

IMPROVING GENETICS PERFORMANCE OF INDONESIAN LOCAL DUCK

Irma^{1*}, Triana Susanti²

¹ Directorate of Animal Breeding and Livestock Production, Directorate General Livestock and Animal Health Services, Ministry of Agriculture, Ragunan, Jakarta, Phone 021-7815781 Fax 021-7815781

²Indonesia Research Institute for Animal Production (IRIAP), Indonesian Agency for Agricultural Research and Development Ciawi-Bogor, Phone (0251) 8240752

*Corresponding author: irmadglahs@pertanian.go.id

ABSTRACT

Duck (*Anas platyrinchos*) is one of the agricultural commodity for meat and egg producer. Compared with broiler or layer chicken, local ducks have lower productivity which related with lower meat yield. To improve the performance of local duck, genetics approach are needed to create superior breed with high meat production and egg productivity for day old. Force molting commonly used by commercial farms but activists against this practice due to animal welfare issue. Another approach to increase performance of local duck is crossing with exotic duck. Crossing of ♂ peking duck and ♀ mojosari by artificial insemination has been done to produce peking mojosari (PM) crossbred until fifth generation (F5). The objective of research is to evaluate performance of peking mojosari crossbred (F5). Meat production of local duck related with small size of layer duck's body, while egg production in poultry is related with molting as the onset to stop egg production. In this research, 200 heads of PM F5 ducks are used. Ducks are caged in individual cage. Feed and water are given in *ad libitum*. The result showed body weight at first laying approximately 2.324,2 g; age at first laying is approximately 180 day, first egg weight approximately 59,08 g, egg index 73.49; Haugh Unit 101.69 and egg production in first three month 39 eggs. This research continued by molecular analysis to identified polymorphism in prolactin gene.

Keywords: crossing, duck, egg, meat, mojosari, peking

INTRODUCTION

As an important agriculture commodity, egg has become a source of protein in human diet. Data from Livestock and Animal Health Statistics (2017) showed Indonesia produce total national egg are 2,107,000 tones with national egg consumption reach 6.3 kg/cap/year. Dominantly, total national egg production comes from commercial layer which contribute 72 %. Duck is the second largest agriculture poultry species which contributes 15 % from total national egg production.

Indonesia has many species of local duck such as mojosari from East Java, Alabio from Kalimantan, Bali, Tegal, Cirebon, Magelang, Kerinci, Cihateup, Turi, etc. All of Indonesian local duck are layer type which produce annual egg. Specific characteristic of layer duck is small body size with lower meat production. Data from Livestock and Animal Health Statistics (2017) showed that

Indonesia have produced 309,000 tones of duck eggs, while duck meat only 43,000 tones.

Recently, demand of duck meat are increasing together with the increasing of product diversification which serve duck meat as main menu. To supply requirement and demand of duck meat, meat performance of some native duck breeds remains to be improved. In order to improve meat productivity of local duck and create specific strain for broiler duck type, genetics approach are needed to create superior breed by crossing local duck with commercial duck such as peking duck.

Peking duck or Beijing duck is commercial meat duck type. In two months of age, body weight of Peking duck can reached 2 - 3 kg. The colour of feather, skin and egg of peking duck are white. Mojosari duck is one of the Indonesian native local duck from Mojosari, East Java. Mojosari duck is a layer type which can produces 200 - 300 eggs per year. As a layer duck, mojosari have small body size. In six months of age, body weight of mojosari only 1.7 kg. Mojosari have two kind of feather, brown and white. The colour of egg's mojosari is bluish. Most of duck egg in Indonesia are processed into salted egg. Genetic approach to crossing peking and mojosari duck for produce peking mojosari crossbred is one of the method to improve meat performance of local duck. And the objective of this research is to evaluated performance of peking mojosari crossbred (F5).

MATERIALS AND METHODS

Total of 200 female peking mojosari crossbred fifth generations (F5) were used in this research. Average of duck's age are nine months from hatching date. Research has been doing from May until December 2013 in Laboratory of Duck Unit, IRIAP, Bogor, West Java and Laboratory of Animal Breeding and Molecular Genetics, Faculty of Animal Science, IPB. Crossbred F5 ducks are produced by artificial insemination (AI) between ♂ peking mojosari and ♀ peking mojosari. Poultry were simultaneously maintained under homogene conditions of feeding and management. Each ducks are placed in individual cages (45 cm x 45 cm) until laying periode for eggs collection. Fresh water and feeds are given contains 19% of protein, 2800 kkal kg⁻¹ of energy, 0.6% of Ca and 0.6% of available fosfor.

Phenotype traits observed are body weight at first laying, age at first laying, first egg weight, and egg production for first three month. Egg weight and other variables eggs quality (not showed) measured by Egg AnalyzerTM. Individual data regarding the number of egg production were recorded in daily recording. Egg collected every morning at 08.00 a.m. Descriptive statistics (means, minimum and maximum value, graphic of distribution frequency by histogram with normal curve) analysis in Minitab 16 software are used to identified variables for selection process and evaluated for progress of selection response in fifth generations.

RESULT

Based on Table 1, body weight (BW) of duck at first laying approximately 2.3 kg, with minimum body weight 1.6 kg and maximum body weight 3.2 kg. Age at first laying approximately 180 days. Egg production for first three month (duck age is nine month) is 39 eggs and reached maximum production for 89

eggs. Means first egg weight approximately 60 g with maximum egg weight 84 g. Egg index and haugh unit are measured to evaluate egg dimension and viscosity which shows 73 % for index (ratio between egg width and length), while haugh unit (HU) is 101. All of data frequency distribution showed by histogram (Figure 1, 2, 3, 4, 5 and 6).

Table 1. Performance of crossbred ducks F5

Variables	Min	Means	Max
BW at 1 st laying (g)	1,628.0	2,324.2	3,293.0
Age at 1 st laying (d)	135	180	217
Egg prod in 3 month (n)	1	39	89
1 st egg weight (g)	37.23	59.08	84.71
Egg index (%)	40	73.49	100
HU	90	101.69	110

Table 2. Characteristics of parental ducks

Variables	Pekin ¹	Mojosari ^{2,3}
Annual egg production (n)	105	151-238
Age at the first laying (d)	191	160
Body weight at 1 st laying (g)	3000	1616
First egg weight (g)	90	54
Body weight at 8 weeks (g)	2552	1165
Shell colour	white	bluish

¹ 2nd data, ^{2,3} Susanti (2000), Prasetyo and Susanti (2001).

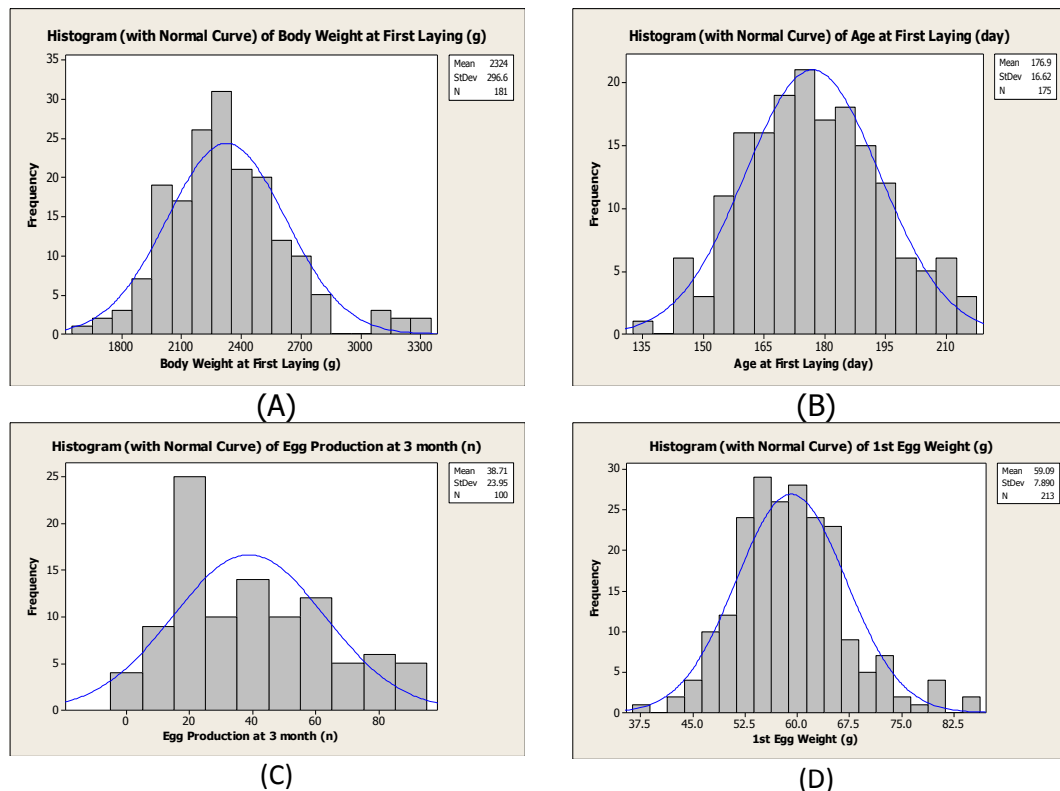


Figure 1. Histogram of duck's BW at 1st laying (A) and age at first laying (B), egg production at 3 month (C), and first egg weight (D)

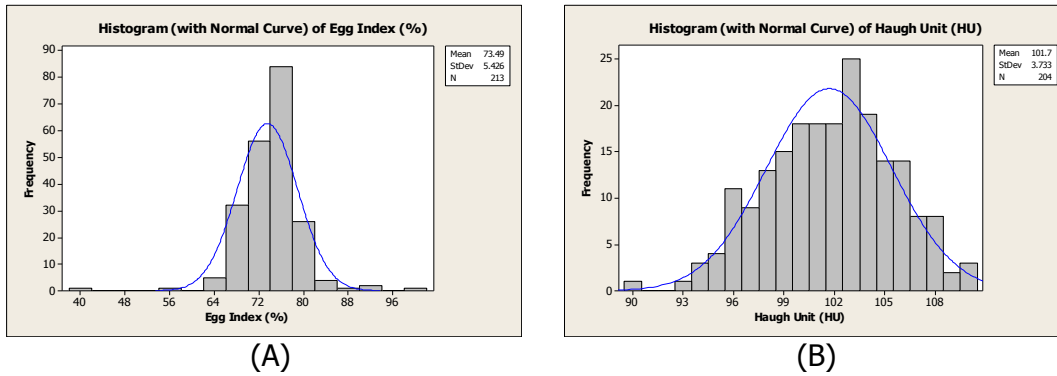


Figure 2. Histogram of duck's egg index (A) and haugh unit (B)



Figure 3. Mojosari (left) and Peking Duck (right)



Figure 4. Duck (left), goose (middle), muscovy (right)



Figure 5. Duck's egg of Peking (left) and Mojosari (right)

DISCUSSION

Duck (*Anas platyrinchos*) is one of the agricultural commodity in Indonesia. Generally, local farmers maintain their poultry by extensive management in small scale ownership. There are four types of duck: layer, broiler, dual purpose and ornamental. Indian runner and Cherry Valley are two kinds of famous world layer duck. Local ducks in Indonesia comes from Indian Runner offspring. Peking and Eynesbury are two kinds of famous world broiler duck. Firstly, domesticated of duck started in China 4,000-10,000 years ago in neolithikum era (Cherry, 2008).

Central population of duck in Indonesia from Java island which can achieves 20.623.214 heads (42%) from total population 49.709.403 heads. Farmers usually slaughter their poultry when their ducks are unproductive indicated by egg stop production (culled female ducks). Alabio and Mojosari are two kinds of famous Indonesian layer duck (Figure 3). There are two kinds of colour feather in mojosari: brown and white colour. Feather colour influence the appearance of skin colour when slaughtered. Black feather gives poor quality in duck carcass and make carcass look like spotted. Some peoples dislike duck meat because off flavour (odor). High fat content especially unsaturated fatty acid in meat duck gives a tendency to produce off flavours (Matitaputty, 2010).

Mojosari duck is a layer type which able to produce annual egg production until 151 eggs in low feed protein 14 % and 238 eggs in high feed protein 20%. Peking duck have short body size such as muscovy drake (*Cairina moschata*) and lower annual egg production with average 105 eggs/years. There are three kinds of waterfowl which different each other but peoples sometimes ambiguous; duck (*Anas platyrinchos*), second; muscovy drake (*Cairina moschata*) and goose (*Anser anser domesticus*). Mule ducks is new kind of crossbreed duck between domestic duck and muscovy duck. All of them seem like one species but has specific characteristic (Figure 4). Crossing two kind of duck breed (peking and mojosari) produce crossbred pekin mojosari which produce high annual egg production for Day Old Duck (DOD) supply and high meat performance for meat supply.

Crossbred peking mojosari produce 230-240 eggs and body weight at 10 weeks reach 2.0-2.5 kg, bigger than mojosari. Crossbred have white and clear carcass, white feather, and first laying at 5.5 months (Prasetyo & Susanti, 2012). Another characteristics of crossbred show improvement of local duck when compared with female ancestor (mojosari). Many of researcher use crossing method for traits which have small heritability (<20 %). Heritability is the ability of parental to inherits their superior traits into their progeny or a measure of the strength of the relationship between breeding values and phenotypic values for a trait in population (Bourdon, 2000). Its showed a proportion of genetic contribution compared with the environment factor. Reproductive traits such as hatchability (0.1), viability (0.1), egg production (0.25), mature age, mature body weight (0.45) and egg quality in poultry and livestock species have small range of heritability value.

Peking and mojosari have white and skin feather which inherited to the progeny. Egg peking duck have white colour and mojosari duck have bluish egg colour (Figure 5). Egg colour of the progeny showed bluish colour which indicated maternal dominantly effect from female line, mojosari. Egg production of crossbred peking mojosari is directed for hatching eggs to produce day old

duck (DOD) broiler duck and does not for egg consumption. While the skin colour and feather are important for commercial industry due to consumer preference and appearance of meat characteristic when slaughter and processed. Research by Retailleau (1999) showed that mature body weight for female peking achieved in 3.4 - 2.6 kg with carcass yield approximately 67 % in eight weeks age, while male peking in 4.1 kg with carcass yield 66.5 % in same ages. Average eggs production for peking are 50 - 180 eggs (Parkhurst & Mountney, 1988).

Other beneficiary traits such annual egg production, age at the first laying, body weight at first laying, day old duck weight are bigger than female parent, due to hybrid vigor or heterozigosity effect. Hybrid vigor or heterosis can increase the performance of hybrids over that of pure breeds, most noticeably in traits like fertility and survivability (Bourdon, 2000). In animal breeding, there are two kinds of method which can be implemented for producing superior breed, selection and mating system. Selection of local duck for meat production is difficult and need long period because local duck are Indian Runner type (layer type). Crossing with exotic breed duck can improves meat performance of the progeny. This case occurred because each parental both male and female line contribute same genetic to the progeny by segregation process.

Based on histogram picture (Figure 1,2), values of an individuals duck, when viewed across an entire population, tend to follow certain pattern or distribution. The pattern exhibited in the above graphics is typical of quantitative traits an referred to as a normal distribution. The normal distribution of quantitative traits appears graphically as a symmetric, bell shaped curve. The great majority of quantitative traits are normally or near normally distributed (Bourdon, 2000). That is because they are affected by many genes. Not all traits are normally distributed. Threshold traits-polygenic qualitative traits-have only small number of possible phenotypes, so phenotypic values for these traits cannot follow any continuous distribution. An example of threshold trait is fertility. Fertility influenced by many genes and is therefore a polygenic trait, but with only two types of phenotypes (pregnant of non-pregnant).

CONCLUSION

Crossbreed peking mojosari (F5) have body weight at first laying is 2,324.2 g and age at first laying is 180 day with first egg weight is 59.08 g. Crossing still shows high variance and needs to evaluated by molecular approach especially with genes related to reproductive i.e prolactin gene polymorphism.

ACKNOWLEDGEMENT

This project is a long research period in Research Institute of Animal Production (IRIAP), Ciawi-Bogor, West Java Indonesia by the IRIAP researcher.

REFERENCES

- Bourdon, M. Richard. 2002. *Understanding Animal Breeding and Genetics* 2nd Edition. Prentice Hall: New Jersey.
- Cherry, P., T.R. Morris. 2008. *Domestic Duck Production*. London (GB): CABI.

- Matitaputty, P.R., Suryana. 2010. The Characteristics of Meat Duck, Problems and Prevention of Off Flavour Due to Lipid Oxidation. Indonesian Bulletin of Animal and Veterinary Sciences.
- Parkhurst, C.R., G.J. Mountney. 1988. Poultry Meat and Egg Production. An Avi Book Published by Van Nostrand Reinhold: New York.
- Prasetyo, L.H., P.P. Ketaren, M. Purba, T. Susanti, S. Sopiana. 2012. 300 Teknologi Inovatif Pertanian. Kementerian Pertanian Republik Indonesia.
- Retailleau, B. 1999. Comparison of the Growth and Body Composition of three types of ducks: Peking, Muscovy and Mule. In Proceeding 1st World Waterfowl Conference, Taiwan.
- Statistik Peternakan dan Kesehatan Hewan. 2017. Direktorat Jenderal Peternakan Kementerian Pertanian Republik Indonesia.
- Suparyanto, A., A.R. Setioko, L.H. Prasetyo. 2004. Evaluasi telur tetas hasil IB antara itik Mojosari putih dengan pejantan pekin. Seminar Nasional Teknologi Peternakan dan Veteriner 2004.
- Suparyanto, A. 2005. Peningkatan produktivitas daging itik Mandalung melalui pembentukan galur induk. Disertasi. Fakultas Peternakan IPB. Bogor.