Selections and Egg Characteristics of Village Chicken Crossing with Pelung-Crossed Chickens

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ABSTRACT
Improving the productivity of village chickens (KP) can be done by crossbreeding using chicken that has high productivity, such as pelung chicken or pelung-crossed chicken (PS). In this study, three mating systems were applied, namely the mating between PS hens and PS roosters, KP hens and PS roosters, and KP hens and KP roosters. Performance selection of all experimental chickens was carried out at the beginning of the study and subsequently tested for egg quality. The results of the selection showed that the average ages of roosters were 13.33 months for PS chickens, 15.00 months for KP chicken, and the average age of hens were 9.90 months for PS and 9.76 months for KP. The average bodyweight of roosters was 3159.33g for PS and 2697.00g for KP, while the average body weight of hens was 2510.30g for PS and 1918.67 for KP. The comb shapes of the PS chicken were a single comb (male and female) while the village chicken's combs were pea (male and female). The shank (leg) of PS chicken was black in both males and females, while the shanks of the native chicken were yellow and black in both males and females. The feather colors of the PS chicken were red in males and black in females. The color of the feathers on the male chicken was striated and black and the female were black. The results of variance analysis showed that the egg weight, length, and egg width of PS hens mated with PS roosters were significantly greater than KP hens mated with PS or KP roosters (56.74g > 46.80g = 45.90g; 58.23mm > 54.77mm = 54.00mm; and 43.34mm > 40.43mm = 40.70mm, respectively). The egg index was similar for those hens with different mating systems. In conclusion, the phenotypic characteristics of KP chicken PS chicken have met the standard recommended by governments. Moreover, all egg characteristics (except egg index) of PS hens mated with PS roosters were significantly higher than KP hens mated with either KP or PS roosters. However, the PS roosters could not improve the egg characteristics of KP hens.

Keywords: *Village chicken, pelung, roosters, hens, crossing, egg.*

1. INTRODUCTION

Village chicken is one type of poultry that is commonly raised by people who live either in urban areas or rural areas. The types of village chickens are still very diverse according to where they are raised or specific characters they have, so it is more appropriate to named them local chickens. Local chickens are important to the livelihoods of many farmers in Indonesia where they are raised in low input traditional management systems. The chickens scavenge for feed which includes kitchen waste, insects, worms, grasses and vegetables. Local chickens produce meat that a specific texture and taste and contains lower fat. Therefore, it is more preferred by most consumers and as a consequence, local chicken meat is more expensive compare to broiler meat. The eggs of local chicken are also more expensive than a commercial chicken eggs and are used for different purposes such as part of traditional herbal medicine called "Jamu" which is very popular in Indonesia [1-2].

In Ethiopia, village chicken production has diverse socioeconomic roles [3]. The Majority of chicken keepers in the rural family use chicken for sale to cover household expenditures (44%), family consumption (24%), and ceremonies relate to cultural and religious events (22%) and means of saving (10%) [4]. Village chicken production is also used as a source of high quality protein food to smallholder farming families [4].

Based on use values, chickens are broadly grouped into single-purpose layers (mainly brown- and white-eggs), and broilers, dual-purpose and multipurpose (general-purpose), experimental, cockfighting (game), traditional (heritage, ornamental), and feral types [5].

Village chickens are classified as poultry with a dual purposes production type, which can produce meat and eggs. There are several varieties of village chicken grouped as meat-type chicken such as Pelung chicken [6-7]. Besides Pelung chicken, meat-type village chicken raised in Indonesia included Nagrak chicken, Gaok, and Sedayu chickens, while layer-type chickens included Black kedu, White kedu, Nusa penida, Nunukan, Merawang, Wareng, and Sumatran chickens. There are also dual-purpose types chicken such as Sentul chicken, Bangkalan, Olagan, Ayunai, Malay, and Siem chickens. In addition to these types, there are fighting type chickens such as Banten chicken, Ciparage, Tolaki, and Bangkok chickens and favorite/ornamental livestock such as Tukung chicken, Burgo, Bekisar, and Walik chickens [8].

In general, native/village chickens are more resistant to disease compared to the introduced breed such as the commercial broiler or laying hen. This is possible because they have been familiar with the local environment and adapted well to environmental changes [9]. Moreover, they have relatively high selling prices and high public interest in consuming village chicken meat and eggs. However, the productivity of native chickens is still very varied. This may be due to the difficulty of controlling the mating of native chickens which are generally still kept traditionally by the people so that the offspring produced are very varied. Therefore, it is necessary to create such a strategy to develop the productivity of village chicken by implementing a good selection system and maximizing the role of artificial insemination technology. Good selection practice combined with crossbreeding using high productive chicken and application of artificial insemination method may increase the productivity of village chicken. The first step in this program is to identify the egg characteristics produced by village chicken crossed with high productive chicken such as Pelung chicken. Therefore, in this research, selection and crossbreeding of village chicken with Pelung chicken was conducted to produce high quality eggs.

2. MATERIALS AND METHODS

Thirty five village chickens (KP) (30 hens and 5 roosters), and 25 Pelung-crossed chicken (PS) (20 hens and 5 roosters) were used in this study. Pelung-crossed chickens were produced from crossbred Pelung chicken (rooster) with village chicken (hens) that were raised in the Laboratory of Animal Science, Universitas Halu Oleo, Indonesia. All roosters selected were mature and ready to mate, with an average age of one year. The feed used was commercial chicken feed with a protein value ranging from 16-17% and energy of 2900 kcal/kg ME. While the chick produced from crossbreeding was fed using a high protein diet (19-21% protein and energy 2900-3000 kcal/kg ME). Feed and drinking water were provided *ad libitum*.

After selection, 24 KP chicken (21 hens and 3 roosters) and 23 PS chicken (20 hens and 3 roosters) were gained. All selected chickens were reared in individual cages and the mating process was carried out by applying artificial insemination. Randomly completed Design with three treatments of the mating systems was applied in this research. The mating systems applied were consisted of KP hens mated KP roosters, KP hens mated PS roosters, and PS hens mated PS roosters. The eggs obtained from those hens with 3 different mating systems were observed its characters included egg weight, egg length, width, and egg index. The data collected were then analyzed using variance analysis and differences between groups were analyzed with Duncan Multiple Range Test using IBM SPSS Statistics 25.

3. RESULTS AND DISCUSSIONS

3.1. Chicken Selections

This research begins with the implementation of the selection of chickens to be bred. The selection was carried out on both hens and roosters. The selection was made on five criteria, namely age, body weight, comb shape, shank color and feather color. The initial selection was directed at the criteria for the physical appearance of the chickens (comb shape, shank color and feather color) followed by determination of age and body weight measurement. The data obtained from the selection of hens and roosters used in this study were

Table 1. Performances of selected chicken

Parameters	Village chicken (KP)		Pelung-crossed chicken (PS)	
	Roosters (n=3)	Hens (n=21)	Roosters (n=3)	Hens (n=10)
Age (months)	15.00±1.00	9.76±1.41	13.33±0.58	9.90±1.37
Body weight (g)	2,697.00±143.45	1,918.67±227.60	3,159.33±113.25	2,510.30±197.32
Comb shape	pea	Pea	single	single
Shank color	yellow, black	yellow, black	black	black
Feather color	striated, black	Black	red	black

Table 2. Characteristics of egg produced from three different mating systems

Mating systems	Egg weight (g)	Egg length (mm)	Egg width (mm)	Egg index (%)
PS x PS	56.74±4.59[a]	58.23±3.45[c]	43.34±1.81[e]	74.63±4.46
KP x PS	46.80±2.58[b]	54.77±1.88[d]	40.43±1.13[f]	73.93±3.98
KP x KP	45.90±2.49[b]	54.00±1.86[d]	40.70±1.74[f]	75.45±3.92
Averages	48.53±5.36	55.67±2.25	41.21±1.97	74.85±4.10

Means in the same columns with different superscripts indicated differences at $P < 0.05$

presented in Table 1.

The average age of the selected hens was 9.90 months for PS chickens and 9.76 months for KP chickens. The results of the body weight of PS chicken were 3,159.33g and 2,510.30g for both roosters and hens, respectively. Whereas, the body weights of KP chicken were 2,697.00g and 1,918.67g for both roosters and hens, respectively.

The comb shape of PS chicken, both hens and roosters, was a single comb, while the KP chickens had a pea-shaped comb (bean) for both hens and roosters. The shank (leg) of PS chicken was black for both hens and roosters, while the shank of KP chicken was yellow and black for both hens and roosters. The feather color of the PS chickens was black for hens and red for roosters. The feathers color of KP roosters was striated and black while the KP hen feathers color was black.

All selection criteria used in this study were in accordance with the selection criteria set by the Ministry of Agriculture [10-11]. Under traditional management, the body weight of rooster and hen of village chicken was 2.61kg and 1.65kg, respectively, [12] while Pelung chicken ranged between 3.37kg-4.00kg [13-14] for roosters and 2.52kg for hens.

3.2. Characteristics of Eggs

The characteristics of chicken eggs evaluated in this study included egg weight, length, width and egg index. Data on the characteristics of the eggs obtained are presented in Table 2.

The results of variance analysis showed that the breed in the mating system had a significant effect ($P<0.05$) on egg weight, egg length, and egg width but not for egg index. Furthermore, based on the results of the DMRT test, it was found that egg weight, egg length, and egg width of PS hens mated with PS roosters were significantly higher ($P<0.05$) compared to egg produced by KP hens either mated with PS or KP roosters. This was very reasonable to happen because PS chickens are higher in body weight compared to KP chickens. This will affect the weight of the eggs produced. The average body weight of PS hens used in this study was 2,510.30g, while the body weight of KP hens was 1,918.67g.

The egg weight averages of PS hens mated with PS roosters was 56.74±4.59g which was significantly higher than KP hens mated with either PS or KP roosters (46.80±2.58g and 45.90±2.49g, respectively). There was some researchers reported that the egg weight of PS chicken were 48.87g (36.10-56.70g)[15], 46.72g[16], 40,60g and 45.90g [17]. Moreover, the egg weight of KP chicken was 42.56g (26.27-55.40g) [15], 45.46g [16], 43.60g [17]. While the egg weight of the Pelung chicken crossed was 41.22g (Pelung crossed with Lurik chicken) and 39.84g (Pelung crossed with Komering chicken) [18]. The results of this study indicated that there was a positive correlation between body weight and egg weight in which the higher of body weight, the higher of egg weight. Moreover, the results of this study also indicated that the egg weight of KP hens was not affected by the breed of roosters that mated the KP hens. The average weight of eggs produced by KP hens mated with PS roosters was similar to the weight of eggs produced by KP hens mated with KP roosters (46.80g vs 45.90g). The role of semen/spermatozoa of roosters is to fertilize an egg, so it is much correlated to fertility, hatching rate and day old chick weight but not to egg characteristics such as egg weight, egg length, and egg width and egg index.

4. CONCLUSIONS

Based on the results, it was concluded that the phenotypic characteristics of village chicken (KP) and Pelung-crossed chicken (PS) were met the standard recommended by governments. Moreover, all egg characteristics (except egg index) of PS hens mated with PS roosters were significantly higher than KP hens mated with either KP or PS roosters. However, the PS roosters could not improve the egg characteristics of KP hens.

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