Data Analysis. Measurement was done every week during experiment from 1 to 10 weeks. Data was subjected to analyses of variance (Steel and Torrie 1995) with mathematical model (Mattjik and Sumertajaya 2002) as follows:

$$Y_{ijk} = \mu + P_i + K_j + \varepsilon_{ij}$$

Traits. The traits measured was body weight, feed intake, and feed conversion.

1. Body weight (g chicken^{-1}) was collected by weighing the chickens on weekly basis;
2. Feed intake (g chicken^{-1} week^{-1}) was obtained by calculating the amount of feed offered and feed residue on weekly basis; and
3. Feed conversion was obtained by comparing the feed intake and the weight gain.

RESULTS AND DISCUSSION

Bodyweight. Bodyweight is a productivity reference and an attribute which has economic value. Growth of MA chicken and AM chicken in 1-4 weeks was not differentiated by sex, because difficulty in starter phase to determine the sex. Bodyweight of merawang-arab (MA) chicken crossed and its reciprocal (MA) is presented in Table 1.

Table 1. Bodyweight of MA and it's reciprocal at DOC-10 weeks of age

Weeks	x̄ ± sd (n;CV%)			
	MA		AM	
	g bird^{-1}			
DOC	27.37 ± 3.26 (147;11.92)B		34.36 ± 2.48 (63;7.22)A	
1	44.57 ± 8.54 (147;19.15)b		47.34 ± 7.89 (63;16.67)a	
2	87.11 ± 26.98 (142;30.97)		90.83 ± 17.58 (63;19.35)	
3	139.98 ± 34.62 (128;24.73)		143.65 ± 26.19 (63;18.23)	
4	196.65 ± 41.93 (127;21.32)b		210.83 ± 33.19 (63;15.74)a	
	Male	Female	Male	Female
5	306.21 ± 47.28 (33;15.44)	284.06 ± 54.78 (33;19.29)	298.86 ± 30.80 (33;10.31)	259.82 ± 27.89 (30;10.74)
6	406.61 ± 51.96 (33;12.78)	371.30 ± 64.40 (33;17.35)a	387.79 ± 48.46 (33;12.50)	335.55 ± 30.30 (30;9.03)b
7	500.30 ± 63.30 (33;12.65)	460.50 ± 69.90 (33;15.18)a	489.18 ± 48.51 (33;9.92)	426.00 ± 43.71 (30;10.26)b
8	614.70 ± 74.80 (33;12.16)	560.70 ± 82.80 (33;14.77)a	582.30 ± 58.20 (33;10.00)	516.00 ± 47.05 (30;9.20)b
9	733.50 ± 73.00 (33;9.95)	662.10 ± 92.50 (33;13.97)	701.00 ± 58.70 (33;8.38)	636.50 ± 38.58 (30;6.06)
10	846.50 ± 69.30 (33;8.19)	748.50 ± 102.3 (33;13.67)	818.20 ± 60.60 (33;7.41)	733.73 ± 44.16 (30;6.02)

A = Arab, M = Merawang, x̄ = mean, sd = standard deviation, CV = coefficient of variation, DOC = *Day Old Chick*. The numbers with different small letters on the same line were significantly different (P<0.05). The numbers with different big letters on the same line were high significant different (P<0.01).

Starting from DOC until 4 weeks, the AM chicken was significantly heavier (P<0.05) than MA chicken (Table 1). The MA and AM chickens at DOC was highly significant heavier (27.37 ± 3.26 g and 34.36 ± 2.48 g, accordingly). The hatching egg of AM (52.504 ± 3.050 g) was heavier than hatching eggs of MA (43.423 ± 4.291 g). The weight of hatching egg correlates with the weight of hatchling (Wineland 2000). The heavier hatching egg weight, the hatchling is heavier. This finding was in line with Hermawan (2000).

MA and AM chicken was sex differentiated at age 5-10 weeks. MA cocks and AM cocks weight at 10 weeks were 845.50 g and 818.20 g, respectively. Meanwhile, the MA and AM females weighed 748.50 g and 733.73 g, accordingly. Other finding reported that merawang males was 667.20 g and merawang females was 542.10 g at 10 weeks of age (Sesmira 2002). Nataamijaya *et al*., (2003) reported that arab male weighed 705.20 g and the female was 586.30 g at 12 weeks. These research revealed heavier MA and AM ckickens at 10 weeks. This indicated that the heterocyst effect occurs by crossing. Heterocyst effect occurs if the average of crosses is higher than the average of the two parents (Noor 2010). This finding was also in accordance with Sartika (2012) that the objective of crossing is to get a new final stock or new strain which higher produvitivies than their parents.

As expected, the average bodyweight of males were higher than females both in MA and AM (Table 1) because the growth rate in chicken is sex influenced (Soeparno 2005). The function of testosterone in the testes in males serves to stimulate muscle growth in males. Whereas estrogen in females stimulates bone growth and serve the meat (Herren 2012).

Feed Intake. Feed intake is the total amount of feed consumed within a certain period. Heavier chicken consumes more rations which are needed for basic living resulting in increasing feed intake during the production period (Amrullah 2004). Feed intake of MA and AM chickens at the age of 1-4 weeks are presented in Table 2.

Table 2. Feed intake of MA and it's reciprocal at the age of 1-10 weeks

Weeks	$\bar{x}$ ± sd (n; CV%)			
	MA		AM	
	g bird^{-1}			
1	45.856 ± 0.521 (1.14)		44.971 ± 0.601 (1.33)	
2	95.089 ± 0.775 (0.82)		93.753 ± 0.916 (0.98)	
3	144.540 ± 0.968 (0.67)		142.530 ± 1.380 (0.97)	
4	190.560 ± 1.000 (0.53)		187.500 ± 2.170 (1.16)	
	Male	Female	Male	Female
5	234.69 ± 6.84 (2.92)	232.66 ± 8.92 (3.83)	234.31 ± 3.35 (1.43)	231.61 ± 2.25 (0.97)
6	286.80 ± 4.78 (1.67)	285.54 ± 5.76 (2.02)	285.38 ± 2.58 (0.90)	283.39 ± 2.33 (0.82)
7	336.37 ± 3.39 (1.01)	335.73 ± 4.21 (1.25)	334.16 ± 3.60 (1.08)	333.30 ± 2.52 (0.75)
8	385.15 ± 4.11 (1.07)	384.62 ± 4.64 (1.21)	382.81 ± 5.10 (1.33)	381.43 ± 2.27 (0.59)
9	435.00 ± 3.21 (0.74)	430.23 ± 2.44 (0.57)	432.31 ± 2.89 (0.67)	428.33 ± 1.91 (0.45)
10	484.07 ± 3.23 (0.67)	480.00 ± 0.92 (0.19)	481.69 ± 1.87 (0.39)	478.80 ± 1.46 (0.30)

A = Arab, M = Merawang, $\bar{x}$ = mean, sd = standard deviation, CV = coefficient of variation.

Feed intake of MA and AM chickens were the same (P>0.05) for males and females. The feed consumption age of 5-10 weeks of males was greater than females (Table 2). This result was in line with the finding of Hasnelly and Kuntoro (2006) that males consume more feed than hens.

Feed intake of MA as well as AM increased with the increasing of age and bodyweight to meet the requirement during growing and production periods (Ensminger 1992). The total feed consumption of merawang chicken until 4 weeks of age was 255.41 g (Hardini 2003). These experiment showed that the chicken crosses at week 4 had higher feed intake. In general, feed intake of cocks at age 5-10 weeks was higher compared to hens. Total feed intake of MA cocks was 1 243.01 g and AM cocks was 1 236.66 g. Meanwhile, feed intake of MA hens and AM hens was 1 238.55 g and 1 229.73 g, respectively.

Feed Conversion. Feed conversion is an indicator to evaluate the amount of feed consumed to increase bodyweight (Subekti 2003). Low feed conversion indicates smaller feed amount used to produce 1 kg of meat (Edjeng and Kartasudjana 2006). The feed conversion of MA and AM chickens is presented in Table 3.

Table 3. Feed conversion of MA and it's reciprocal at the age of 1-10 weeks

Weeks	$\bar{x}$ ± sd (n;CV%) Feed Conversion			
	MA		AM	
	g bird^{-1}			
1	1.851 ± 0.204 (11.03)		2.009 ± 0.203 (10.11)	
2	2.265 ± 0.578 (25.52)		2.315 ± 0.267 (12.04)	
3	2.849 ± 0.285 (10.00)		3.010 ± 0.424 (14.08)	
4	3.103 ± 0.245 (7.89)		3.108 ± 0.405 (13.04)	
Average	2.517 ± 0.603 (23.96)		2.586 ± 0.584 (22.57)	
	Male	Female	Male	Female
5	2.740 ± 0.450 (16.41)	3.007 ± 0.427 (14.21)	2.902 ± 0.302 (10.42)	3.382 ± 0.358 (10.59)
6	2.855 ± 0.375 (13.13)	3.394 ± 0.776 (22.87)	3.353 ± 0.671 (20.00)	3.495 ± 0.287 (8.22)
7	3.397 ± 0.760 (22.36)	3.596 ± 0.539 (15.00)	3.420 ± 0.931 (27.21)	3.633 ± 0.488 (13.43)
8	3.419 ± 0.533 (15.60)	3.814 ± 0.461 (12.08)	3.633 ± 0.831 (22.89)	3.945 ± 0.402 (10.18)
9	3.649 ± 0.590 (16.17)	4.101 ± 0.487 (11.88)	3.795 ± 0.224 (5.90)	4.245 ± 0.331 (7.79)
10	3.934 ± 0.370 (9.40)	4.225 ± 0.279 (6.59)	4.189 ± 0.292 (6.97)	4.325 ± 0.323 (7.47)
Average	3.332 ± 0.653 (19.61)	3.549 ± 0.699 (19.71)	3.689 ± 0.637 (17.27)	3.838 ± 0.502 (13.08)

A = Arab, M = Merawang, $\bar{x}$ = mean, sd = standard deviation, CV = Coefficient of variation.

MA chickens tent more efficient in using feed. MA chicken had low feed conversion (2.517) compared to AM chicken (2.611) at the age of 1-4 weeks, but statistically not different (P>0.05). Feed conversion between MA and AM in both males and females was the same (P>0.05) because the genetic composition between MA and AM chickens was the same (50% merawang and 50% arab chickens). North and Bell (1990) reported that males are more efficient in converting feed into meat because males have faster growth compared to females. This research found the similar facts.

CONCLUSIONS

Crossbred Merawang-Arab chickens and their reciprocal (Arab-Merawang) resulted the same bodyweight for males but different for females at the age of 6-8 weeks. Feed intake and feed conversion both males and females MA and AM was the same.

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