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Characteristics of Quality Semen, Hatching Arabic Chicken Eggs and Growth of Chicks from Crosses

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Abstract

This study aims to evaluate and analyze the characteristics of the quality of semen, and hatching of Arab chicken eggs and the growth of crosses from chicks. This research was conducted at the Permata Farmer Group business, Wua-wua Village, Wua-wua District Kendari, Southeast Sulawesi for three months. This study uses a Completely Randomized Design which is three treatments and six replications. The parameters measured were semen quality, egg weight, egg index, fertility, DOC weight gain, feed consumption, and feed conversion. The data analysis used is Analysis of Variance. The results of this study indicate that the consequences of crossing three males did not have a significant effect (P> 0.05) on the measured parameters. It can be seen in the research process which gives results that are not much different from the results of the crossing of three different males using the Arabic parent in the initial phase of production.

Keywords: quality of semen, hatching, the growth of Arabian chicken

A. Introduction

Arabian chicken is one type of laying hens that are not races which have good market prospects to be developed in Indonesia because their egg production is relatively high, almost resembling putting hens' productivity, which is around 190-250 grains per year. Characteristics of eggs that resemble local chicken eggs with egg weights of around 30–35 g hardly have natural properties, so that laying time becomes longer (Sulandari Zein, Priyanti, Sartika, Astuti, Widjastuti, Sujana, Darana, Setiawan, & Garnida, 2007). Some of the advantages of Arabic

chickens in addition to high egg production are: (1) low feed conversion, (2) Arab chicken males have the advantage of being able to marry female chickens every 2-3 hours, (3) relatively more resistant to disease, and. (4) Can be maintained with traditional patterns to intensive. The acceleration of breeding of Arab chicken breeds can be accelerated through various technological breakthroughs that have been developed. The technology used to spur the breeding of Arab chickens can use artificial insemination technology (IB). Artificial Insemination is a technique of artificial reproduction by incorporating semen that has been diluted with specific dilutions into the reproductive tract of the hens that are in the laying phase. The benefits of artificial insemination include (1) enhancing the use of superior males, (2) saving costs and maintenance personnel, (3) males used in IBs having undergone prior selection, (4) transmission of preventable diseases, and (5) increasing reproductive efficiency, (Sarwono, 2011).

B. Methodology

1. The Material

The primary material used in this study was 18 female Arab chickens with an age of 19 weeks and a heavyweight average of 2.11 ± 0.04 kg. In this study, also used three varieties of roosters, namely Arab roosters, chicken Peranakan Bangkok, and native chicken. Arab cock five months old and weighing 2.47 ± 0.07 kg, Bangkok Peranakan chicken is eight months old and weighs 2.6 ± 0.07 kg, while the free-range chicken is eight months old and weighs 2.53 ± 0.14 kg. The semen collection process (2ml) and spite (1ml) and physiological NaCl (0.9%) are used as semen thinners in the process of semen collection.

Table 1. Nutrient content of feed given to mother and male.

Name of Feed	Dry Matter	Crude Protein	Crude Fiber	Crude Fat
Milled Corn (%)	87,85	8,50	8,82	2,23
Bran (%)	84,38	11,20	10,44	13,51
RK 24 (%)	91,12	28,25	14,43	2,39

Source: Results of Analysis of the Faculty of Animal Husbandry Feed and Science Laboratory of IPB, Bogor 2018

This study uses rations mixed with feed ingredients, among others: milled corn, bran and concentrates, can be seen in Table 2.

Table 2. Self-mixed rations

Name of Feed	Percentage of feed
Milled Corn (%)	45
Concentrate (%)	35
Bran (%)	20
Total	100

Source: The rations which were mixed by themselves in the group of Permata Farmers, 2018.

The nutritional content of BP 11 commercial feed consumed by chicks as a result of the crossing of three different males can be seen in Table 3.

Table 3. BP 11 commercial feed nutrient content

Name of Feed	Water Content	Protein	Fat	fiber	Ash	Ca	P
BP II (%)	13,0	21,0-23,0	5,0	5,0	7,0	0,9	0,6

Source: PT. Charoen Phokphand Indonesia

The research enclosure is in the form of a multilevel battery enclosure measuring 40x20x45 (cm) per plot. The feed place is made of pipe which is installed extensively in the batteray cage, while the area for drinking water is available in each enclosure. Also, 18 brooder cages with a size of 35x35x35 (cm) were used which were equipped with heaters for the maintenance of newly hatched chicks up to 30 days old.

2. Research Procedures

a) Preparation Phase

The preparation stage in this research is the preparation of the maintenance cage for Arabian hens using batteray cages, and the males use individual pens made of wood and rang and chicks from the crosses using pens made of wood and rang, which distinguishes the pen of chickens which is the cage size and partitioned by 18 plots. Also, equipment and artificial insemination materials are also prepared.

b) Artificial Insemination Process

Semen is collected from roosters by sorting in the afternoon. The semen was then diluted with a concentration of 0.2-0.4 ml using physiological NaCl 0.9% with a ratio of 1: 1 before being disseminated to the reproductive tract of the hens. Before being distributed to the mother, the impurities in the anus and surrounding areas are cleaned using a tissue containing a disinfectant solution. The process of insemination is done by inserting semen included in the spoit (dose 0.1ml / tail) into the reproductive tract of the hen.

c) Hatching

The hatching process begins with fumigation using detergent (to taste) dissolved into water, on the hatching machine and stabilizes the temperature of 380C for 1x 24 hours with 60% humidity, by turning on the lights in the hatching machine and preparing gutters under the egg rack. The next day the cleaned and marked eggs are put on the egg rack in the hatching machine.

3. Parameters of Research

1. Quality of Semen and Spermatozoa

The quality of semen and spermatozoa in the three males used in Artificial Insemination (IB) was analyzed using hemocytometer in Bali cattle UPTD Laboratories Nursery and Animal Feed Province of Southeast Sulawesi

2. Index of Eggs

The egg index was obtained from the measurement of the length and width of the eggs, which measured each egg collection every day for one week.

Index of eggs = (width / length X 100%)

3. Growth of Chicks

a) Consumption of ration (g / tail)

Ration consumption was measured every day by calculating the difference between the rations given the previous day and the remaining rations left in the next day in units of grams, then summed up to get ration consumption data during the study. To calculate ration consumption, use the formula:

Feed consumption (g) = Ration given (g) - remaining ration (g)

b) Body weight gain (BWG) (g/head)

Body weight was measured everyone week once during the study, based on the difference between the body weight at the end of the fourth week and the initial body weight of the week in units of grams. To calculate the body weight gain, use the formula:

BWG (g/head/week) = Final Body Weight (g) - Initial Weight per week (g)

c) Conversion of rations or FCR

The ration conversion is calculated by dividing the number of rations consumed with the body weight gain achieved. The formula calculates the conversion of rations:

$$\textbf{Feed Conversion (FCR)} = \frac{\textbf{Jumlah pakan yang dikonsumsi (kg)}}{\textbf{Produced weight (kg)}}$$

4. Sex Ratio

The chicken sex ratio is seen from the comparison of the number of male and female chicks that have been hatched. The formula calculates sex ratio:

$$\textbf{Sex Ratio} = \frac{\textbf{Number of Sexes}}{\textbf{Number of Chicken available}} \textbf{ X 100}$$

5. Chicks Mortality (DOC)

Calculation of the percentage of DOC mortality was carried out at the end of chicken maintenance, with the aim of knowing the number of dead chickens. The rate of mortality can be calculated as follows:

$$\textbf{Mortality} = \frac{\textbf{Number of Dead Chickens}}{\textbf{The number of eggs that hatch}} \textbf{ X 100\%}$$

4. Data Analysis

This study used a completely randomized design (CRD) with three treatments, namely 3 (three) varieties of roosters as a source of semen (spermatozoa) consisting of Arabic chickens, local native chickens, and Bangkok chicken breeds. Each treatment consisted of 6 Arab chickens which were replicated in this study. The mathematical model used (Steel & Torrie, 1993) is:

$$Yij = \mu + \tau_{i} + \varepsilon_{ij}$$

Information:
i = 1, 2, ... t and j = 1, 2, ... r

Yij = Observation on the first j line and treatment
μ = general average
τi = first row effect (treatment) = μi- μ
Ɛij = random effect on the first line (treatment), jth line (repetition)
t = number of treatments
r = number of replications

C. Result and Discussion

1. Quality of Semen and Spermatozoa

The results of the evaluation of fresh semen used in this study can be seen in Table 4. The results of macroscopic observations of the sperm of three types of chickens showed that the ejaculate semen volume average ranged from 0.2-0.4ml. The average volume of semen is by what was stated by Toelihere (1993), which is 0.2-0.4 ml.

Table 4. Quality of semen and spermatozoa in three different male varieties.

Characteristic of Fresh Semen	Kampung Chicken	Arabic Chicken	Bangkok Chicken
A. Makroskopis:			
Volume (ml)	0,75±0,08	0,3±0,21	0,17±0,06
Color	Milky white	Beige	Milky white
Bau	typical	typical	typical
Concentration	Thick	Thick	Thick
pH	8,3±0,27	7,7±0,48	6,87±0,06
B. Mikroskopis:			
Concentration (10^9/ml)	1,60±0,09	3,04±0,11	10, 067±2,45
Mass Motility	+++	+++	+++
Motility (%)	77,57±3,67	91,8±6,78	83,3 %±5,77
Viability (%)	83,87±2,22	92,2±6, 65	85,6±2,00
Abnormality (%)	6,80±0,78	3,00±0,17	0,167%±0,29

Description: +++: Very good, (there are lots of fast moving waves).
Source: Bali cattle UPTD Laboratory Nursery and Animal Feed Prov. Southeast Sulawesi.

The degree of acidity (pH) of semen obtained in this study is still in the range of normal chicken semen pH as Hidajat (2000) who reported that the pH of chicken semen ranged from 7.5-7.8. The color and consistency of semen are thick and creamy, not translucent with light; this is as stated by Suprijatna et al. (2005) that good quality semen is creamy and opaque which shows high concentration. The concentrations of chicken spermatozoa ranged from 1.70 x 109–3.05 x 109. It is by what was stated by Suprijatna, Umiyati, & Ruhyat (2005) that chicken semen ranged from 1.7 x 109 - 3.5 x 109. This spermatozoa mass movement was classified as very good

(+++). It shows that the flow of spermatozoa contained in semen is excellent (Ali, Hassan, & Elghany, 2007). The motility of spermatozoa obtained in this study is very good; this can be seen in table 4.1, namely (AC) 91.8 ± 6.78, (BC) 83.3% ± 5.77 and (KC) 83.87 ± 2, 22. It is in line with the opinion of Irastuti (2007) which states that the percentage category of spermatozoa motility is good at 80-100%. Similarly, abnormalities of spermatozoa are still within the normal range. According to Partodiharjo (1992), good semen should not contain abnormal spermatozoa more than 15%.

2. Index of Eggs

The average index of Arab chicken eggs from Arabian chicken crossing with three different male varieties can be seen in Table 5.

Table 5. Average Index of Eggs in the Triple Cross of Different Stud Varieties (%)

Repetition	Treatments		
	AC	BC	KC
1	77,43	77,00	73,67
2	77,00	76,05	79,86
3	78,00	75,43	75,57
4	77,86	82,02	77,86
5	77,75	75,08	77,43
6	79,57	74,86	79,57
Averages	77,94±0,09	76,97±0,27	77,33±0,24

The results of the variance analysis showed that the treatment of the type of male chicken varieties had no significant effect (P> 0.05) on the index of the eggs of Arabian chickens. The average index of eggs obtained in this study were: 77.93% (AC), 76.96% (BC), and 77.32% (KC). Bell & Weaver (2002) state that the egg index is the result of measuring the length and width of the egg (width/length X 100%) and the range of the standard egg index is 0.70 - 0.74. The egg shape is influenced by the width of the diameter of the isthmus. The wider the diameter of the isthmus, the egg shape produced tends to be round and if the diameter of the isthmus is narrow, the resulting egg shape tends to be oval. The higher the index value of the egg, the more the egg shape will be round (Pilliang, 1992; and Septiawan, 2007).

3. Chicks Maintenance and Growth

a) Weight gain

The average weight gain of the body of the child crossed with different male varieties can be seen in Table 6.

Table 6. Average Body Weight of Chicks Crossed with Different Stud Varieties (gr/head/day).

Repetition	Treatments		
	AC	AB	AC
1	6,06	8,53	7,46
2	6,55	9,32	5,47
3	7,61	7,72	7,59
4	7,45	5,39	6,28
5	5,38	6,99	8,81
6	5,59	6,21	6,18
Averages	6,44±0,94	7,36±1,46	6,97±1,21

The results of the variance analysis showed that the treatment of rooster varieties did not have a significant effect (P> 0.05) on body weight gain (BWG) from the crossbred chicks. The average UN chicks produced by crosses obtained in this study were: 6.44gr / head / day (AC), 7.36 gr/head/day (BC) and 6.97gr / head / day (KC). It is by Rasyaf (1992) research suggesting that poultry body weight gain is also influenced by heredity, quantity, and quality of food provided. Lukman (2005) states that body weight gain is very closely related to the increased consumption of rations. Ration consumption will increase based on body weight gain, which

means that the more weight gain the body will consume, the more rations will be consumed by the chicken.

b) Chicks Feed Consumption

The average consumption of poultry feed crossed with different male varieties can be seen in Table 7.

Table 7. Average Daily Feed Consumption of Chicks Crossed with Different Stud Varieties (gr/head/day)

Repetition	Treatments		
	AC	AB	**AC**
1	21,00	24,50	23,50
2	22,75	22,75	22,75
3	23,75	24,25	23,25
4	24,00	24,25	24,75
5	20,00	24,75	23,50
6	24,50	26,00	21,25
Averages	22,67±1,80	24,42±1,04	23,17±1,15

The results of the variance analysis showed that the results of the crossing of three different male varieties had no significant effect (P>0.05) on the consumption of daily chicks feed. It can be seen from the average feed consumption per day of each of the three male chicks, namely: AA of 22, 67gr /head/day, AB of 24.42gr /head/day and AK of 23.17 gr/head/day. It is by Tilman, Hartadi, Hari, & Soedomo (1991) stated that ration consumption is the amount of food consumed by livestock to be used to provide basic living and for the production of these animals. According to Kholis & Sitanggang (2003) Arabic chicken's Day Old Chick (DOC) ration has a minimum of 14% protein and 2,600-2900 Kcal / Kg of energy. Based on the Decree of the Minister of Agriculture No.420/kpts/ot.210/7/2001 (2001) The protein requirements of starter period chicken range from 14-15% with a metabolic energy content of 2300-2900 Kcal/Kg. This study feed given to chicken is commercial food BP 11 with 21.0-23.0%.

c) Chicks Feed Conversion

The average conversion of chicken feed crossed with different male varieties can be seen in Table 8.

Table 8. Average Feed Conversion of Chicks from the Results of Crossing Three Different Stud Varieties.

Repetition	Treatments		
	AC	**AB**	**AC**
1	3,47	2,87	3,15
2	3,47	2,44	4,16
3	3,12	3,14	3,06
4	3,22	4,50	3,94
5	3,72	3,54	2,67
6	4,38	4,19	3,44
Averages	3,56±0,45	3,45±0,79	3,40±0,56

The results of the variance analysis showed that the results of the crossing of three different varieties of roosters had no significant effect (P> 0.05) on the conversion of chicks feed. It shows that from each of the chicks produced by consuming the same feed that is BP 11 does not show different results on existing feed conversion even though the genetic male is different. It can be seen in the average of the results of the crossing of three different male varieties, namely: AA of 3.56, AB of 3.45 and AK of 3.40. Hyun, Ellis, Riskowski, & Johnson (1998), the lower conversion rate shows that the livestock is more efficient in the use of rations given. In this study, it was confirmed that the conversion of feed of chicks was excellent so that it can be seen in the growth of body weight in chicks which every week rose rapidly and the ability of chickens in experiments to convert the use of ration to the maximum.

4. Sex Ratio

The average comparison of male sex (sex ratio) of chicks from the results of three different male crosses can be seen in Table 9.

Table 9. Average Comparison of Sex (Sex Ratio) Chicks Results of Different Studs of Three Crosses (%).

Repetition	Treatments		
	AC	AB	**AC**
1	50,00	75,00	75,00
2	50,00	0,00	30,00
3	66,67	55,56	33,33
4	16,67	50,00	16,67
5	25,00	42,86	44,44
6	33,33	40,00	50,00
Averages	69,05±0,18	75,26±0,24	71,26±0,20

Description: Sex ratio of male DOC resulted from the crossing of different male varieties.

The results of the variance analysis showed that the results of the crossing of three different male varieties had no significant effect (P>0.05) on the sex ratio of chicks. In the results of this study, the number of male sex ratios was higher than that of females. Amount of rate of AA crossing the cause of AA crossing was obtained 69.06% with a ratio of 26 (males): 12 (females), AB acquired 75.26% with a ratio of 30 (males): 11 (females) and AK acquired 71.26% with the ratio of 33 (males): 13 (females) did not significantly affect the sex ratio of chicks. Presumably because of the frequency of mating (IB) in female Arab chickens from the three different males was relatively the same. It is by the opinion of Kholis & Sitanggang (2003) which states that Arab chickens start producing eggs at the age of 4.5-5.5 months, while native chickens at the period of 6 months. High Arabic chicken production is 190-250 grains per year with egg weights of 30-35 g/grain and almost do not have the nature of incubation so that the time of laying is longer (Sulandari et al., 2007).

5. Mortality

The average comparison of the mortality of chicks from the crossing of three different males can be seen in Table 10.

Table 10. Average of Comparison of Chicks Mortality Results of Different Studs of Three Crosses (%).

Treatments	Number of Chicks (Tail)	Number of dead Chicks (Tail)	Mortality (%)
AC	38	1	2,63
BC	41	0	0,00
KC	46	1	2,17
Total	125	2	4,08

The results of this study indicate that the average mortality of chicks from crosses is 4.08%. The mortality of high-yielding chicks is shown by the results of crossing fellow Arabian chickens with an average of 2.63%, followed by chicks produced by crossing Arab chickens with native chickens with an average mortality of 2.17% whereas the chicks produced by crossing Arab chickens and chickens from Bangkok breeds do not show death. Fatafta & Abu-Dieyeh (2007) states that what needs to be considered to reduce mortality is to control the health of chickens, control the cleanliness of feed places, and drink, separate infected chickens from healthy chickens.

D. Conclusion

Based on the results of the study, it can be concluded that the results of crosses do not have a significant effect (P> 0.05) on the measured parameters. It can be seen in the research process which gives results that are not much different from the results of the crossing of three different males using the Arabic parent in the initial phase of production.

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