Ex-situ exploration of cemani chicken in Balai Penelitian Ternak (Balitnak), Bogor-West Java

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Abstract. Cemani chicken is the rarest chicken in the world and generally in Indonesia is associated with medication and ritual ceremonies. The purpose of the research to determine the performance of cemani chickens that are kept outside their habitat. A total of 20 hens kept in litter cages was observed in the exploration. The hens were given commercial feed and drinking water was given ad libitum. The observed variable were hen day production (%), first egg weight (g), egg quality, and growth (g). All data obtained were analyzed descriptively. The results showed that hen day production (%) during 6 months of production increased, from 14.96% at the beginning of production to 48.97%. The first egg weight was 31.31 ± 1.43 g with the egg quality is almost the same as the quality of other local/native chicken eggs. The average body weight of DOC was 25.13 g/head, 8 weeks 839.94 g/head (♂) and 759.98 g/head (♀), and 20 weeks 1537.29 g/head (♂) and 1455.18 g/head (♀). The observed from the data obtained, the performance of cemani chicken in Balitnak showed hen day production, first egg weight, and DOC weight was slightly lower, but for 20-weeks bodyweight, growth was relatively higher.

1 Introduction

Cemani chicken is one of very popular kind chicken in Indonesia and is usually used for religious or traditional ceremonies. The price of cemani chicken is quite expensive because it is a rare chicken that is believed to have medical value, namely treating cardiovascular and respiratory diseases [1]. That is why many people look for cemani chicken to be consumed and raised for cultivation.

However, in their natural habitat (in situ) the population of cemani chickens is not known. To maintain the cemani chicken population, steps or programs that can be taken are by conducting a germplasm management program, including exploration and inventory activities; characterization; collection; evaluation; conservation (in situ and ex situ) and rejuvenation; material exchange; data documentation; and utilization [2]. Germplasm conservation is the most successful method for preserving the genetic traits of endangered species and commercial value.

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Preservation of germplasm is twofold, namely in situ and ex situ, in situ conservation carries a risk of loss due to unexpected outbreaks of infectious diseases such as highly pathogenic bird flu, and accidents. The Convention on Biological Diversity in particular recommends ex situ conservation be carried out in situations where in situ conservation programs are not successful. Ex situ conservation has advantages and risks, such as (1) ex situ conservation complements the rehabilitation and restoration of damaged ecosystems and threatened species, (2) ex situ conservation facilities provide the opportunity for researchers to study plants, animals, and microorganisms under controlled conditions, and to improve the collection, storage, and regeneration techniques, (3) ex situ facilities can be used to evaluate germplasm, as a centre for documentation and information systems, and can provide information about genetic resources commercially, (4) the captivity of wild animals can be used to restore populations of endangered species, and (5) it is important to increase populations as quickly as possible and reintroduce animals to the native habitat to minimize genetic erosion [3].

Based on the explanation that has been stated, the purpose of writing a paper is to explore cemani chicken that is kept ex situ in Balitnak in terms of production, weight, egg quality, and growth of cemani chicken from day old chicken (DOC) until the age of 20 weeks. So that this paper can be useful to supplement information on the development of cemani chicken outside their habitat.

2 Materials and method

2.1 Study area

The research was conducted at the Chicken Cage Complex, "Balai Penelitian Ternak (Balitnak)", Bogor, West Java from February to December 2019. Cemani chickens are kept in a litter cages and a natural mating system is carried out with a male to female ratio of 1: 5. Provision of commercial feed (Table 1) as much as 100 g/head/day with ad lib drinking water. The hygiene and sanitation program are carried out regularly. A total of 20 hens and 4 roosters were observed systematically in accordance with the objectives and information needed. After the parent begins to learn to lay eggs (approximately 5-5.5 months of age), the recording of egg production begins.

Table 1. The nutritional content of commercial feed given to Cemani chicken.

Contents	%
Water content	12
Crude protein	16.5-18
Fat	3
Fiber	6
Ash	13.5
Calcium	3.25-4.25
Phosphor	0.45

2.2 Egg collection

Eggs were collected manually between 09.00-11.00 hours, then placed on the tray. Sorted eggs (which are clean and of good quality) are collected for hatching purposes, avoiding cracking eggs, whereas dirty eggs are washed carefully immediately after collection. The eggs to be hatched are stored for 4 days in the storage room until they reach the desired number.

2.3 Incubation

Eggs were placed in an automatic portable incubator at temperatures of 37.8°C and 70% relative humidity for eighteen days. On the eighteenth day of incubation, candling was performed. Eggs that show signs of embryonic development through a network of blood vessels that appear to spread from the centre of the egg out are considered fertile. Furthermore, fertilized eggs are transferred from the incubator tray to the hatching tray on the same machine.

2.4 Parameters that were measured

Parameters that were measured include hey-day production, first egg weight, egg quality, and growth of Cemani chicken. Hey-day production is obtained from the number of eggs divided by the number of brooders at that time multiplied by 100%. First the eggs' weight were taken using a sensitive weighing scale in grams. Observation of egg quality using a sample of 29 eggs. The observed egg quality consists of (1) egg yolk color, to compare egg yolk color with egg yolk colour fan with a colour scale of 1-15; (2) Haugh Unit (HU) is a measurement of albumen height and egg weight. The weighted egg is cracked and its contents are placed on a flat glass then the albumen height is measured using a caliper gauge; (3) yolk weight was measured by weighing the yolk using digital scales expressed in grams; (4) egg white weight was measured by weighing egg white using digital scales expressed in grams; (5) Eggshell weight was carried out after drying the eggshell and then weighed using a digital scale expressed in grams; and (6) eggshell thickness was carried out using a micrometer screw gauge with the measurements taken at the blunt, middle, and sharp ends of the egg which were then averaged and expressed in mm. Growth was done by weighing from DOC hatching (0 weeks) to 20 weeks old chickens. At the age of 0-8 weeks, the weighing was done once a week, then after the age of 10-20 weeks, the weighing is done every two weeks to avoid stress.

2.5 Data analysis

Raw data was entered into the excel program. Calculation of mean ($\bar{X}$) and standard deviation (SD) was performed using the help of the SPSS version 25.0 program and the measurement results were tested descriptively which were displayed in tables and graphs.

3 Results and discussion

3.1 Hen day production

The high egg production can be illustrated by the HDP value obtained, but the ability of chickens to produce eggs varies widely. The higher the HDP value, the better the egg production for a group of chickens. The average HDP value during the maintenance period can be seen in Figure 1.

From the graph, it can be seen that the average HDP (%) of cemani chicken during the six months increased from 14.96 to 48.97% and is almost the same as black kedu chicken [4]. That is, the cemani chicken was able to be developed in the Balitnak area (ex-situ). This is influenced by the temperature of the Balitnak environment which is comfortable for breeding cemani chickens. The ideal environmental temperature will indirectly support optimal egg production, due to hormonal balance and ovarian activity. Theoretically, the increase in temperature above the comfort zone for poultry will cause heat stress, so 3β-hydroxysteroid Dehydrogenase (3β-HSD) activity is lower in follicular granulosa cells to

increase the steroidogenic rate. This means that the follicular operation in the ovary will take place more slowly. This phenomenon is one of the reasons and causes of the decline in the production of composite eggs of laying poultry versus heat stress [5]. High environmental temperatures have been identified to be one of the main stressors in poultry production [6].

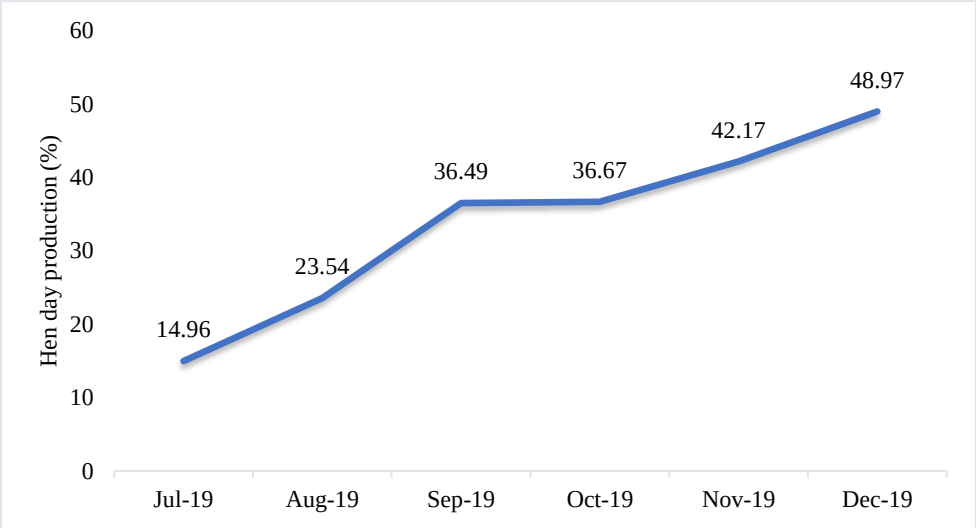

Figure 1. Percentage of hen day production (%) of cemani chicken.

In addition, there are two main factors that influence egg production, namely the initial condition of livestock when they start laying eggs and the potential for livestock to grow from the start of laying eggs to peak production. In other words, body weight affects egg production [7].

3.2 First egg weight

The egg weight is influenced by the environment, genetics, egg composition, body weight, and egg size. The size of the egg varies greatly and one of them is affected by the age of the livestock. The weight of the egg will increase with age. The first egg weight of a cemani chicken was 31.31 ± 1.43 g and relatively heavier than the weight of black kedu chicken egg [4] of 28.64 g. The higher weight of the first egg in the study was probably influenced by the quality and amount of feed given. As previously mentioned, cemani chickens are given commercial feed, so that the nutritional needs of the feed are met. One of the most important factors that affect egg size are adequate protein and amino acids in the ration. Therefore, low ration consumption has an impact on reducing the intake of protein and amino acids that are absorbed by the chicken body and will indirectly affect egg weight [8].

3.3 Egg quality

The egg quality is something that is assessed, observed, and compared to see if the egg Is considered good or bad. The external quality can be seen from the cleanliness of the skin, texture, and shape of the egg, while the internal quality can be seen from the egg whites, the shape of the yolk, and the strength of the yolk. In addition, the decrease in egg quality can be known by weighing the weight of the egg or water cell, and by breaking the egg to check the

condition of the yolk and egg white (HU). The results of measurements on the quality of cemani chicken eggs are listed in Table 2.

Table 2. Egg quality of cemani chicken.

Parameters	Value
Yolk color	8.50 ± 2.27
HU	85.13 ± 6.81
Yolk weight (g)	14.53 ± 3.72
Albumen weight (g)	17.84 ± 3,01
Eggshell weight (g)	3.56 ± 0.59
Eggshell thickness (mm)	0,35 ± 0,03

Egg sample is 29 eggs with 4 days egg storage.

The color of the yolk is one of the factors in determining the internal quality of an egg. The range of egg yolk color according to Roche Yolk Color Fan is 1-15 ranging from pale to dark orange. Based on the Roche Yolk Color Fan, the average value of cemani chicken egg yolk is 8.50 ± 2.27. However, compared to black kedu chicken, the value of the egg yolk of cemani chicken is slightly lower [4]. The content of xanthophyll, beta-carotene, chlorophyll, and chitosan in the ration is one of the factors that influence the colour of the yolk. The difference in egg yolk color is thought to be caused by differences in the ability of metabolism to digest ration and absorption of xanthophyll pigment in the ration. In addition, the egg has water leakage from the egg white to the yolk which causes the stretching of the vitelline membrane, so that the volume of the yolk becomes larger which causes the yolk to turn pale [9].

According to Tugiyanti and Iriyanti [10], egg quality can be measured based on the HU (Haugh Unit) value, which is measured by the height of the albumen, the higher the HU value, the higher the egg white, the better the egg quality and also shows that the egg is new or fresh. The HU value of cemani chicken is higher than the HU value of black kedu chicken [4]. This is due to the egg cemani chicken stored no more than 4 days.

The average weight of cemani chicken egg yolk is heavier than that of Dayak local chickens, 11.7 ± 2.42 g [11]. This difference is probably due to the influence of genetic factors from chickens. According to Tugiyanti and Iriyanti [10], one of the factors affecting the quality of egg externals is genetic. Thus, the average albumen weight of cemani chicken is also heavier than that of the Dayak local chicken, 14.78 ± 2.39 g [11].

The eggshell is the outer part that encloses the contents of the egg and serves to reduce physical and biological damage and is equipped with pore shells which are useful for gas exchange from the inside and outside of the eggshell. There are two membranes inside the eggshell, the eggshell membrane (outer shell membrane), and albumen membrane (inner shell membrane) that serves to protect the egg contents from bacterial infiltration from the outside [12]. The weight of the eggshell is influenced by the nutrient content of the ration, health, maintenance management, and environmental conditions. The average weight of cemani chicken eggshells is lower than that of black kedu chicken [4].

Factors affecting eggshell thickness, namely age, genetic factors, health, environment, and feed. Thin eggshells are relatively larger and larger porous, thus accelerating the decline in egg quality due to faster evaporation and decomposition [13]. The average thickness of cemani chicken eggshells is still considered normal, as stated by Steward and Abbott [14], which is 0.33-0.35 mm.

3.4 Growth

The growth of cemani chickens up to 7 weeks of age is not differentiated by sex, because it is difficult to differentiate local chicks up to 7 weeks of age. After the age of more than 7 weeks, they are then grouped by sex by looking at the comb and back feather. Every week the chicken's body weight changes. The average body weight is presented in Figure 2.

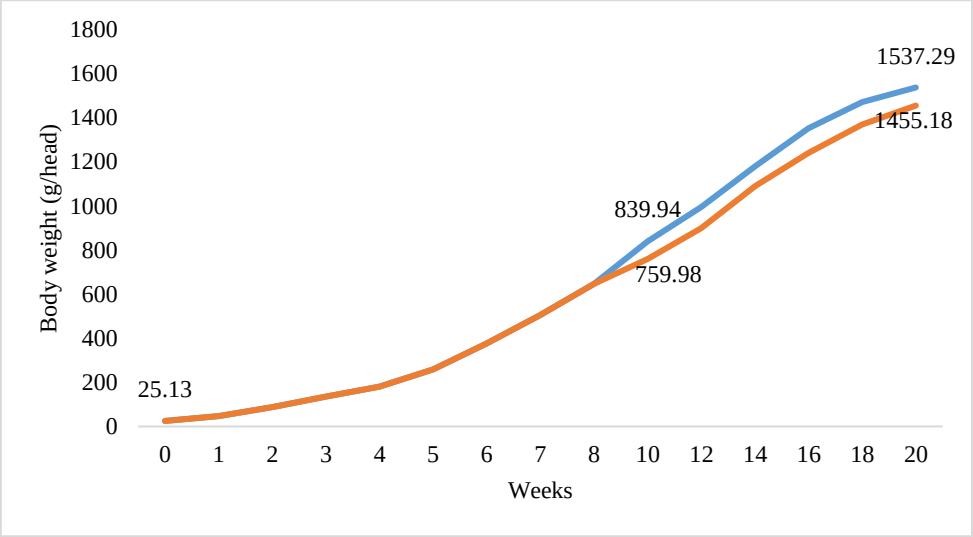

Figure 2. Growth of male (—) and female (—) cemani chickens.

The weight of cemani chicken has a lower hatch weight when compared to the weight of the native chicken research by Wardono et al. [15] which has a hatching weight of 28.41 g. Meanwhile, the results of Abdurrahman [16] research showed that the hatching weight of cemani chicken was 28-32 g.

Cemani chickens in the study have a low hatching weight, but at 5 months the weight is higher. According to Abdurrahman [16] the weight of cemani chickens at the age of 5 months, namely 1400-1500 g (male) and 1200-1300 g (female), while at the same age the study of cemani chickens in males had reached 1537.29 g and in females 1455.18 g. This can be achieved because he cemani chickens are maintained intensively by feeding them with commercial feed that fulfill their nutritional needs.

4 Conclusion

It can be concluded that genetic resource exploration activities are still needed to maintain the diversity of existing animals. This research can provide information about the structure and quality of cemani chicken eggs which can be used as a basis for the development and refining program of cemani chickens outside their habitat (ex situ).

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