

## **The success rate of artificial insemination in the crossesbred of male Bangkok Chickens and Pelung Hens**

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**ABSTRACT:** Bangkok and Pelung chicken were chickens that are quite popular in Indonesia. One of the breeding programs was to increase meat production could be done through crossbreeding. This study aims to determine the success rate of artificial insemination of crossbreeds of male Bangkok chickens with Pelung hens. The research material used was four male Bangkok chickens aged one year and six female Pelung chickens. This study consisted of four phases: raising chickens, collecting Semen from Bangkok males, artificial insemination of Bangkok males with Pelung hen chickens, and hatching eggs from artificial insemination. The parameters observed in this study were egg weight, fertility, hatchability, DOC weight, and the correlation between egg weight and DOC weight. Data were analyzed using quantitative analysis. The research conducted has obtained an average egg weight of 46.21 grams, 66.67% fertility, 78.57% hatchability of DOC weight 36 grams, and a correlation between egg weight and DOC weight of 0.93%. The research concluded that the results of crossing Bangkok males with Pelung hens could increase hatching egg weight, hatchability, and DOC weight.

**Keywords:** Bangkok chickens; Pelung chickens; Crosses; Artificial insemination

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## **INTRODUCTION**

Along with the increase in human population growth, the public's need for animal protein has also increased. The local chicken was one of the potential sources of animal protein in Indonesia. Sidadolog (2007) stated that the utilization and use of local chickens until now is still traditional as a meat and eggs producer. Other advantages of local chickens are that they can survive and breed well despite the low quality of feed and disease resistance. As the germplasm of Indonesian livestock, this local chicken needs to be maintained, purified, and utilized optimally to provide animal proteins.

The local chicken meat was much preferred because it has a distinctive taste. Despite its considerable market potential, until now, local chickens still have low productivity. This productivity includes meat production and egg production capabilities. This situation led to the need for efforts to increase the local chicken population by utilizing existing technology. Artificial insemination is one of the technology packages that can be used to increase the local chicken population. Artificial insemination technology in a hen population could increase DOC production in large quantities with a uniform lifespan while saving maintaining male chickens. Kharayat et al. (2016) stated that artificial insemination in poultry could increase the mating ratio because naturally, a male chicken could only mate 6–10 hens. While by using artificial insemination technology, the number of hens could be mated up to 4 times.

It is due to the semen dilution process in Artificial Insemination technology that can increase semen volume to be inseminated. Besides, if insemination is carried out 30–45 minutes after the semen collection, spermatozoa could lose viability. Therefore, spermatozoa need a dilution material that has been formulated to prolong their survival (Stepinska and Bakst, 2007). Bangkok and Pelung chicken are quite

popular chickens in Indonesia. Bangkok chicken is a local breed of chicken that is generally kept as a complaint chicken. Bangkok chicken morphology is generally large and stocky, while Pelung hen chickens could be superior broilers.

One of the breeding programs to increase meat production can be done through crossbreeding. In the short term, this crossing method will quickly increase the average weight of chicken pieces. The crossing between chicken breeds with good flesh characteristics through artificial insemination technology is expected to increase meat production in the offspring. On this basis, the authors researched to find out the success of Bangkok stud crossing with Pelung inductees through artificial insemination technology. This study aimed to determine the success rate of artificial insemination of Bangkok male crossing with Pelung hen.

## **MATERIALS AND METHODS**

### **Research Materials**

The materials used in this study were NaCl liquid, hatching eggs from crosses, Semen from four 1-year-old Bangkok chickens, and six 8-month-old Pelung chickens. The equipment used in this study was a full automatic hatching machine, cage, calculator, digital scales, tissue stationery, and spoit. This research was conducted in Kukutio Village, Watubangga District, Kolaka Regency, South East Sulawesi.

### **Research Methods**

#### **1. Chicken Maintenance**

Placing chickens in individual cages measuring 40 x 50 x 70 cm, and chickens were given a complete feed in the form of crumble from the company PT. Japfa Comfeed, Tbk. The feed's nutritional composition was a crude protein content of 17%, coarse fiber 6%, ash 14%, phosphorus 0.6%-1%, and calcium 3%-4.2%, as much as 150 g / tail day. Drinking water was given ad libitum. Before implementing research data collection, it is necessary to adapt the environment in chickens for three weeks.

Pelung hen eggs in the first period are not used as research data. Eggs used as research data were eggs in the second period. Bangkok chickens used as males performed sperm collecting habituation for three weeks before taking the research data.

## **2. Bangkok Male Chicken Semen Collection**

Semen collection used the massage method twice a week. To facilitate the implementation of sperm collection requires two people. Their job was to carry out the stimulated and collected Bangkok chicken sperm. When stimulating the male chicken, keep the male calm by regularly sorting from the upper groin to the tail base. A Bangkok male's specific sign was that the tail would rise up and out of the cloaca if the male was already aroused, with the index finger and thumb directly pressing the cloaca until ejaculation occurs. When ejaculation occurred, the sperm that came out was immediately accommodated by a second person (Junaedi and Husnaeni, 2019).

## **3. Artificial Insemination**

Stages of artificial insemination include:

1. The collected Bangkok chicken semen was diluted using lactate ringer diluent in a ratio of 1:3 (1 ml Bangkok chicken semen ; 3 ml ringer lactate). Artificial insemination was carried out twice a week. The implementation was in the afternoon using the intrauterine method using a 1 ml spuit.
2. Two people carried out the implementation of artificial insemination to facilitate its implementation. One person held the hen part of the chicken thigh tightly. Then right thumb pressed the cloaca area (left) and left hand, put the index finger and middle finger like cutting the tail, and pressed it up a little while the left thumb presses down so that the reproductive organs of the hen came out (Junaedi and Khaeruddin, 2018).
3. Syringes that already contain sperm were inserted into the female vaginal

canal located on the left as deep as  $\pm 7-8$  cm (until it touches the uterus). Before the sperm was sprayed, the cloaca's pressure was loosened so that the sperm would not come out of the vagina again (Junaedi and Khaeruddin, 2018).

## **4. Hatching Eggs**

Artificial insemination eggs between Bangkok males and Pelung hens were collected. Then the egg weighing was carried out and put in a full automatic hatching machine. The hatching process lasts for 21 days. After the eggs hatch, DOC weighing was carried out, calculating fertility, hatching rate, and calculating the correlation between egg weight and DOC weight.

### **Research Parameters**

The experimental parameters are:

1. Egg weight (Gram)
2. Fertility (%)
3. Hatching rate (%)
4. Hatch weight (Gram)

Correlation of egg weight with hatching weight

### **Data Analysis**

The data obtained were analyzed quantitatively to see hatching rate, fertility, egg weight, and hatching weight. Percentage of fertility and hatchery is calculated using a formula:

$$\text{Fertility} = \frac{\text{Number of fertile eggs}}{\text{Number of eggs hatched}} \times 100\%$$

$$\text{Hatching rate} = \frac{\text{Number of hatched eggs}}{\text{number of fertile eggs}} \times 100\%$$

Hatch weight and egg weight are weighed and calculated using the following mathematical formula:

$$\bar{x} = \frac{1}{n} (x_1 + x_2 + \dots + x_n)$$

Description:

x = calculate average

xi = 10th sample value

n = number of samples

The following correlation formula was used to determine the correlation between hatching eggs' weight and DOC chickens' weight.

$$r_{xy} = \frac{n \sum XY - (\sum X) \sum Y}{\sqrt{\{N \sum X^2 - (\sum X)^2\} \{N \sum Y^2 - (\sum Y)^2\}}}$$

Description:

$r_{xy}$ : coefficient of validity

N: number of subjects

X: comparative value

Y: the value of the instruments to be searched

## RESULT AND DISCUSSION

### Characteristics of Hatching Eggs Resulting from Crosses

The research results on hatching egg characteristics with observations that include measurements of egg weight, fertility, hatching rate, and hatching weight shown in Table 1.

**Table 1.** Average Egg Weight Value of Fertility, Hatching Rate, and DOC Weight.

No	Hatching Egg Weight	Fertility	Hatching Rate	DOC Weight
	Gram	Fertile/Non	Hatched/Non	Gram
1	50,5	-	-	0
2	45,5	-	-	0
3	50,5	Fertile	-	0
4	45	Fertile	-	0
5	40,5	Fertile	Hatched	30,5
6	42	Fertile	Hatched	31
7	45	-	-	0
8	45,5	Fertile	Hatched	35
9	45	-	-	0
10	49,5	Fertile	Hatched	37,5
11	46,5	Fertile	Hatched	37,5
12	45	-	-	0
13	49,5	Fertile	Hatched	38
14	44	Fertile	Hatched	34,5
15	45	Fertile	Hatched	35,5
16	51,5	Fertile	Hatched	39,5
17	45	-	-	0
18	45	Fertile	-	0
19	45	-	-	0
20	46	Fertile	Hatched	37,5
21	49	Fertile	Hatched	39,5
Average	46,21±2,85	66,67±3,34	78,57±3,34	36±3,07
Total	21	14	11	11

Correlation of Hatch egg Weight with DOC Weight 0.93%

### **Egg Weight**

Based on the average egg weight of Bangkok chicken crossing with Pelung hen was  $46.21 \pm 2.85$  grams. The results were better than the egg weight of native chickens reported by Mansjoer and Martoyo (1977), ranging from 32.75-36.96 grams. But it was lower than the original Bangkok chicken out of 51.37 grams (Junaedi and Khaeruddin 2018). The difference in hatching egg weight of different chicken nations was due to the diversity of genes that cause individual diversity. Genes that have a close relationship would have less diversity than individuals who have other kinship relationships. Egg weight was often used as a selection criteria for hatching eggs. According to SNI (2008), ve weight criteria were included in 3 classes, namely large with egg weight more than 60 g / grain, while the egg weighs 50-60 g / grain, and small was an egg with a weight of less than 50 g / grain. A good weight of hatching eggs included normal weight according to the breed of poultry; for example, for thoroughbred chickens, about 55-65 grams and native chickens 45-55 grams.

One factor affecting egg weight was a genetic factor (Junaedi and Khaeruddin 2018). Genetic factors affected the length of the ovum growth period so that larger yolks would produce larger eggs. According to Nafiu et al. (2014), egg weight was a performance character that bequeaths from its elders. The character was different in every breed, variety, and strain of chicken. Other factors that affected the weight of eggs were mainly hens, such as the hen body's weight, age, and the quality and quantity of feed consumption. Mahi and Muharlieni (2013) stated that strains, hen age, and feed nutrients influence egg weight.

### **Fertility**

Table 1 showed that the average percentage of egg fertility produced is 66.67%. The percentage of fertility obtained in this study was lower than the percentage of Pelung chicken fertility reported by Mansjoer et al. (1990) of 76.60%. The age factor of the brood affected fertility in

chickens. The lifespan of chickens used in this study is eight months of age, which is included in the initial production period, so fertility in this phase is still low. Zainuddin and Jannah (2014) stated that age greatly affects ovulation, where ovulation increases rapidly from pre-adulthood to the highest point and slowly decreases old age neutering. Ankanegara (2011) added that factors that affect fertility, among others, are light, the ratio of male chicken and hen chicken, livestock age, the interval between mating time and storage of hatching eggs, feed, abnormalities of spermatozoa, egg production, breed, and season. The high fertility is due to the mating system that already uses Artificial Insemination.

Artificial insemination carried out in this study was the process of inserting a Bangkok chicken male cement into the reproduction of Pelung chicken hen with the help of spoit had a clear hereditary advantage compared to natural mating. Similarly, Sastrodiharjo stated (1996) that the advantages of utilizing artificial insemination techniques to improve the efficiency of male livestock use, tackling low fertility due to natural mating, and knowing clearly and definitively the origin of their elders (parent and male). Besides, it could increase the amount of hatching egg production and efforts to procure large numbers of chicks, the same age and a short time.

Artificial insemination activities were carried out twice a week. The implementation of artificial insemination takes place in the afternoon after the chickens lay their eggs. The purpose of insemination in the afternoon would produce high fertility because, by that time, the hens were already laying eggs, and the ambient temperature was not too hot so that the stress on the chickens is reduced.

### **Hatching Rate**

The hatching rate produced in this study had an average percentage of 78.57%. The result could be categorized as quite high when compared to the hatchery rate of native chickens presented by Iriyanti et al.

(2007), which was only 72.02% that was hatched naturally. Hatchability results during the study were more optimal than the research results of Nataamijaya et al. (1994). Nataamijaya et al. (1994) obtained a hatching rate in Sentul chicken research of 78.20%, and Pelung chicken hatching rate by 80% (Mansjoer et al., 1990) Nataamijaya et al. (1994) obtained a chicken hatching rate of 78.20%, and Pelung chicken hatching rate by 80% (Mansjoer et al., 1990)

How to calculate the hatching rate was to compare the number of eggs hatched with the total number of fertile eggs. The higher the number of fertile eggs than the number of eggs hatched, it would produce a high hatching rate. High fertility was necessary to produce a high hatching rate. The temperature on the hatching machine could cause a percentage decrease in the hatching rate.

Hatching temperature in this study as recommended (Mulyantini 2010) is between 37.20°C – 38.20°C for setter period (early entry of eggs) but higher than recommended for mid-egg life period of about 37.00°C - 37.,50°C. Temperatures above or below optimum would decrease the hatching rate, resulting in weak embryos and low-quality chicks. Simultaneously, too high humidity causes chicks to hatch longer, larger and flaccid weights on the abdominal area. Moisture served to reduce fluid loss from the inside of the egg during the hatching process, helping to soften the eggshell at the time of hatching so that the fowl easily breaks the eggshell.

A hatching rate decrease could also occur due to the regular frequency of opening the lid on the hatching machine to change. According to Wulandari's statement (2002), the frequency of opening hatching machine doors to perform egg screening too often could cause a decrease in the temperature of hatching machines due to the transfer of heat to an environment with a lower temperature. Too high a temperature would cause the embryo's death or abnormality, while moisture affected the embryo's normal growth.

## **DOC Weight**

The hatching weight resulting from the crossing of a Bangkok male with a pelung hen was excellent. Table 1 saw that the average hatching weight reaches  $36 \pm 3.07$  grams. Hatching weight was obtained by weighing chicks when the feathers were dry. The average hatching weight in Bangkok male chicks with Pelung hen was higher than the hatching weight produced from black Kedu chickens, which was an average of 28.98 grams (Nataamijaya, 2008). In white Kedu chickens, the hatching weight was 25.5 grams, Sentul chickens weigh 32.2 grams (Hidayat and Sopiyan 2010), and in pure Pelung chickens, 31.83 grams (Darwati, 2000).

Egg weight was the main factor that affects hatching weight. Other factors that affected hatch weight were temperature, hatching machine humidity, feed, genetic, and environmental. Lasmini and Heriyati (1992) stated that the factors that affected hatch weight were genetic, feed, egg weight, and environment. Nuryati et al. (2000) added that too high temperatures and too low humidity could cause the resulting hatch weight to decrease. In this study, hatching eggs were carried out using an automatic machine with a temperature between 36-38°C and a humidity of 65-70%.

## **Correlation of Egg Weight with Hatch Weight**

The correlation analysis results showed that egg weight had a very real relationship with the DOC weight of Bangkok chicken crossing to pelung hen, and the value was very high at 0.93% ( $P < 0.01$ ). It means that the larger the hatching egg will have a good DOC weight as well. One of the factors that affected DOC weight was the composition of egg yolk and egg white. Egg yolks role an important role in forming embryos so that eggs containing large yolks would produce a large hatching weight. Kartasudjana (2006) stated that the yolk role an important role in forming embryos, where the larger the yolk, the greater the RESULTING DOC. Mahi and

Muharlieni (2013) that the yolk and egg white content affected the egg's weight, both of which would affect DOC's hatching weight.

The results showed that the larger the egg weight, the greater the hatching weight, and the smaller the egg weight, the lower the hatching weight. According to Nafiu et al. (2014), there was a relationship between egg weight and DOC hatching weight. According to Purwanti et al. (2009), hatching weight was positively correlated with egg weight, where the heavier the egg weighs, the heavier the hatching weight and vice versa. Pratiwi et al. (2013) that hatching weight was very related to egg weight. These results indicated that obtaining chickens with a high DOC weight could be started by selecting egg weights. The best eggs were eggs that weigh at least 50.00 grams.

## CONCLUSIONS

The study results showed the conclusion that crossing Bangkok males with Pelung hens could increase hatching egg weight, hatchability, and DOC weight.

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