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KUB Chicken Egg Weight Effect and Shelf Life to Fertility, Hatchability, and Weight of Hatching in Kupang Regency

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ABSTRACT

The study's objective is to know the effect of egg weight and shelf life on fertility, hatchability, and hatching weight. The location is the chicken research farm of Agriculture Research Center East Nusa Tenggara for four months. Materials are KUB Chicken ("Ayam Kampung Unggul Badan Litbang" or Superior Native Chicken of Research Center) Egg from the parent stock aged five to nine months. Eggs are collected daily, while weight measurement and selection are weekly. The hatching uses two incubators with Glory Bathor brand with a capacity of 576 eggs. The parameters are egg weight, shelf life to fertility, hatchability, and weight of hatching. During the study, the analysis uses a Completely Randomized Design (CRD). The statistical results show that the egg weight has a highly significant effect ($p<0.01$) on fertility, hatchability, and hatching weight. Furthermore, the shelf life of the egg is having a considerable impact ($p<0.05$) on hatchability and hatching weight. Egg weight treatment at 35 grams to 39.9 grams shows the highest average on fertility and hatchability, as much as 83.26% and 38.33%. Subsequently, The highest hatchability appears on the treatment of 45 gram to 49.9 gram with 31.84 gram. The best result of shelf life treatment to hatchability and hatching weight is on Day I treatment with 74.83% and 31.44 gram.

Key words: *egg weight, fertility, hatchability, KUB chicken, parent stock, shelf life, the weight of hatching*

INTRODUCTION

BACKGROUND

The scarcity of DOC (day-old chick) as the starter becomes a problem at a local farmer level. High initial investment requirements for the chicken breeding business become the major obstacle to the local farmer. Native chicken farming is very prospective due to the growing demand for animal protein need and the steady expansion of the culinary industry.

The positive growth of egg demand, annually, makes the farmer interested in breeding KUB chicken ("Ayam Kampung Unggul Badan Litbang" or Superior Native Chicken of Research Center). Moreover, the study of Saptana dan Sartika (2014) shows that native chicken farming contributes adequate profit to the farmer.

Iskandar & Sartika (2014) research in Livestock Research Center Ciawi leads to the new superior native chicken breed called KUB Chicken. KUB Chicken has the superiority at: (1) high egg production (160 eggs to 180 eggs/ chicken/ year); (2) low broodiness ((±10%); (3) high growth capability; (4) more savory meat; and (5) high adaptability.

The development of KUB chicken in East Nusa Tenggara deals with several problems: (1) low hatched egg quantity; (2) expensive feed; and (3) disease invasion such as New Castle Disease (ND) and also Avian Influenza (AI).

The performance of KUB chicken, which is reared in an experimental pen at Kupang Agriculture Research Center, shows several results: (1) egg production average is 45.92%; (2) egg weight 45.87 grams; (3) DOC weight 30.1 to 35.4 gram/head; (4) rooster (70 days old) 1,066 grams; and (5) pullet 745 grams with Feed Conversion Ratio (FCR) 2.18 at 30 weeks to 36 weeks (Fernandez and Rubianty, 2018; Ratnawaty *et al.* (2019). The production performance of KUB chicken is higher than Suryana (2017) at the egg weight average of 36.12 grams/head to 38.12 grams/head. In contrast, the average results from Suryana (2017) are higher on several aspect: (1) egg production average 65% to 67%; (2) DOC

weight 3.8 to 3.9 grams/head; (3) FCR 34.50-36.86 grams/head.

The egg is an affordable source of animal protein for people. The average egg consumption per capita was 6,776 in 2018. Those demands have experienced a steady growth of around 1.9% annually (Food Consumption Statistic, 2018). There are several reasons why egg becomes people's favorite: (1) easy to be processed; (2) easy to be consumed; (3) rich of essential nutrient; (4) contain antioxidant which is essential to the human body (Alexander et al., 2016; Djousse et al., 2016; Nimalaratne and Wu, 2015).

KUB chicken has the superiority with higher egg production than typical native chicken (Hidayat et al., 2011). However, at the local farmer stage, the hatchery time between eggs will vary because the fertile egg will be collected first until the brooder reaches maximum quantity before going to the brooder machine.

The demand for native chicken meat has been growing each year steadily. Developing KUB chicken can be a good alternative for a business plan. Agriculture research Centre of East Nusa Tenggara becomes one of KUB chicken's pool centers in Kupang Regency, East Nusa Tenggara. Today, the demand for KUB chicken starters is increasing. Because of that, the breeding and reproduction management has to be better in order to produce good quality KUB chicken starters. (Achadri, 2020). This study aims to know the effect of egg weight and shelf life on fertility, hatchability, the weight of hatching KUB parent stock chicken at Kupang Regency.

Materials and Methods

Materials

The study had conducted at the experimental pen of Agricultural Research Center East Nusa Tenggara, Naibonat-East Nusa Tenggara Regency, for four months from May 2020 to September 2020. The materials were KUB chicken parent stocks with 5 to 9 months old and a 1:6 sex ratio. The experiment was using intensive rearing.

The feed given was 85% commercial feed with 15% additional milled corn, and the drinking water was ad libitum with additional vitamins each once to three times each week. The materials were 576 eggs, with an average from 33.4 grams to 49.9 grams each egg. The hatching used an automatic incubator with Glory Bathor brand and the capacity of 576 egg that has a thermometer included inside the incubator. Meanwhile, The weigher was Tolledo brand with digital mode and 0.1-gram precision. The weigher is for measuring DOC, which is just after hatching. The egg tray used cardboard (gabus culbox) for storing egg and rice straw for coating egg inside the cardboard. The tray hatcher was for arranging eggs at the brooding stage inside the incubator. The installation of trays is in order to store water inside the incubator and keep it humid. The stationary was near the incubator in order to record the data.

Methods

The methods used Completely Randomized Design (CRD) with four egg Wight and shelf life treatments one to six days. Each treatment used four replication of hatching periods. The hatching period used 576 eggs of KUB chicken placed to four thray inside the incubator divided into tray contained 144 eggs from egg weight treatment and shelf life. The data were collected and analyzed using ANOVA for CRD with Least Significance Difference.

Experimental Procedure

1. Egg collection. Eggs are going through collection and selection base on weight then being marked by date and weight. The collection of fertile eggs happens each morning and afternoon.
2. Weight measurement and marking. The weight measurement happens in order to know the initial identification for egg's weight and date.
3. Egg selection. The selection is based on the size, weight (33.4 grams to 49.9 grams), wholesomeness, cleanliness, shell color, and shape (oval).
4. Storing the egg. The egg is kept on the shelf with a coating of rice hay. The activity happens from day one to day five. On day six, the egg is transported to the incubator for the hatching process.
5. Incubator preparation. First, it begins with checking of cleanliness, temperature end humidity checking. Then, incubator sterilization happens using the disinfectant. Subsequently, the incubator has set at 37°C to 38°C; humidity: 48% to 55%.

6. Egg then goes into the incubator with horizontal position to simplify the flipping of fertile egg.
7. Daily checking. The daily checking is around temperature, humidity, and flipping the egg. On day eight of incubation, the egg is managed evenly to be ready for hatching time. On the day of 9, the egg starts to crack, and the hatching begins.
8. DOC weight measurement. After hatching, DOC is going through weight measurement in order to collect initial hatching weight data. Pratiwi *et al*. (2013) said that the initial hatching weight could be collected after the egg had turned to DOC. Therefore, the weight measurement DOC is using scale individually.
9. Cracking the unhatched egg to check the fertility happens after day 24 to day 25, marked by no more hatching egg. Greenberg (1981) suggests a better way to measure fertility by opening the unhatched egg and checking the germinal disc with bare eyes or a microscope.

The parameters of the study are fertility, hatchability, and initial hatching weight.

Fertility: the percentage of fertile egg or showing any embryo development from some eggs at incubator either it is successfully to hatch or not.

$$\% \text{ Fertility} = \frac{\text{Total fertile egg}}{\text{Total incubated egg}} \times 100\%$$

$$\text{Hatchability} = \frac{\text{Total hatched egg}}{\text{Total fertile egg}} \times 100\%$$

Hatching weight= The measurement result from DOC weight with one day old and 95% of it is fur has dried

Result and Discussion

Egg Eight to Fertility, Hatchability, and Hatching Weight

ANOVA analysis shows that the egg weight has a highly significant effect (<0.01) on egg eight to fertility, hatchability, and hatching weight. The result corresponds with Nugroho (2003) that egg weight is the indicator of fertile egg selection because the egg weight is one of the factors affecting fertility, hatchability, and hatching weight which finally affects the growth quality of chicken.

The effect of egg weight on the percentage of fertility, hatchability, hatching weight can be seen in Table 1.

Table1. *The effect of egg weight on the percentage of fertility, hatchability, hatching weight*

Egg weight Treatment (gram)	Fertility (%)	Hatchability (%)	Hatching weight (grams)
33.4-34.9	58.63b	9.54a	23.52 a
35-39.9	83.26c	38.33c	28.13 b
40-44.9	75.92bc	22.80b	30.18 b
45-49.9	29.21a	2.25a	31.84 b

Information: The result following with the similar alphabet show no significant difference with analysis of LSD 5%

Based on table 1, egg weight treatment shows a significant difference in fertility, hatchability, and hatching weight. The effect on fertility indicates that the highest average result is at 35 grams to 39.9 grams egg weight treatment (83.26%). This treatment is significantly different from treating 33.4 grams to 34.9 grams and treatment 45 grams to 49.9 grams, but not showing a significant difference with treatment 40 grams to 44.9 grams. The robust result at the treatment of 35 grams to 39.9 grams contributes to the high fertility rate

Treatment of 35 grams to 39.9 grams also shows the most satisfying result to hatchability (38.33%) which is also has a significant difference from the other treatments ($p<0.05$). The satisfying result of hatchability happens because the treatment 35 grams to 39.9 grams is very suitable for the hatching process. Kurtini and Riyanti (2003) reported that the egg with average or medium weight would be hatched better than another weight status because a small egg has a bigger air shack, leading to a premature hatch. In contrast, a heavier egg than average will have a smaller air shack, leading to a late hatch.

Although the treatment of 35 grams to 39.9 grams contributes higher at fertility rate and hatchability, the hatching weight is still the highest at treatment 45 grams to 49.9 (31.8 grams), which is significantly different ($p<0.05$) with treatment 33.4 grams to 34.9 grams, but it

is not significantly different (p>0.05) with treatment 35 grams to 39.9 grams and treatment 40 grams to 44.9 grams. This result indicates that the higher egg weight will lead to a higher weight of hatching. The higher weight of hatching at treatment, 45 grams to 49.9 grams, is probably caused by more yolk and albumin content, leading to abundance nutrient for embrio development, leading to higher hatching weight. This phenomenon is consistent with Sudaryanti (1985) and Kartasudjana (2006) opinion that various egg weights would lead to diverse embryo development in both cell quantity and size. Furthermore, Romanoff and Romanoff (1975) informed that a more significant egg would have a more prominent component. Subsequently, Hasan et al. l (2005) and Mahi et al. l (2013) stated that the weight of hatching had a positive correlation with egg weight. Therefore, the higher egg weight will lead to a higher weight of hatching result. The significant results happen because of the difference in yolk and albumin content as the nutrient in embryo development. Higher egg weight contains more yolk and albumin. Therefore, the higher in both yolk and albumin will support embryo needs in nutrient better which help the offspring reach a higher weight at hatching time.

Egg Shelf Life Effect to the Hatchability and Hatching Weight

The ANOVA result shows that the egg shelf life has a significant effect (P<0.05) on hatchability and hatching weight. The average result hatchability and hatching weight due to egg shelf life can be seen in table 2.

Table2. *Egg Shelf Life Effect To The Hatchability And Hatching Weight*

Egg shelf life treatment (day)	Average hatchability (%)		The average weight of hatching (Gram)	
I	74.83	b	31.44	b
II	74.07	b	31.11	b
III	74.03	b	31.09	b
IV	74.00	b	31.08	b
V	70.24	a	29.5	a
VI	68.34	a	28.71	a

Description: The result of the same alphabet indicates no significant difference at LSD 5%

Tabel 2 informs that the difference between treatments to both hatchability and hatching weight. Base on hatchability, treatment I shows the highest result with 74.83%, which is significantly different with both treatment V and VI, but it is not significantly different from others. The result indicates that the longer egg is postponed from hatching, the less its hatchability. The phenomenon is supported by Adnan (2010) statement that the different storing times of eggs will result significantly in hatchability. The reducing hatchability happens because chalaza, which serves as the most crucial part of the egg, degrade more when it is kept longer in storage. The chalaza serves as the room for embryo development and separates yolk and albumin. The disconnection of chalaza makes the embryo fails to be developed.

Hartono and Isman (2010) state that the egg component that serves vital roles in hatching is chalaza. The chalaza is the part of albumin that helps to bind the yolk. When chalaza is disconnected, the embryo will not develop optimally and normally. Table 2 shows that the highest weight of hatching at 31.44 grams is significantly different from treatment V and VI, but not with the others. The result corresponds with Adnan (2010) that stated that egg shelf life significantly affects egg weight. The result shows that the longer egg at storage before incubation leads to the lesser its hatching weight. The contrast effect happens because organic content degrades more to the storage time, reducing egg quality and resulting in lesser egg weight. Iskandar (2003) stated that the degradation of organic content reduces egg weight, which affects the weight of hatching.

Conclusions and Suggestions

Conclusions

The study concludes that statistical analysis shows that egg weight significantly affects (P<0.01) fertility, hatchability, and hatching weight. In addition, egg shelf life impacts significantly (P<0.05) to hatchability and weight of hatching of KUB parent stock. Treatment 35 grams to 39.9 grams shows the highest mean result of fertility (83.26%) and hatchability (38.33%). The treatment of 45 grams to 49.9 grams shows the highest result on the weight of hatching (31.84 grams). Treatment I (one day storage time) has the highest hatchability (74.83%) and weight of hatching (31.44 grams).

SUGGESTIONS

The study suggests that egg with 35 grams to 39.9 grams is highly recommended to get a good result from KUB parent stock with six to nine-month-old. In addition, the egg shelf life before incubation should not be longer than four days.

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