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Qualitative Traits of Muscovy duck (*Cairina moschata*) in Ciayumajakuning, West Java, Indonesia

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ABSTRACT

Qualitative traits can be used as a reference for Muscovy duck development and conservation. Qualitative traits are indispensable for selection based on phenotypic such as plumage, beak, and shank. The research objective was to study the qualitative traits of Muscovy duck in Ciayumajakuning (Cirebon, Indramayu, Majalengka, dan Kuningan). This research used the survey method with the sampling technique of multistage probability random sampling. The research object observed was 673 Muscovy ducks consisting of 309 males and 364 females. Data analysis applied the descriptive qualitative analysis method. The results of the research showed that female Muscovy duck's plumage colours were dominated by black-white (44.78%), only white (28.30%), and only black (17.86%); while male colours were dominated by only white (45%), black-white (35.9%), and grey (7.77%). The female beak colours were dominated by black (25.82%), black-white (20.60%), and pink (23.63%), while male beak colours include pink (38.80%), black (21.00%), and black-white (19.40%). Female shank colours were dominated by black (39.29%), white (27.29%), and yellow (18.68%); while male shank colours, among others, were yellow (41.70%), black (29.80%), black-white (12.00%). Based on the study's results, the qualitative traits of the Muscovy duck in Ciayumajakuning were quite diverse.

Keywords: Ciayumajakuning, Muscovy duck, Qualitative Traits

INTRODUCTION

In the last couple of years, the role of poultry in producing meat has received significant attention, especially Muscovy duck livestock. In Indonesia, Muscovy duck is a waterfowl generally kept for producing meat. Muscovy ducks being kept by and large have the following body weights: 3-4.5 kg for male Muscovy ducks and 1.5-2.5 kg for female Muscovy ducks (Yakubu 2011); 4.7-5.4 kg for drake and duck Muscovy ducks (Chen et al. 2018); 3-3.5 kg and 1.8-2.5 kg for male and female Muscovy ducks (Etuk et al. 2006); 3.5 and 2.5 kg for male and female Muscovy ducks (Tamzil et al. 2018).

The dressing carcasses percentage of males and females was 72.01 -74.90 and 69.09 - 70.98 (Abd El-Samee et al. 2012). The percentage of male and female Muscovy duck carcasses were 70% and 51% (Banga-Mboko et al. 2007), 78.8%, and, 77.4% (Yakubu 2013). The percentage of male carcasses ranged from 61.7 to 62.9% (Drouilhet et al. 2016). Another advantage is that Muscovy duck has a better percentage of carcass and meat quality than ducks. Muscovy ducks produce 40-60 eggs per year (Oguntunji et al. 2015); the calculation of the number of eggs per Muscovy duck per season is 80.8 ± 0.74 (Banga-Mboko et al. 2007). The weight of a Muscovy

duck egg was 78.36 g-85.32 g (Etuk et al. 2012), 76.4 g, and 76.3 g (Tamzil et al. 2018). The data above shows excellent potential for developing Muscovy ducks as meat and egg-producing livestock.

In Indonesia, Muscovy duck is generally raised in rural areas as a part-time job besides the main occupation of farming or employees. Muscovy duck breeders can sell their Muscovy ducks whenever they need them. The muscovy duck population in Indonesia is 8.7 million and in West Java alone is 1.5 million (Ditjennakpkh, 2018). Ciayumajakuning is a Muscovy duck center in West Java that has of 1.03 million ducks; the details are as follows: Cirebon 253,000, Indramayu 770,000, Majalengka 129,000, and Kuningan 68,000 Muscovy ducks (Dinas Ketahanan Pangan dan Peternakan Provinsi Jawa Barat, 2018). Muscovy ducks raised in Ciayumajakuning are generally local species, so they have a good chance of developing. Muscovy duck productivity in the Ciayumajakuning area is still low (Widianingrum et al. 2020). As a result, the Muscovy duck population has remained the same year to year, and breeders/farmers suffered losses. Muscovy duck productivity can be enhanced through high-quality breeds supported by good feeding and raising management. Selection means choosing the Muscovy ducks with excellent characteristics to be raised, such as qualitative traits.

Research on the qualitative traits of Muscovy ducks in Ciayumajakuning is crucial in identifying the types of existing Muscovy ducks. Research on the qualitative traits of Muscovy ducks has been done by Afrika (Yakubu and Ugbo 2011). Limited studies regarding breed characterization of the local ducks in Indonesia have been carried out, either for technical characteristics of Muscovy duck or for genetic characterization (Ewuola et al. 2020). Muscovy duck development efforts must be aided by high productivity; high productivity is affected by breeding, feeding, and management.

The importance of qualitative characteristics in the productivity of the ducks is one of the characteristics that distinguish the ducks in Ciayumajakuning from other areas. these differences can be observed in the colour of the plumage, the colour of the beak, and the colour of the shank. This research aimed to study the qualitative traits of Muscovy duck in Ciayumajakuning.

MATERIAL DAN METHOD

The research material was 673 heads of adult Muscovy ducks (309 male and 364 female). The research method used was a survey method with a sampling technique of multistage probability random based on the data of the Muscovy duck population in West Java. The data analysis used was a descriptive qualitative analysis method. Qualitative parameters included the colour of plumage, beak, and shank. Procedures were collecting Muscovy duck population data from the Department of Animal Husbandry of West Java Province, the District and breeder in Ciayumajakning area. The map of the research area can be seen on Figure 1.

Figure 1. Map of the Research Area (Shutterstock, 2022)

RESULTS AND DISCUSSION

a. Plumage Colour

The proportions of the qualitative traits of male and female are presented in Table 1. Based on Table 1, the colour proportions of female plumage were white, black-white, black, brown, and grey for 28.30%, 44.78%, 17.86%, 1.37%, and 7.69%, respectively. At the same time, the colour proportion of male Muscovy duck's plumage was white, black-white, black, brown, white-grey, and grey for 45%, 35.9%, 6.15%, 1.94%, 3.24%, and 7.77%, respectively. The dominant plumage colour similarity was might be due to the similarity in gene flow that influences plumage colour variations in the three study areas.

Table 1. The Proportions of Qualitative Traits of Muscovy duck

Qualitative Traits	Male	Female	Male Relative Frequency (%)	Female Relative Frequency (%)	Total Relative Frequency (%)
a. Plumage Colour					
White	139	103	45.00	28.30	35.96
Black White	111	163	35.90	44.78	40.71
Black	19	65	6.15	17.86	12.48
Brown	6	5	1.94	1.37	1.63
White Gray	10	0	3.24	0	1.49
Gray	24	28	7.77	7.69	7.73
Total	309	364	100	100	100
b. Beak Colour					
White	4	68	1.29	18.68	10.70
Black	65	94	21.00	25.82	23.63
Black White	60	75	19.40	20.61	20.06
Gray	0	11	0	3.02	1.63
Pink White	23	0	7.44	0	3.42
Pink Black	37	30	12.00	8.24	9.96
Pink	120	86	38.80	23.63	30.60
Total	309	364	100	100	100
c. Shank Colour					
White	23	100	7.44	27.47	18.28
Black	92	143	29.80	39.29	34.92
Black White	37	26	12.00	7.14	9.36
Black Yellow	28	23	9.06	6.32	7.57
Yellow	129	68	41.70	18.68	29.28
Black Gray	0	4	0	1.10	0.59
Total	309	364	100	100	100

In addition, the tendency of farmers to select a specific plumage colour affects the domination of a certain colour. Breeders have utilized qualitative traits in the selection of livestock, including uniformity in outward appearances, such as colours and colour patterns of plumage (Ewuola et al. 2020). The result of the study shows that the frequency of female plumage was dominated by black-white (44.78%) and white (28.30%). The plumage colour of 1,020 Muscovy ducks from various regions in Nigeria was dominated by black-and-white (spots)

(45.0%), followed by black (34.00%), white (10.0%), tanned white (9.71)%, and blue (0.39%). (Oguntunji and Ayorinde 2015).

The result of the study shows that the frequency of male plumage was dominated by white (45%) and black-white (35,9%). White (and) black with white spots showed a balanced frequency (50:50) of colour on Drake (Tamil *et al*., 2018). Meanwhile, in this study female have the more dominant colour of white plumage than black with white spots with frequencies of 62% and 38%, respectively. Domestic Muscovy duck plumage colours are very diverse, namely black-white, blue, blue-white, brown, brown-white, white, black, black-white, violet, and clinical (dull, dirty, and unshiny colours) (Bati et al. 2014). Muscovy duck plumage in northern Nigeria was 36.9% colourful, 30.6% white, 6.4% black, and 26.1% black-white (Raji et al. 2009). The colour of Muscovy duck plumage observed had only a tiny fraction of white (Brun et al. 2005a). The white colour frequency of Muscovy duck plumage was lower at 30.33%, and the rest was black (Ogah et al. 2009).

The plumage colours of the drake and duck are presented in Figure 2. Based on Figure 2, the colours of female plumage were ivory, including white, black-white, black, brown, and grey. In comparison, the plumage colours of male were white, black-white, black, brown, white-grey, and grey. The diversity of plumage colours of the Ciayumajakuning Muscovy duck was an inheritance of traits passed on from the elders to their offspring. The inheritance of plumage colour is a genetic complexity and essential in the interactions between alleles and in alleles (Brun et al. 2005b). Mule duck meat production is developing in Europe, Vietnam, and South East China (Cheng et al. 2002). The observed highest frequency of mottled plumage for Muscovy ducks in the present study agrees with the reports on Muscovy ducks of North-central Nigeria and West Bengal, India, respectively (Oguntunji 2017). Conversely, black and multi-coloured were the predominant plumage colours among North West (Schaaf et al. 2018) and North Eastern (Raji et al. 2009) Nigeria Muscovy ducks, respectively. Corroborated this assertion that social preference, natural selection, and adaptation are the significant causes of the variation inplumage colour (Oguntunji and Ayorinde 2015).

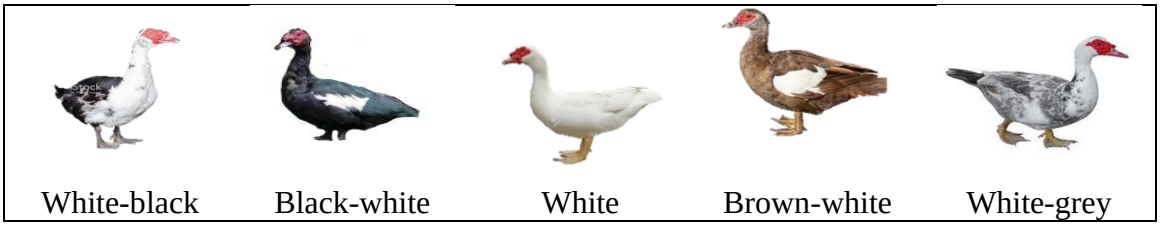

Figure 2. Plumage, Beak, and Shank Colours of Muscovy duck

b. Beak Colour

Based on Table 1, the proportion of female beak colour were black (25.82%), pink (23.63%), black-white (20.60%), white (18.68%), pink-black (8.24%), and grey (3.02 %). While the beak colours of male were pink (38.80%), black (21.00%), black-white (19.40%), pink-black (12%), pink-white (7.44%), and white (1.29%). Phenotypic diversity in a population is a product of the interaction of evolutionary forces such as selection, migration, mutation, maintenance management, and environmental stress experienced by individuals over many years; diversity in a population can be used as a guide for selecting birds for various purposes (El-Tholoth et al. 2019).

The beak colour pattern in this study differs from Tamsil *et al*. (2018) who report that the Lombok Muscovy duck (male and female) has two colour patterns: black with white in the middle and white with black in the middle (Tamzil et al. 2018). Females' frequency of white rotation with black in the middle is higher than the average black with white in the middle. However, in male, both patterns have the same frequency (Gustafson et al. 2007).

There are two patterns of beak colours of Ciayumajakuning Muscovy ducks: a one-colour pattern and a two-colour pattern. In a two-colour pattern, the beak colour on the base is black, and the tip is white or pink; when the base is black, the middle part is white or pink, and the tip is black. The colour of female Muscovy duck's beak varies and comprises white, black, black-white, grey, pink-black, and pink. In contrast, the beak colour of male includes white, black, black-white, pink and white, pink-black, and pink. The difference in the beak colour of male Muscovy ducks is that there would not be grey, and in ducks, there would be no pink-white (Guémené et al. 2007).

Different colours of the beak, legs, and shank are thought to be influenced by the maintenance/raising management and different feeding methods, as also gene influences (Briese et al. 2009). Muscovy ducks under intensive maintenance tend to have a beak, leg, and shank colour of pale ivory. In contrast, those under semi-intensive maintenance have the predominantly dark ivory colour of the beak, leg, and shank. It is suspected because Muscovy ducks being kept in semi-intensive maintenance, in addition to obtaining a carotenoid or xanthophyll source from the feed given, receive more xanthophyll from the natural feed when they are roaming freely (El-Tholoth et al. 2019). Based on observations in the field, some Muscovy duck breeders tend to use more algae/swamp forage in preparing feed as a source of carotenoids or xanthophyll, which can help the formation of yellow pigments (Liu et al. 2015).

One pair of genes causes yellow (w) in plumage, beak, and shank due to xanthophyll. According to (Ogah et al. 2009), the yellow colour of the beak, legs, and shank is caused by lipochrome fat or pigment in the epidermal layer. Meanwhile, black pigment or melanin is not found in the epidermis and dermis; it is influenced by the Id gene (dermal melanin inhibitor), inhibiting the placement of melanin pigment inside the skin. The dermal melanin gene (Id +) mainly affects the black colour of the skin. Melanin is produced from the amino acid tyrosine phenol oxidation carried out by enzymes (Damaziak et al. 2014).

The appearance of yellow on the beak and legs is due to the influence of the recessive sepia faiogeno (f) gene and lies in the autosomal (Liu et al. 2019). The variations in the colour of the beak, legs, and shank are determined by three main factors, namely skin structure, the pigment in the skin, and genetic factors. Pigments in the skin are mainly composed of melanin and xanthophyll. Melanin is a complex protein that brings blue and black colours to the skin. The yellow colour on the skin, including on the feet, beak, and shank, is not produced by Muscovy duck's body cells as melanin does, but by xanthophyll from plants and poultry get xanthophyll from the food being consumed (Marie-Etancelin et al. 2008).

The beak colour of the female varies, namely white, black, white-black, grey, pink-black, and pink. In comparison, the beak colour of male Muscovy duck includes white, black, black-white, pink-white, pink-black, and pink. The proportion of duck beak colour is black (25.82%), pink (23.63%), black-white (20.60%), white (18.68%), pink-black (8.24%), and grey (3.02 %). While the beak colours of male are pink (38.80%), black (21.00%), black-white (19.40%), pink-black (12%), pink-white (7.44%), and white (1.29%). The difference is that there are no grey colours in the beak of a drake and no pink-white in a duck's beak. Carotene (lipochrome) pigments cause a yellow colour in the beak of poultry in the epidermis, but there is no melanin pigment (Lyu et al. 2021). The bill colour predominant plumage types in the two sexes were mottled (drake 46.34%; duck 44.47%) and black (drake 31.71%; duck 34.92%. Bean colour Highest proportion (69.31%) of Muscovy ducks had black beans. Others were ash (18.43%), brown (4.61%), red (4.51%), and white (3.14%)(Ewuola et al. 2020).

c. Shank Colour

Based on Table 1, the colours of the shank Muscovy duck vary. The highest frequency of shank colour of female is black (39.29%), white (27.29%), yellow (18.68%), black-white (7.14%), black-yellow (6.32%), black (6.19%), and grey (1 09%). The highest frequency of shank colour of male Muscovy duck is yellow (41.70%), black (29.80%), black-white

(12.00%), black-yellow (9.06%), and white (7.44%). Shank colour differences are thought to be influenced by maintenance management and different feeding methods, and gene influences (Ewuola et al. 2020). Muscovy ducks under intensive maintenance tend to have a beak, legs, and shank colour of pale ivory: while those under semi-intensive maintenance have a beak, legs, and shank colour of predominantly dark ivory. It is presumably because Muscovy ducks under semi-intensive maintenance, in addition, to obtaining a carotenoid or xanthophyll source from the feed given, receive more xanthophyll from the natural feed when they are roaming freely (Oguntunji and Ayorinde 2015).

The yellow colour on the shank is influenced by melanin which causes the black colour on the shank (Magalhães et al. 2020). Most birds are included in digits I to IV (with numbers of two, three, four, and five finger bones). The first finger is right behind. The position of fingers can be used for taxonomic purposes related to the position of the bird when perched or not. Previous studies buttressed this assertion that in most avian species, testosterone induces non-plumage traits such as Asbill and leg colour, presence of wattles, spurs, and combs, and behavioral traits such as aggression and male-specific sex displays (Ogah et al. 2009).

However, a Muscovy duck with black plumage and white in the middle has a plain black shank with yellowish-white foot nets (Ogah et al. 2009). The high frequency of yellow shanks is since all Muscovy ducks with white plumage has yellow shank (Oguntunji and Ayorinde 2015).

The Shank colour of female consists of black, white, yellow, black-white, yellow-black, and grey-black of 39.29%, 27.29%, 18.68%, 7.14%, 6.32%, 6.19%, and 1.09%, respectively. The shank colour of male consists of yellow, black, white-black, and yellow-white of 41.70%, 29.80%, 12.00%, 9.06%, and 7.44%, respectively. The yellow colour on the shank is influenced by melanin which causes the black colour on the shank. Most birds are included in digits I to IV (with numbers of two, three, four, and five finger bones). The first finger is right behind. The position of fingers can be used for taxonomic purposes related to the position of the bird when perched or not (Dash and Mohanty 2002).

Comparison of shank pigmentation distribution in this study and other related studies in Ciayumajakuning revealed standard. They reported further that most ducks had black-yellow shank representing 53.5 percent, followed by all-black (36.5 percent) and all-yellow (10.0 percent). Half (50 percent) of the sampled Muscovy ducks had yellow shanks. Other variants were black (32.75 percent), slate (14.51 percent), and ash (2.75 percent) (Oguntunji et al. 2015). Diversity in shank colour variants can be caused by the absence of selection and directional mating between local ducks. (Chung et al. 2020). Comparison of classes of colour scored for bill and bean in the two sexes indicate a common trend whereby black colour was higher in males. In contrast, ash and brown were prevalent in females, thus suggesting possible sex-influence on the expression of bean colour in Muscovy ducks (Kiple and Ornelas 2001).

CONCLUSION

Based on the research results, the qualitative traits of the Muscovy duck in Ciayumajakuning are quite diverse. The following data support it: plumage colours of females and males were dominated by black-white 44.78% and white 45%. The beak colours of females and males were dominated by black 25.82% and pink 38.80% respectively. Shank colours of females and males were dominated by black 39.29% and yellow 41.70%.

CONFLICT INTEREST

Dini Widianingrum serves as an editor of the Agrivet Journal but has no role in the decision to publish this article. The author declares no conflict of interest in writing or publishing this article.

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