Phenotypic Study Results of Crosses between Local Chickens with Layer Chicken Isa Brown

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ABSTRACT

This research was conducted to produce crossbred by cross between local chickens with laying chicken strain isa brown. This study uses 3 types of local chickens, namely sabu chicken (C1), bangkok chicken (C2), and naked neck chicken (C3) which is crossed with laying hens Isa brown. Phenotypic properties studied include egg production, egg weight, fertility, hatchability, embryo mortality and hatching weight. The results showed that mating group have not significant effect (P>0.05) on egg production as measured by HDP but had significant effect (P<0.05) on egg weight. Mating groups also had no significant effect (P> 0.05) on egg fertility. Hatchability of each mating group from lowest to highest, C3 = 45.75 ± 19.03%, C1 = 49.35 ± 15.34%, and C2 = 58.37 ± 14.17%. However, statistically found there was not significantly different (P> 0.05). Embryo mortality rate was found to be quite high for the three mating groups, i.e C3 = 54.25 ± 19.03%, C1 = 50.65 ± 15.34%, and C2 = 41.63 ± 14.17%. This study uses Completely Randomized Design with the mating group as the treatment. The treatments are C1: sabu rooster x isa brown hen, C2: bangkok rooster x isa brown hen, and C3: naked neck rooster x isa brown hen. Each treatment was repeated 3 times and each replication consisted of 5 hens. but not significantly different (P> 0.05). The resulting hatching weight ranged from 43.85 to 46.84 grams with average for each group was C1 = 44,26 ± 4,76 grams, C2 = 46,04 ± 4,59 grams, and C3 = 43,85 ± 4,30 grams. Statistical analysis showed that mating groups had no significant effect (P> 0,05) on the hatching wight. Cross between bangkok rooster and isa brown hens showed better results compared to the other two crosses.

Keywords: Phenotypic, Crosses, Local chicken, Isa Brown

INTRODUCTION

Poultry farming in Indonesia has an important role in the development of farms, because it is the spearhead in the fulfillment of animal food needs. Currently poultry contribute the largest on national meat production is 60.73% and then followed by 21.94% beef. Of the total number of poultry is about 67% provided by hybrid chicken and only about 23% provided by local chickens, the rest by other types of poultry (Directorate General of Animal Husbandry, 2008)

Poultry in the future will still be the foundation as a source of food to meet the needs of animal protein because of some things that benefit the community: cheap, easy to get and liked. To speed up the poultry industry to better meet the needs in the country and compete in the global market, then the development of chicken farms should not rely only on hybrid chicken. This is based on several considerations, namely: (1) hybrid chicken was very high dependency level on overseas in the procurement of production facilities (seeds, rations, medicines) and technology, (2) the spread of hybrid chicken products have not been able to reach the isolated area, limited only around big cities. Indonesia has a large territory covering 18 thousand islands. For such an area that is able to meet the need for animal food only local chickens, because it is maintained by the community up in the isolated area (Ahmad and Siswansyah, 2006). Therefore, local chicken or domestic poultry has a strategic role in providing animal food. In addition to being a source of animal food for the family of farmers, is also able to supply some other community needs, especially those around the city as a diversification of animal food.

However, until now the development of local chicken is still not optimal in the provision of animal food in order to support national food security. Until now the productivity of local chickens is still low, so it is only able to meet about 23% of the local population of poultry, because it is still managed traditionally as a sideline business. Therefore, the development of local chickens should be directed to improve the welfare, independence of business, preserve and utilize the diversity of local resources and encourage and create competitive export.

The development of local or domestic poultry productivity can be done through environmental improvement programs or through genetic quality improvement programs. Environmental improvement program can be done through various efforts such as increasing the quantity and quality of feed, improvement of system maintenance and disease control. But the improvements gained through environmental improvements are temporary. If the environmental improvement program is stopped then the productivity of chicken will decrease again. Research on this topic has been widely practiced in domestic poultry and contributes considerably in changing the system of native chicken breeding.

Genetic quality improvement program in the effort of productivity development of domestic poultry can be done through selection and mating system. One of the most common mating systems used in breeding is outbreeding. The most common example of outbreeding is mating between different breed. This mating system is mainly used to produce high quality genetic livestock by combining genes from different livestock breed. This system has a high potential for use in poultry farms in order to increase productivity of domestic poultry. Through cross utilization of this breed can be produced high quality chicken seeds and can be well adapted in the environment with climatic conditions as in the province of East Nusa Tenggara. Based on the above considerations it have been carried out a research entitled Phenotypic Study Results of Crosses Between Local Chicken with Layer Chicken Isa Brown.

MATERIALS AND METHODS

This research has been conducted in Kelurahan Naikoten I, Kota Kota Kota Kupang District, for 6 months from May to October 2016. The study used 54 chickens, consisting of 3 local chickens (sabu), 3 bangkok roosters, 3 naked neck roosters and 45 laying hens of Isa Brown. Roosters of various strains are mated to Isa Brown laying hens with Artificial Insemination technique. The eggs produced, hatched by using a hatching machine. The chicks of these crosses will be used as material for the research of the second stage.

This study uses Completely Randomized Design with mating group as the treatment. The treatments are C1: sabu rooster x isa brown hen, C2: bangkok rooster x isa brown hen, and C3: naked neck rooster x isa brown hen. Each treatment was repeated 3 times and each replication consisted of 5 hens.. The description of the treatments is as follows:

Data obtained from this study were analyzed using descriptive statistics and analysis of variance in accordance with the instructions of Steel and Torrie (1993). If the result of variance analysis indicates that there is a significant effect, it will continue with Duncan Multiple Range Test. All data analysis is done using SPSS version 20 software package.

RESULTS AND DISCUSSION

Egg production

The egg production data for each mating group was calculated on the basis of hen day production (HDP) and observed for 14 days. HDP for C1 group was the lowest (60.32 ± 15.54%) followed by C2 group (61.11 ± 17.84%) and the highest was C3 group (65.08 ± 16.80%), as presented in Table 1.

Table 1. Average HDP from chicken research during 14 days of production

Days to	HDP (%)		
	C1	C2	C3
1	88.89	88.89	77.78
2	66.67	88.89	88.89
3	77.78	77.78	88.89
4	66.67	66.67	77.78
5	55.56	55.56	66.67
6	55.56	44.44	66.67
7	44.44	44.44	55.56
8	66.67	77.78	77.78
9	77.78	66.67	66.67
10	66.67	66.67	66.67
11	55.56	55.56	55.56
12	44.44	44.44	44.44
13	33.33	44.44	44.44
14	44.44	33.33	33.33
Mean	60.32 ± 15.54	61.11 ± 17.84	65.08 ± 16.80

The mean HDP of the study chickens was 62.17% and ranged from 33.33% to 88.89%. The presence of this variation is likely due to the age of the chicken that has passed the peak of production where the chickens used in this study were more than 80 weeks of age. Another thing that can explain the state of low production of eggs is the high ambient temperature that can be seen from the chicken that often panting especially during the day. Gunawan and Sihombing (2004) stated that at high ambient temperatures it takes more energy to regulate body temperature while feed consumption decreases, thus reducing the supply of energy for egg production. Furthermore, Fauziah (2016) states that poultry in the tropics suffers from heat stress which can lead to a decrease in egg production up to 25%.

Although empirically HDP chickens data were different but statistics analysis result show that mating group have no significant effect (P> 0,05). The absence of significant influence from the mating group shows that egg production is more influenced by genetic factors i.e seeds used and also feed given. Baktiningsih et al. (2013) states that the factors that affect egg production are the seeds used, parent age, housing, lighting, feed and environmental temperature.

Egg weight

The average weight of the hatching egg based on the mating group is presented in Table 2.

Table 2. Average hatching egg weight by mating group (gram)

Mating Group	Replication			Total	Mean
	I	II	III		
C1	64.33	65.67	62.67	192.67	64.22 ± 4.06^{ab}
C2	71.67	69.67	64.67	206.01	68.67 ± 4.97^{a}
C3	64.67	56.67	63.67	185.01	61.67 ± 5.83^{b}

Description: different superscripts in the same column shows significant effect (P <0.05)

The results showed the average egg weight of isa brown laying hen based on mating group from the highest to the lowest as follows: C2 group (68.67 ± 4.97 grams), followed by C1 group (64.22 ± 4.06 gram) and the lowest was C3 group (61.67 ± 5.83 grams). Statistical analysis showed that mating group had significant effect (P <0.05) on the weight of the hatching egg. Duncan test results showed that C2 group was significantly different with the C3 group, but has no significantly different with C1 group. The average weight of the hatching eggs in the C1 group was not significantly different with the C3 group. The C2 group is the best in producing the hatching egg weight. While the C3 cross group is the lowest compared to other crosses.

This egg weight difference is the influence of female genetic factors and is not influenced by the genetic factors of roosters. This is allegedly influenced by the individual metabolic ability of each hen is relatively unequal, so that although the strain, age and feeding the same but feed consumption of each individual is relatively unequal. Genetic factors affect the long period of growth of the ovum so that chicken eggs with larger yolk will produce larger eggs as well. Each individual female has a different period of growth of the ovum, resulting in an egg of varying sizes (Ensminger, et al., 2004).

Fertility

Egg fertility is the number of fertilized eggs divided by the number of eggs that are hatched. The fertility rate of eggs by mating group is presented in Table 3.

Table 3. Average of fertility of chicken eggs based on mating group (%)

Mating Group	Replication			Total	Mean
	I	II	III		
C1	71.67	66.89	69.91	208.47	69.48 ± 12.81
C2	71.64	72.69	75.63	219.96	73.32 ± 11.04
C3	69.91	79.64	52.31	201.86	67.29 ± 15.72

The data of fertility rate as shown in Table 4 shows that the C2 group has the highest ferlitility (73.32 ± 11.04%), followed by the C1 group and the lowest was C3 group (67.29 ± 15.72%). This result is consistent with Bahr and Bakst's (1987) statement which states fertility in inseminated chicken ranges from 60-70%.

The result of statistical analysis showed that the mating group had no significant effect (P> 0.05) on egg fertility. The absence of any significant influence from the mating group may be caused by the response of the isa brown hen to the mating by artificial insemination is no different. In addition, the three local chicken strains used originated from the same location so that the possibility of a smaller difference. Islam, et al. (2002) which states that fertility is the inherited trait of the elders to its variety that varies among breeds, varieties and individuals in one breed or variety.

Hatchability

The hatchability of isa brown hen eggs based on the mating group is presented in Table 4.

Table 4. Average hatchability of chicken eggs research based on mating group (%)

Mating Group	Replication			Total	Mean
	I	II	III		
C1	56,55	46,67	44,84	148,06	49,35 ± 15,34
C2	59,72	51,11	64,28	175,11	58,37 ± 14,17
C3	49,05	51,55	36,67	137,27	45,75 ± 19,03

The data in Table 4 shows that the hatchability of each mating group from lowest to highest, C3 = 45.75 ± 19.03%, C1 = 49.35 ± 15.34%. And C2 = 58.37 ± 14.17%. The result of statistical analysis showed that mating group had no significant effect (P> 0.05) on hatchability. Hatchability is influenced by several factors such as the number of fertile eggs and embryo mortality. The percentage of hatchability is inversely related to the embryo mortality rate.

Low hatchability in this study is thought to be caused by the parent's age. The parent age used in this study was more than 80 weeks old, which according to Opel (1979) that the older age of the female chicken hence the resulting of hatchability will be smaller.

The average mortality of embryos based on mating group is presented in Table 5.

Table 5. Average of embryo mortality rate research based on mating group (%)

Mating Group	Replication			Total	Mean
	I	II	III		
C1	43.45	53.33	55.16	151.94	50.65 ± 15.34
C2	40.28	48.90	35.72	124.90	41.63 ± 14.17
C3	50.95	48.45	63.33	162.73	54.25 ± 19.03

The embryo mortality based on mating group showed that C3 group had the highest mortality rate (54.25 ± 19.03%), followed by C1 group and the lowest was C2 group (41.63 ± 14.17%). The results obtained indicate that the mortality rate of the embryo is quite high which results in a considerable number of fertile eggs that cannot hatch. This is probably caused by the age of the parent that has passed the productive period and also the condition when hatching is often a power interuption due to rotating blackouts.

The result of statistical analysis showed that the mating groups have no significant effect (P> 0.05) on mortality rate of embryo. Embryonic mortality observed during the study was embryonic mortality occurring at age 7 and 18 days. The high mortality rate of the embryo on the 7th day and also on the 18th day is thought to be suspected by the temperature and humidity of the hatching machine due to rotating blackouts, so that the heat source obtained only from the wax causes difficulties to regulate the temperature. Unstable temperatures will cause failure in the hatching process, i.e the numbers of eggs fail to hatch and also affect the length of time hatching. It is characterized by a non-uniform hatching time that is faster on the 19th day or longer on the 22nd day. In addition, unstable humidity can cause embryonic death when the eggshell begins to crack and the chick is having difficulty while pipping so that there are some eggs in this study that are assisted in the process of pipping. This is in accordance with the opinion of Daulay, et al. (2008) that if humidity is not optimal, the embryo will not be able to break the eggshell.

Hatching Weight

The hatching weight of the crosses from the local roosters with the isa brown laying hens is presented on Table 6.

Table 6. Average of hatching weight of chicks based on mating group (gram)

Mating Group	Replication			Total	Mean
	I	II	III		
C1	44.00	44.56	44.22	132.78	44.26 ± 4.76
C2	46.11	46.44	45.56	138.11	46.04 ± 4.59
C3	41.44	42.33	47.78	131.56	43.85 ± 4.30

The data in Table 6 shows that the highest mean of hatching weight is in the C2 cross group (46.04 ± 4.59 gram), followed by C1 (44.26 ± 4.76 grams) and the lowest hatching weight was found in C3 group (43, 85 ± 4.30 grams). The result of statistical analysis showed that the crosses group had no significant effect (P> 0.05) on the hatch weight. This is because the hatching weight is not only influenced by egg weight but also influenced by other factors that are temperature and humidity of hatching machine. However, there is a positive correlation between hatching weight and egg weight. The results obtained are in accordance with the opinion of Lestari, et al. (2013) which states that the hatching weight is affected by egg weight, while North and Bell (1990) explain that small-weighted eggs will produce small chicks at the time of hatching compared to large-weighted eggs.

CONCLUSIONS

1. The appearance of female production based on the marriage group showed that the treatment did not have significant effect (P> 0,05) on the parameter study such as egg production, fertility, embryo mortality, hatchability, and hatching weight, but significantly (P <0.05) on egg weight variable.
2. The hatching weight is not influenced by the mating group but there is a close relationship between the hatching weight and egg weight where the higher weight of egg, the higher hatching weight and vice versa.

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