Weight Growth of the Hybrid Chicken (*Gallus gallus domesticus*, Linnaeus 1758) Crossing Result of Female Pelung with Male F$_3$ Golden Kamper

Salma Dewi Pratita[1] Nareta Defiani[1] Afifah Nur Hidayah[1] Nurul Hidayah[1] Putri Shafira Setyowati[1] Budi Setiadi Daryono[2,*]

[1]*Faculty of Biology, Universitas Gadjah Mada, Bulaksumur, Sleman, Yogyakarta, Indonesia 55281*
[2]*Laboratory of Genetics and Breeding, Faculty of Biology, Universitas Gadjah Mada, Bulaksumur, Sleman, Yogyakarta, Indonesia 55281*
[*]*Corresponding author. Email: bs_daryono@mail.ugm.ac.id*

ABSTRACT
Backcross is a cross between an offspring and its parents, or an individual that is genetically similar to its parents, to minimize the genetic variation of the resulting offspring. A female Pelung cross with a male F$_3$ Golden Kamper is a type of backcross. Golden Kamper chicken is a breed of chicken from a selective cross between Pelung and Layer. This study aimed to determine the quantitative phenotypic characteristics of hybrid chickens from a cross between a female Pelung and male F$_3$ Golden Kamper, and to determine the weight growth of hybrid chickens from a cross between a female Pelung and a male F$_3$ Golden Kamper. The method started from crossing a Pelung female with an F$_3$ Golden Kamper male to produce fertile eggs. The eggs were incubated for 21 days in the incubator. After that, Day Old Chicken (DOC) was weighed from the day of hatching. DOC weights were weighed for 49 days. After that, morphometric measurements were carried out on DOC at 49 days old. Result observed was weight growth data and the results of morphometric measurements of DOC from a cross between a female Pelung and a male F$_3$ Golden Kamper. The other outcome obtained was the growth of DOC weight from hatching to 49 days experienced significant growth. The weight growth of DOC chickens from crosses between Pelung females and F$_3$ Golden Kamper males reached an average of 410.7 g in the seventh week. This weight is smaller than Pelung, which can reach an average of 472.6 g and F$_2$ Golden Kamper which reaches an average of 435.7 grams at the same age. The results of the average quantitative characteristics of the morphometry carried out including, chicken height 25.52 cm, body height 18.39 cm, beak width 0.85 cm, beak length 2.48 cm, head width 1.58 cm, head length 4.96 cm, comb length 1.97 cm, comb height 0.38 cm, neck length 7.40 cm, back length 12.52 cm, body length 12.35 cm, body width 4.98 cm, chest circumference 21.04 cm, wing length 8.50 cm, upper thigh length 6.20 cm, lower thigh length 8.28 cm, and shank 5.54 cm. Based on the research conducted, it is known that the average weight of DOC from crossing female Pelung with male F$_3$ Golden Kamper at 49 days of age is 410.7 g. There are 17 phenotypic quantitative characteristics that we found in DOC from crossing female Pelung with male F$_3$ Golden Kamper at the age of 49 days.

Keywords: Backcross, Golden Kamper, Phenotype, Weight growth.

1. INTRODUCTION

Poultry is one of the commodities whose product demand increases every year. One of the poultry commodities in Indonesia is chicken. Chickens can be used for both meat and eggs. The population of laying hens in 2019 reached 5.74 million heads. Around 74.08% of the chicken population is actively producing. The broiler population in 2019 reached 9.60 million heads and 59.75% of the population is actively producing [1]. This

makes chicken farming a commodity that is quite popular with the community.

Indonesian native chicken is the result of the domestication of the red jungle fowl (*Gallus gallus*). The process of domestication of local chickens makes local chickens have different characteristics from red jungle fowl. Local chicken itself consists of several types, such as broilers (pelung, nagrak, gaok), laying (black kedu, white kedu, nusa penida, etc.), and dual-purpose (sentul chicken, bangkalan, etc.) [2]

The productivity of local chickens still tends to be low compared to purebred chickens such as layer or broilers. Increased productivity can be done by increasing genetic quality through the crossing process [2]. Laboratory of Genetics and Breeding, Faculty of Biology, has been developing breeding chickens, both local chickens and broilers since 2006. One of the chickens that has been successfully crossed is the Kampung Super (Kamper) type [3]

Crossbreeding is one of the crosses that is now often used by breeders. This cross is usually done by mating one pure line with another. The existence of puppies that have a better character than the average character of the parent will be selected for selective breeding. This will produce the best quality tillers [4]. Gama Ayam in 2013-2014 performed a cross between a Pelung blirik rooster (local) and a brown laying hen. The result of this cross is called the F_1 Kamper chicken. The weight of this Kamper F_1 chicken can reach 911-1100 grams in 49 days [5].

The productivity of F_1 Kamper chicken eggs is also relatively high. The cumulative number of eggs in 300 days reached 140.37 eggs. The number of eggs is lower than the Layer chicken, which is 195.07 eggs, but much higher than the Pelung chicken, which is 56.40 eggs [6] F_1 Kamper has varied coat colors, namely plain white, brown-white, brown blirik, black blirik, and plain black so selective breeding was carried out which resulted in F_1 Kamper with golden brown fur and high body weight [7] The average weight of Golden Kamper chicken in 7 weeks reached 435.7 grams. This weight is lower than Pelung chicken which reaches 472.6 grams, but is higher than Layer chicken which reaches 424.9 grams [7]

Due to this promising result, we conducted a backcross between ♀ Pelung and ♂ F_3 Golden Kamper. Backcross is a cross between an offspring and its parents, or an individual that is genetically similar to its parents, to minimize genetic variation of offspring generated and and makes it easier to observe target character. With the backcross method, there will be a transfer of characters that desired to be combined so that individual offspring have traits that are superior. The purpose of this research is to determine the quantitative phenotypic characteristics of hybrid chickens from a cross between a female Pelung and male F_3 Golden Kamper, and to determine the weight growth of hybrid chickens from a cross between a female

Pelung and a male F_3 Golden Kamper.the quantitative phenotypic characteristics of hybrid chickens from a cross between a female Pelung and male F_3 Golden Kamper, and to determine the weight growth of hybrid chickens from a cross between a female Pelung and a male F_3 Golden Kamper.

2. METHOD

2.1. Breeding

This researched used broodstock ♀ Pelung and ♂ F_3 Golden Kamper. The broodstock were intensively reared in a 3 m x 2 m cross cage at PIAT, Kalitirto, Berbah, Sleman, Yogyakarta. These brooders are fed AD II feed which has been mixed with minerals. Chickens are given a drink. The eggs produced by the broodstock will be incubated in PIAT.

2.2. Maintenance of Day Old Chicken (DOC)

10 chicks used in this study were kept in cages measuring 1.2 m x 0.6 m x 0.3 m. This is to facilitate monitoring of feed, cleanliness, safety, and health of DOC chickens. The enclosure is equipped with a 25 watt incandescent lamp. DOC chickens were transferred after 2 weeks into a semi-intensive cage measuring 3 m x 2 m at PIAT UGM. Chicks were fed BR feed with a protein concentration of 21% from 0 to 7 weeks of age.

2.3. DOC Weight Measurement and Phenotype Character Measurement

DOC weight measurement was carried out once a week with the same day and time until DOC reached 49 days of age. Phenotype character measurement was measured with metline based on morphological guidance of chicken sceletal adopted from [8]

2.4 Data Analysis

Data is analyzed with Microsoft Excel software the average weight of 49-day-old (DOC) taken every week then presented in graphical form.

3. RESULT AND DISCUSSION

Gama Ayam has succeeded in producing F_1 Kamper with an average weight of 911-1100 gr at 49 days of age. F_1 Kamper is the result of a cross between Pelung and Layer [5]. Golden Kamper chicken is a selective breeding from F_1 Kamper which has a characteristic golden brown feather color. This cross aims to produce chickens that have good egg and meat productivity. Inbreeding in Golden Kamper chickens has been carried out until the third offspring form F_3 Golden Kamper. his inbreeding aims to reduce the occurrence of genetic variation so as to achieve uniformity in the population [9]. A cross

Table 1. Morphological measurements

Characteristics	Detailed procedure
Chicken height (TA)	From the base to the tip of the comb
Body height (TB)	From the base to the base of the neck
Beak width (LP)	Width at the base of the largest
Beak length (PP)	From the base to end
Head length (PK)	From the spine of the spine to the base of the beak
Head width (LK)	From the comb to the bottom
Comb height (TJ)	From the highest tip of the comb to the base of the comb
Comb length (PJ)	From the back to the front of the comb
Body length (PB)	From the tailbone to the tip of the sternum
Body width (LB)	From back to chest
Chest circumference (LD)	From the front of the chest to the back (circular)
Dorsal length (PPu)	The top of the tailbone to the base of the neck bone
Wingspan (PS)	Straighten from the base to the tip of the bone
Neck length (PL)	The base of the neck to the base of the head
Tibia length (PBe)	From the groin to the bend of the tibia
Femur length (PPa)	From the groin to the leg bone (fingers)
Shank	From the tarsus to the base of the patella

between a female Pelung and an male F_3 Golden Kamper is called a backcross. The purpose of crossing F_3 Golden Kamper and Pelung chickens in this study was to determine phenotypic traits on body weight performance and visual appearance for body posture. The DOC produced by crossing a female pelung with a male F_3 Golden Kamper consisted of 10 female DOCs. Body weight and morphometry were measured from 0 days old DOC to 49 days old..

3.1. Body weight of DOC BC BC Pelung x F3 Golden Kamper

DOC BC maintenance has been carried out intensively in cages for 7 weeks. DOC body weight measurements were carried out from week-0 until week-7. Intensive maintenance was carried out for 49 days, DOC was fed BR I with *ad libitum* and given drinking water equipped with vitamins.

The average growth weight of chickens at week-0 is 37.2 g, at week-1 it is 67.9 g, and until week-7 it reaches 410.9 g. The highest weight record in the week-7 of DOC2 BC was 518 g while the lowest weight in DOC4 BC was 343 g. In Figure 1 it is explained that DOC BC hybrid Pelung x F_3 GK with semi intensive maintenance, *ad libitum* standard feed diet can reach average body weight of 410 gr at 49 days of age.

The average weight of DOC BC is smaller in value when compared to the average weight of F_1 Kamper, Pelung, and F4 Golden Kamper. At week-7, F_1 Kamper has an average weight of 771.3 g [7], Pelung chickens weigh 472.6 g, and F4 Golden Kamper are 607.2 g [7 ; 9].
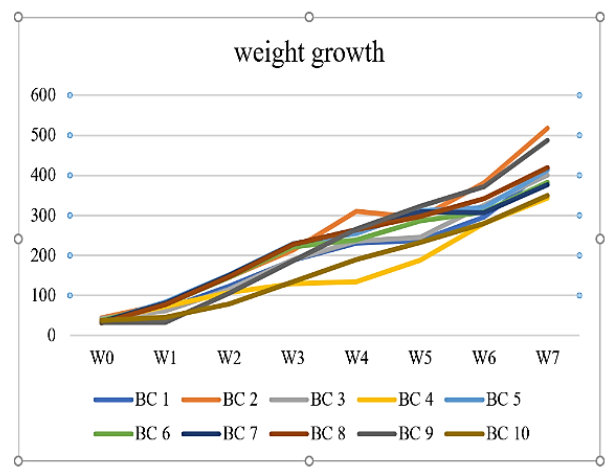

Figure 1. Weight growth of DOC BC Pelung x F_3 Golden Kamper for 49 days

This DOC weight is lower than the F_1 Kamper which reaches an average of 771.3 g, Layer Lohmann Brown-Classic which reaches an average of 530 g at the age of 49 days [5]. The weight of the Pelung x F_3 GK hybrid

DOC is higher than some local chickens at 8 weeks of age, namely Sentul (female 355.98 g) and Kampung (female 358.74 g) [10]. The results of crossing with Pelung chickens and F_3 Golden Kamper with the backcross method it is expected that BC has a higher body weight than other native chickens.

The weight of hybrid chickens from DOC BC Pelung x F_3 Golden Kamper crosses was relatively lower than F_1 Kamper which was the first generation of Golden Kamper. This decrease in chicken weight can be caused by inbreeding which can cause inbreeding depression in F_3 Golden Kamper. Continuous inbreeding will trigger inbreeding depression [9]. Inbreeding depression is a condition in which the performance of chickens decreases in later generations (F_3, F4, F5, etc.). This decrease in performance can be caused by autozygosity, namely the increased probability of the emergence of a recessive gene in heterozygous allele pairs. The decline in performance includes chicken growth weight, low reproducibility, high mortality rate, and decreased susceptibility to disease.

3.2. Morphometric Result of DOC BC Pelung x F_3 Golden Kamper

Based on the research that has been done, there are 17 quantitative morphological characteristics found. This morphometric measurement was carried out when the DOC was 49 days old. The results of the zoometrical measurements of the hybrid DOC from the cross between a female Pelung and a male F_3 Golden Kamper can be seen in the Table 2.

Table 2. Morphometric Result of DOC BC Pelung x F_3 Goldern Kamper at 49 days old

No	Parameters (cm)	Result Pelung x F3 GK (cm)
1	TA	25.52±2.40
2	TB	18.39±1.85
3	LP	0.85±0.17
4	PP	2.48±0.79
5	LK	1.58±0.26
6	PK	4.96±0.16
7	PJ	1.97±0.64
8	TJ	0.38±0.10
9	PL	7.40±0.80
10	PPu	12.52±1.22
11	PB	12.35±3.47
12	LB	4.98±0.64
13	LD	21.04±1.59
14	PS	8.50±0.73
15	PPa	6.20±0.57
16	PBe	8.28±0.33
17	Shank	5.54±0.53

The weight growth of DOC chickens from crosses between Pelung females and F_3 Golden Kamper males

reached an average of 410.7 g in the seventh week. This weight is smaller than Pelung, which can reach an average of 472.6 g and F_2 Golden Kamper which reaches an average of 435.7 grams at the same age. The results of the average quantitative characteristics of the morphometry carried out including, chicken height 25.52 cm, body height18.39 cm, beak width 0.85 cm, beak length 2.48 cm, head width 1.58 cm, head length 4.96 cm, comb length 1.97 cm, comb height 0.38 cm, neck length 7.40 cm, back length 12.52 cm, body length 12.35 cm, body width 4.98 cm, chest circumference 21.04 cm, wing length 8.50 cm, upper thigh length 6.20 cm, lower thigh length 8.28 cm, and shank 5.54 cm.
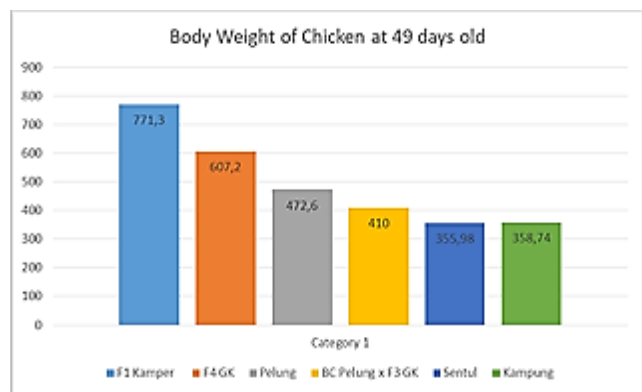

Figure 2. Body Weight of some chicken at 49 days old

AUTHORS' CONTRIBUTIONS

The contribution of each author consist of three jobdesk. Salma Dewi P., Putri Shafira S., and Nurul Hidayah was collected the body weight and morphometrical data. Afifah Nur H. and Nareta Defiani was compile the manuscript. Budi Setiadi Daryono as supervisor participated in correcting the data and manuscript. All the authors read and approved the final manuscript.

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