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## Research Article

# Phenotypic Characteristics of Super Kampong Chickens Raised as Meat Producers

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### Abstract

**Background and Objective:** Phenotypic polymorphisms of livestock can be used as a basis for selection programs. This study was conducted to determine the characteristics of super kampong chickens raised as meat producers. **Materials and Methods:** A total of 184 birds were maintained in open housing with concrete floors, from day-old chicks until 13 weeks of age. During the starter phase, the birds were given broiler feed and from week 4 onward, feed quality was reduced every week by adding 10% fine rice bran. The observed variables were feather color, shank color, lobe color, skin color, beak color and comb shape at 13 weeks of age. The obtained data were tabulated and the frequency was calculated. **Results:** The results showed that the most common color of super kampong chicken feathers was brown, followed by white, Columbian, black, striated and gray. Shank color was mostly yellow, followed by black and white. Lobe color was mostly red, followed by white. The overall skin color was white. The beak color was mostly yellow, followed by black and white. The shape of the chicken comb was dominated by the pea type, followed by the single type. The dominant phenotypic characteristics of the dam line inherited by the super kampong chickens were feather color, shank color and beak color, while lobe color, skin and comb shape were inherited from the sire line. **Conclusion:** Super kampong chickens exhibit high phenotypic polymorphism.

**Key words:** Beak, comb, feather color, shank, lobe, Kampong chickens, phenotypic traits

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**Competing Interest:** The authors have declared that no competing interest exists.

**Data Availability:** All relevant data are within the paper and its supporting information files.

## INTRODUCTION

Kampong chickens are widely used in traditional Indonesian dishes and still cannot be substituted by broiler chickens because these chickens have a unique savory flavor<sup>1</sup>. In addition, these chickens have a lower fat content than male broilers but a similar fat content to Arabic chickens<sup>1</sup>. The quality of kampong chicken meat is very similar to that of Arabic chicken meat but shows lower tenderness than that of male laying lines<sup>2</sup>.

Kampong chickens do well when maintained using a traditional extensive management method in which they can wander freely and are given supplementary feed such as agricultural waste and kitchen scraps<sup>3</sup>. However, the growth and egg production rates of these chickens are very low<sup>4</sup>, making it difficult to breed these chickens in large numbers. As a result, it is difficult to meet the increasing demand for these chickens for Indonesian culinary needs. To address this issue, a large number of identical chicken seeds are needed. To meet this need, cross-breeding between commercial laying hens of the Hisex Brown strain and Bangkok male chickens (Indonesian local chicken) was carried out. Commercial laying hens were used to obtain an increased number of eggs, while male Bangkok chickens were used to achieve the same meat quality found in kampong chickens. Thus, this cross is expected to produce a large number of chickens in a short time with the same meat quality and flavor as kampong chickens. The available studies on the performance of super kampong Chickens of which we are aware are inadequate; therefore, this study aimed to determine the characteristics of super kampong chickens raised as meat producers. The results of this study can be used as a basis for the selection of super kampong chicken for various purposes. It is expected that this study will enrich scientific knowledge of these chickens.

## MATERIALS AND METHODS

**Location:** The chickens were reared at the teaching farm of the Faculty of Animal Science, Mataram University, Lombok, Indonesia.

**Housing and management:** A total of 185 day-old chicks were raised in open housing with concrete floors, which were covered with rice husks as litter. During the starter phase, the birds were fed a commercial broiler diet with the nutrient composition shown in Table 1. Starting from the age of 4 weeks, feed quality was decreased by adding 10% fine rice

Table 1: Chemical composition of commercial broiler diet (%)

Moisture	12
Crude protein	20.5-22.5
Crude fat	5
Crude fiber	5
Ash	7
Calcium	0.8-1.1
Phosphate	0.5
Feed mill information	

bran. The percentage of rice bran gradually increased by 10% every week. Lighting was provided for 24 h per day. Water and feed were provided *ad libitum*.

**Measurements:** The variables observed in this study were feather color, shank color, lobe color, skin color, beak color and comb shape. The measurement of all variables was performed on individual chickens at 13 weeks of age.

**Data analysis:** The collected data were tabulated and the frequency was calculated.

## RESULTS AND DISCUSSION

The results of this study revealed six different colors in the observed chickens: white (Fig. 1), brown (Fig. 2), Columbian (Fig. 3), black (Fig. 4), striated (Fig. 5) and gray (Fig. 6). The high color variation of the feathers was an indication that it was appropriate to refer to the crossbred line between the commercial laying hens of the Hisex Brown strain and Bangkok male chickens as super kampong chickens. One of the characteristics of kampong chickens is the presence of a variety of feather colors<sup>5,6</sup>. In the current study, brown chickens referred to individual chickens with a brown feather base and a combination of brown and white feathers. The chickens included in the white feather group were those exhibiting plain white feathers and those exhibiting white feathers with red highlights on the wings, at the base of the tail and on the neck or a white base with slight black coloration at the base of the tail. The brown and white feather color of the super kampong chickens was inherited from their parent, the commercial Hisex Brown laying chicken. The female commercial laying chickens exhibited brown feathers, while the male had white feathers.

The Columbian feather color in super kampong chickens referred to chickens showing dark red coloration on their neck, back and wings and black coloration on their tail and chest. The chickens were included in the black group when they were covered with plain black feathers; when the head, neck and back were black with reddish-yellow highlights and when the head and neck were black with white highlights.



Fig. 1: Brown color feather



Fig. 4: Black color feather



Fig. 2: White color feather



Fig. 5: Striated color feather



Fig. 3: Columbian color feather



Fig. 6: Grey color feather

The super kampong chickens were considered to show striated feathers due to striated coloration. Feathers showed white base and a combination of yellow, black and brown colors that started from the backside of neck and reached towards the tail. The black tail was decorated with a few stripes of white feathers, while the area from the upper neck to the head and the lower body was white. The striated color group also included the chickens whose feathers over their entire bodies were a combination of white and black, but those on the neck and head were a combination of gray and black. Another variety of chickens with striated color was covered with brown and black feathers from the upper body up to the tail but with white feathers with black strands on their head, neck, chest and thighs.

The chickens were included in the gray group when their feather base color was gray and their head and neck were covered with black-gray feathers. The chickens with a gray base color and brown head, neck, back, wing and chest were also grouped into the gray group.

The data on the frequency of feather color, shank color, lobe color, skin color and the shape of the super kampong chicken comb are presented in Table 2. The data showed that the feather color of super kampong chickens was mostly brown (39.7%) and white (34.2%), followed by Columbian, black, striated and gray. This means that feather color inherited from female Hisex Brown chickens was more dominant (74%) than that from male Bangkok chickens (26%). The female Hisex Brown commercial chicken is brown, while the male Bangkok chicken is white. The variety of feather colors recorded in this study was similar to a previous report which indicated that the male kampong chickens had six different feather colors, while that of female kampong chickens had seven different colors<sup>7</sup>. However, the observed variety of feather colors is higher than that of the Arabic chickens, which exhibited only four different feather colors: gold, silver, golden silver and golden white<sup>8</sup>.

Feather color in poultry is controlled by the melanocortin 1 receptor (MC1R) gene<sup>9</sup>. This gene plays an important role in the regulation of eumelanin (black/brown) and pheomelanin (red/yellow) in chicken feather pigmentation<sup>10,11</sup>. Melanin produces black feathers in poultry<sup>12</sup>. Brown, gray and black colors appear because of the deposition of the eumelanin pigment, while the reddish brown color is caused by pheomelanin. The reddish yellow color is caused by carotenoid pigments<sup>13</sup>.

Three different shank colors were identified in super kampong chickens: yellow (Fig. 7), black (Fig. 8) and white (Fig. 9). The highest shank color frequency was yellow, followed by black and white (Table 2). This proved that the shank color of the Hisex Brown female laying hen strain was



Fig. 7: Yellow shank

Table 2: Frequency of several super kampong chicken phenotype traits

Variables	Frequency
<b>Feather color</b>	
Brown	0.397
White	0.342
Columbian	0.130
Black	0.092
Striated	0.027
Grey	0.011
<b>Shank color</b>	
Yellow	0.745
Black	0.217
White	0.038
<b>Lobe color</b>	
Red	0.875
White	0.125
<b>Skin color</b>	
White	1.000
Yellow	0.000
<b>Beak color</b>	
Yellow	0.565
Black	0.424
White	0.011
<b>Comb shape</b>	
Pea	0.837
Single	0.163
Rose	0.000
Walnut	0.000

more dominant than that of the male Bangkok chicken in super kampong chickens. The appearance of yellow as the dominant shank color in the super kampong chicken is beneficial for the development of super-free chicken as a meat-producing chicken. Chicken meat consumers in Indonesia prefer chickens with yellow shanks compared to other shank colors<sup>14,15</sup>. The difference in shank color is caused by the influence of pigments<sup>10,11</sup>. The yellow shank color is



Fig. 8: Black shank



Fig. 10: Red lobe



Fig. 9: White shank



Fig. 11: White lobe

caused by the lipochrome pigment, while the absence of the lipochrome pigment causes the shank to turn white. Dark blue and light blue shanks are caused by the deposition of melanic pigments in various shank cells that have a white base color, while dark green and light green shanks are caused by deposition of melanic pigments in the shanks that have a yellow skin base color. Black shank are caused by the deposition of melanin in the shank and appear in black chickens, including those with both yellow and white skin.

Table 2 shows that the super kampong chicken lobe exhibited two colors, red (Fig. 10) and white (Fig. 11). Red color showed the highest frequency. This result is in accord with a previous study which showed that lobe color is dominated by red color<sup>16</sup>. Thus, the red lobe of the super kampong chicken was inherited from the Bangkok chicken, while the white lobe came from the Hisex Brown laying hens.

In general, super kampong chickens have white skin. The factors that influence the skin color of chicken are genes and feed<sup>17</sup>. Both Hisex Brown and Bangkok chickens exhibit white skin color. Skin color greatly influences the choice of chicken consumers. Consumer preferences for chicken skin color vary around the world and are generally affected by the history and the supply of chickens in the region<sup>18</sup>. In northern Italy, yellow skin is preferred, whereas in southern Italy, pale white skin is preferred<sup>17</sup>. Consumers in Indonesia prefer chicken with clean white shiny skin<sup>14,15</sup>. Thus, the existence of kampong super chickens with white skin is seen as an advantage for developing the chicken as a source of meat in Indonesia.

The results of the study also showed that the beak color of the kampong super chicken was mostly yellow (Fig. 12), followed by black (Fig. 13) and white (Fig. 14). The yellow



Fig. 12: Yellow lobe



Fig. 14: White beak



Fig. 13: Black beak



Fig. 15: Pea comb

color was derived from Hisex Brown laying hens, while the black and white colors were derived from the Bangkok chicken. The beaks of broilers are usually yellow or white<sup>19</sup>. The yellow color of the beak is not produced by the body of the poultry but comes from carotenoids (xanthophyll) found in feed<sup>20</sup>.

Table 2 also indicates that the shape of the kampong super chicken comb is dominated by the pea type (Fig. 15), followed by the single type (Fig. 16). In tropical regions, the most common comb shape is the single type<sup>21</sup>, which is very useful for poultry to release body heat<sup>22</sup>. The shape of the single comb in kampong super chickens is derived from a laying chicken, while the pea comb shape comes from Bangkok chicken. This means that the



Fig. 16: Single comb

comb of kampong super chickens follows the shape of the Bangkok chicken comb more closely than that of the laying chicken.

### CONCLUSION

The most common feather color in super kampong chickens was brown, followed by white, Columbian, black, striated and gray. The most common shank color was yellow, followed by black and white. The most common lobe color was red, followed by white. The overall skin color was white. The most common beak color was yellow, followed by black and white. The most common shape of the comb was the pea type, followed by the single type. The dominant phenotypic traits (feather color, shank color and beak color) of super kampong chickens were inherited from the laying chicken, while the color of the lobe and skin and comb shape were inherited from Bangkok chicken.

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