Phenotypic Characteristics and Egg Quality of Improved Philippine Mallard Duck (*Anas platyrhynchos domesticus* L.) under Intensive Management System

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ABSTRACT. *Organized selection and breeding program was implemented for the first time in the Philippines to address the lack of quality breeder stocks in the country. The developed select lines namely PMBr, PMBl, PMWh, and crosses were characterized based on their phenotypic traits. The PMBr and PMBl were mated employing 2x2 full diallel cross design and their growth, laying and egg quality traits were evaluated. The PMD select lines and crosses exhibited high uniformity, but sexual size dimorphism exists. A slight difference was observed in the growth performance of improved PMD in terms of body weight, feed consumption, and livability rate. The PMBl and PMBr exhibited early sexual maturity at 19 weeks, while the F1 reached more than 5% egg production at 22 weeks. The PMBl reached 50% egg production earlier at 27 weeks, while the peak of production ranged from 29 to 32 weeks. Hen-housed and hen-day egg production records showed similar trends. The F1 sustained an egg production of above 69% for 13 weeks with an average of 76%. The PMBr laid larger eggs ($p<0.05$) thus higher percent albumen, while slight variation on percent yolk weight, shell weight, shape index, shell thickness and yolk color were observed among PMD pure lines and crosses. The selection methods and purification process employed in PMD had shown positive results on high uniformity of their growth and laying performances.*

RATIONALE

The predominant egg-type duck raised by Filipino farmers primarily for balut (embryonated egg) production is the native Philippine Mallard duck (PMD) also known as Pateros but locally known as itik. The PMD is believed to have evolved from ducks that originated from the mainland China brought by Chinese traders in the early 19th century. The original plumage color was unknown but over the years, Filipino duck raisers selected ducks which are black in color with white bib. The importation of Khaki Campbell in the 1950s, Pekin ducks in the 1960s, Tsaiya and CV 2000 in the 1990s are believed to have influenced the overall characteristics of the present-day PMD due to indiscriminate crossing practiced by farmers as way of upgrading their stocks which resulted to ducks with variable plumage colors and unpredictable performances. The average annual egg production of PMD under the traditional system, which is the prevalent system of raising in the Philippines ranges from 40% to 60%.

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The average performance of PMD continued to decline despite improved housing and feeding management. The major problems identified include lack of good quality breeder stocks, high cost of feeds, lack of credit, and inefficient marketing systems. The lack of quality ready-to-lay ducks as replacement stocks is the topmost concern of the industry because no one is engaged in the production of day-old ducks (DOD) and pullets that are of good quality. DODs are hatched from balutans when there is demand for it, a clear manifestation that replacement stocks are only a by-product of balut production.

Cognizant of the deteriorating condition of the local duck industry, organized selection and breeding program was implemented for the first time in the Philippines by the Bureau of Animal Industry - National Swine and Poultry Research and Development Center (BAI-NSPRDC) in Lagalag, Tiaong, Quezon together with the members of the Duck Industry Association of the Philippines, Incorporated (DIAPI) with support funding from DOST-PCAARRD to address the lack of quality breeder ducks using local genetics from the Provinces of Pampanga, Batangas and Quezon and to establish the Philippine signature Mallard duck breed.

The objectives of this study were to determine the phenotypic characteristics, growth and laying performances, and egg quality of the PMD pure lines and crosses.

METHODOLOGY

Animal care: The experimental procedure of this study was approved by the Institutional Animal Care and Use Committee (IACUC) of the University of the Philippines Los Baños.

Source of stocks: Two thousand hatching eggs collected from duck raisers who were members of the DIAPI were screened, hatched, and grown in confinement using the facilities of the BAI-NSPRDC, Lagalag, Tiaong, Quezon.

Methods of Selection: A combination of individual selection, independent culling level, and family selection were used. Individual selection was used on egg weight, egg weight at 40 weeks, and plumage colors such as brown, black, and white. Independent culling level was used in body weight at 18 weeks, while family selection was used on egg production. Phenotypic characterization was done starting at second generation to monitor the progress of the selection and purification process. In this study, the ducks belong to the third generation.

Phenotypic Characterization: A total 120 ducks (91 females and 29 males) from the three select lines namely PMBr, PMBl and PMWh were randomly selected for phenotypic characterization. The phenotypic traits such as plumage color and pattern, neck feather markings, bill color and shape, bean color, presence of crest, eye color, skin color, shank color, and body carriage were based on the description provided by the Philippine Native Animal Development (PNAD) Program with modification and pictorial guidance for phenotypic characterization of chickens and ducks. Tape measure was used to measure the morphometric traits such as the wingspan, bill length, chest circumference, body length, neck length and shank length. Digital weighing scale was used to get the body weight.

The qualitative traits were analyzed using descriptive statistics such as frequency counts and percentage while the quantitative traits were analyzed using sequential test in 2 x 2 factor factorial in CRD.

Mating design: The PMBr and PMBl were

assigned to a full diallel cross mating design wherein each mating combination was composed of one (1) drake and five (5) ducks given below:

Performance evaluation: In growth and laying performances evaluation of PMD select lines, PMWh was not included because they were not selected as one of the parents in the development of the improved PMD commercial line.

Progenies from each mating combination were randomly distributed into two replications with a male to female ratio of 1:5. The body weights of ducklings were periodically weighed (biweekly) using digital weighing scale. The weekly feed intake of all progenies was recorded during the brooding, growing, rearing, and laying periods until 40 weeks of age. The total number of live ducks in every stage of the growing period was recorded. Eggs were collected daily and labeled according to their respective mating group.

♂ \ ♀	PMBr	PMBl
PMBr	PMBr x PMBr	PMBr x PMBl
PMBl	PMBl x PMBr	PMBl x PMBl

PMBr – Philippine Mallard Brown, PMBl – Philippine Mallard Black
♂ - male, ♀ - female

Twenty per cent of the eggs produced per replication during the scheduled data collection except the soft and broken shell eggs were weighed individually using digital weighing scale. The egg components and egg quality traits were measured according to standard procedures. The 40 weeks partial egg production records were used as one of the selection criteria to improve annual egg production.

FINDINGS

Phenotypic characteristics: The select lines had uniform bill shape, no crest, white skin, and slightly upright body carriage. Sexual dimorphism in terms of plumage differences in colored PMD exist in which the males had iridescent green head while the females were drab. The male PMBr had well pronounced speculum and black tail feather while in PMBl and PMWh were obscured.

The PMBr select line has brown plumage, plain pattern, and neck feather marking, green (male) and slate-gray (female) bill , black bean, brown eyes, and orange shank.

The PMBl select line had black plumage, dusky with medium bib, green (male) and black (female) bill, brown eyes and either orange or brown shank.

The PMWh select line had white plumage, plain pattern and neck feather marking, yellow orange (male) and yellow with spots (female) bill, flesh bean, gray eyes, and orange shanks.

The F1 male cross had black plumage, dusky pattern, plain feather marking, green bill, black bean, brown eyes, and orange shank.

The F1 female cross had dark brown plumage, mallard pattern, plain or medium neck feather marking, slate-gray bill, black bean, brown eyes and brown shank.

The reciprocal F1 male cross had either

dark brown or black plumage, plain pattern with large bib, green bill, black bean, brown eyes, and orange shank.

The reciprocal F1 female cross had either dark brown or black plumage, dusky pattern with medium bib, either slate gray bill, brown eyes and orange shank.

Sexual dimorphism was evident among the PMD select lines with males having higher body weights, body lengths and chest circumferences than females.

The PMD select lines and crosses were comparable in terms of bi-weekly body weight, feed consumption during growing and laying periods.

No mortality occurred during the rearing period (100% livability). However lower livability rate was exhibited during the onset of laying.

Comparable egg production performance was exhibited by the select lines and crosses in terms of hen-housed and hen-day egg production.

Comparable egg number was exhibited by the select lines and crosses.

The PMBr line laid heavier eggs thus resulted to high percent albumen. In terms of yolk color and other egg quality traits, the select lines and crosses were comparable.

CONCLUSION

The selection efforts and purification process in PMD had shown positive results on high uniformity in qualitative and quantitative traits although there exists sexual dimorphism in favor of the male PMD. The growth, laying and egg quality traits were comparable except that the PMBr laid heavier eggs with high percent albumen.

RECOMMENDATION

Time will come that the select lines will be highly inbred as a result of the purification process and inbreeding depression will manifest in the performance, it is therefore recommended that other genetic groups of PMD located in other parts of the Philippines should be characterized phenotypically and genetically, and their performance be evaluated to identify genetic groups suitable for breeding thereby introducing new genes in order to maximize genetic variability within the improved PMD population.

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She finished her Doctor of Philosophy in Rural Development in 2013 at USM, and PhD in Animal Science in 2017, specializing in Animal Breeding, with a minor in Genetics at the University of the Philippines Los Baños. She studied the genetic and phenotypic characteristics, and combining abilities of growth, laying, and egg quality traits of Philippine Mallard Duck Select lines, now Itik Pinas.

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