Abstract: This study was conducted at the PNGUNRE poultry farm using 270 birds in 2018. Muscovy ducks are hardy waterfowls existing with variations in phenotypic characteristics. Five phenotypes (n=25 lavender, n=20 chocolate, n=56 silver, n=59 black and n=110 white) by plumage colour where distinctively sampled and characterized. Measurements on body weight, neck length and neck height were used as the parameters for comparison on five phenotypes. Analysis was done using SPSS version 16.0 involving Duncan’s multiple tests to separate the means while Pearson’s correlation coefficient was performed to find relationship between the parameters. Negative correlation (-.137*) was observed between plumage colour and BW, NL, NH and BL. The sexual dimorphism accounted for -.402**, -.238**, -.315** and -.172** at high significant (P<0.01) of BW, NL, BL and BH respectively. There’s high negative correlation of sex on the traits measured. Plumage colour cannot be used to select BW, BL, BH and NL for breeding purposes. Dimorphism in ducks has a negative effect on the assessed parameters accept NL. Separate study on the effect of sex on the measured parameters is required.

Keywords: Muscovy Duck, Body Weight, Body Length, Body Height, Neck Length, Plumage Colour, Correlation, Phenotype.

I. INTRODUCTION

The present study aims to investigate whether the plumage colour will have an effect on the phenotypic traits in Muscovy ducks. This could aid their proper management, conservation and improvement in breeding program.

_problem Definition_

Phenotypic variations in plumage colour indicates variations in production, reproduction and economic traits of Muscovy duck under certain ecosystems. Variations in the traits remains uncertain to investigate the genetics of Muscovy duck. Phenotypic expression of genes is a combined influence of genetics and environment (P=G+E), but by how much remains uncertain. Thus, investigating the phenotypic plumage cluster defines the phenotypic genetic distances that would assist with appropriate breeding plans and selection to improve the desired traits of Muscovy duck breed. The study investigates to answer the two questions.

1. Does plumage colour influence population size of Muscovy duck?
2. Does plumage colour have effect on other phenotypes?

_plumage Colour_

“Lavender” is autosomal recessive. Lavender is an independent mutation and not a combination of chocolate and blue like other domesticated ducks. It can be viewed as untypical colour too, as it suppresses both black and red creating a pastel effect. They weigh up to 7 kg (15 lb). Females are considerably smaller, and only grow to 3 kg (6.6 lb), roughly half the males’ size. Thin bodied boat-shaped body. Extra-large egg size weighs in around 2.3 ounces and jumbos around 2.5 ounces. Both sexes have a nude black-and-
red or all-red face; the drake also has pronounced caruncles at the base of the bill and a low erectile crest of feathers, (Johnson, 2009).

**Chocolate**” (Ch) is the only colour that is sex–linked recessive. Ch causes a brown plumage, because all black pigment is replace by a less light-absorbing version of it (brown). It does not affect red. In domestic drake (male), length is about 86 cm and weight is 4.6 – 6.8kg, (Johnson, 2009).

“White” inherit autosomal incomplete dominant. This is caused by the same gene “Pied” that is mention above. For a complete white you need double factor or homozygous Pied: PP White Muscovy ducks have long claws on their feet and wide flat tail. The drake male is about 86cm in length and weighs 4.6-7kg while the female is smaller, at 64cm in length and weighs2.6-4kg, (Johnson, 2009).

Black is the usual wild type colouring without visible mutations and therefore the base for all other patterns and colours. It’s the most common colour, hence the name, though it is often combined with some form of pied. The reason for this is because probably most colour mutations are recessive. The drake male is about 80 cm in length and weight about 7-10kg while female weighs about 5-6kg, (Philip, 2007).

Pure breed of blue Muscovy or homozygous results in silver (splash in ducklings). **Silver** is also called pale grey. Silver Muscovy ducks weighs about 6-9 kg and have length of about 70cm, (Philip, 2007).

**Objective**

1. To evaluate the influence of sex on the other parameters of Muscovy ducks measured.
2. To assess and make comparison on the effect of the phenotypic colour on other traits.

### II. MATERIALS AND METHODS

#### Location of study and management of experimental animals.

The study was conducted at the farm of University of Natural Resources and Environment-Central Campus in East New Britain Province of Papua New Guinea. The farm is situated on the northwest direction of the campus.

Muscovy ducks were generally managed under semi-intensive system with provision of watering point. They roam freely during the day and scavenge for feed in and around pasture. They were fed withbroiler finisher and supplemented with copra meal. In the evening, the ducks were placed back in the shelter provided for protection against predators and harsh weather conditions and also for laying eggs.

#### Data Collection

Data were obtained from 270 Muscovy ducks having five (5) cluster of plumage colours (n= 25 lavender, n=20 chocolate,n=56 silver, n=59 black and n= 110 white).

The parameters in this study include, plumage colour, plumage pattern, feather distribution, eye colour, skin colour, beak colour, beak shape, shank length, body height, body length, live weight, egg weight, egg colour feather morphology, body shape and head colour. Each bird was measured and tagged with coloured wool to identify their sex. Only mature ducks were measured, the young ducks were only tallied and recorded.

Some parameters are visual observations while others involve measurements. The following parameters below were measured using a balance scale (5kg capacity) and sawing tape measure on centimetre units.

#### Parameters measured.

1. **Body weight.**

   Individual body weight for ducks is measured using a Balance scale (5kg Capacity). The ducks were tied to the legs and placed into the bucket. Bucket weight was tared and initial reading for the scales was taken and recorded.

2. **Body height**

   The body height was measured using a sawing tape measure having the bird stand horizontal position from the feet stage. The measurement was taken from the tip of the duck’s head to the feet to get the reading.

3. **Neck length**

   This was measured as the distance between the first and the last cervical vertebra and the pygostyle.

4. **Other observations**

   The other parameters include, eye colour, skin colour, shank colour beak colour, beak shape, feather morphology, body shape, head shape, feather distribution, plumage colour, plumage pattern are identified based on observations.

#### Statistical Analysis

The data wasanalysed using the general linear model of SPSS 16.0 with sex and plumage color as fixed factors. Significant means were separated by the Duncan’s multiple range tests. Correlation between measurements was determined by the Pearson’s Correlation Coefficient at the significant level of 0.05 and 0.01.
III. RESULTS AND DISCUSSIONS

Results of the effects of five plumage colour and sex on the body weight (BW), body length (BL), body height (BH) and neck length (NL) are explained in Table 1.

Correlations

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Table 1: Effects of plumage colour and sex on body weight, neck length, body length and body height of Muscovy ducks.

*Correlation is significant at the 0.05 level (2-tailed)
** Correlation is significant at the 0.01 level (2-tailed)

Effects of plumage Colour

The effect of plumage colour on body weight and other measurements of ducks are presented in Table-1. Five plumage colours were recorded in the local Muscovy duck population during the period of the study. The mean for the traits as shown on Table-1 were; BW- 2094.63, NL-27.12, BL-64.51, BH-37.61 respectively. The mean for the plumage colour shown is 2.96.

Correlation coefficients of plumage colour on measurable traits of Muscovy ducks are presented in Table-1. There’s negative and highly significant (P<0.01) observed for the body weight(-.137). Studies conducted by Górski and Witak (2003) show that development of body weight of Muscovy ducks is to a greater extent related to feeding rather than to color type. According to Taguia et al (2007), high and positive correlations have been reported between zometrical measurements and body weights in African Muscovy as the effect of plumage colour. The result of the present study with variations could be attributed to the sensitivity of these trait to
environmental changes such as temperature, nutrition or other external factors and genetic.

From the result, plumage colour has negative correlation on neck length and body height (-.009 and -.107 respectively) with no significant (P<0.05) or (P>0.01) were observed on traits from the effects of plumage. The result simply indicates that the plumage colour does not cause any effect on neck length and body height.

However, there’s positive correlation on body length as indicated on the result at 0.086. The result indicates that plumage colour trend does have effects on body length.

**Effects of sex**

Result of sex on body weight, neck length, body length and body height are shown in Table-1. The sexual dimorphism accounted for -.402**, -.238**, -3.15** and -1.172** at high significant (P<0.01) of BW, NL, BL and BH respectively. There’s high negative correlation of sex on the traits measured. The sex does not have any influence on this parameters. However, these sources Leclercq, 1990; Baeza et al., 1999; Ogah et al., 2009, states that, ‘because of the sexual dimorphism in Muscovy duck and its marked effect on muscular and body growth, the assessment of changes in shape and size in Muscovy duck will be sex dependent.’ Atchley and Rutledge, (1980) argued that these dynamic processes of multidimensional growth are accompanied by concomitant changes in the phenotypic variance and covariances and their components. On the other hand, Jolicoeur and Mosimann, (1960) indicates that, the size of most organisms is more affected than shape by fluctuation of the external environment. The variations might result from genetic composition and level of inbreeding in the population under consideration.

According to Veeramani et al (2014), the interaction between variety and sex had no significant effect on neck length. The difference in neck length might be due to breed variation and age of birds.

**IV. CONCLUSION**

The high, negative and significant correlation between plumage colour and body weights, neck length and body height measurements indicate that plumage colour cannot be used as criteria for assessment and selection to improve those parameters in breeding program. However, body length can be considered with further investigations. Our study shows resultson the sexual dimorphism of Muscovy ducks and its marked effect parameters to be of high negative correlation and high significance (P<0.0) which contradicts studies done in other areas. Therefore, it is recommended that more investigation is required to be carried out on effects of sex on the parameters measured by categorizing the Muscovy ducks into age groups to investigate males and females separately.

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