IJAS Iranian Journal of Applied Animal Science

Egg Production and Hatching Performance of Alope and Kalosi Chickens Treated with Varying Frequencies of Bromocriptine as Antiprolactin

Research Article

M.M. Ahmad Ruhani[1], W. Pakiding[2*], H. Hasbi[2] and M.I. Andi Dagong[2]

[1] Department of Animal Science and Technology, Faculty of Animal Science, Hasanuddin University, Jl. Printis Kemerdekaan KM.10 Makassar, South Sulawesi, Indonesia
[2] Department of Animal Production, Faculty of Animal Science, Hasanuddin University, Jl. Printis Kemerdekaan KM.10 Makassar, South Sulawesi, Indonesia

Received on: 27 Jun 2024
Revised on: 20 Oct 2024
Accepted on: 15 Nov 2024
Online Published on: Dec 2024

*Correspondence E-mail: wempie@unhas.ac.id

Online version is available on: www.ijas.ir
doi.org/10.71798/ijas.2024.1195176

ABSTRACT

The development of Alope and Kalosi chickens is limited by low egg production caused by the appearance of brooding, which is controlled by an increase in prolactin concentration. The objective of the study was to determine the effect of the administration frequencies of bromocriptine as an anti-prolactin on egg production, reproductive performance, and concentration of the prolactin hormone as well as egg hatching performance of Alope and Kalosi chickens. One hundred and twenty Alope and Kalosi chickens consisting of 96 hens (48 each) and 24 cocks (12 each) aged 43 weeks were used in this study. Chickens were kept in flocks of litter floors with a sex ratio of 1:4. The treatment applied was no bromocriptine administration (control), 600 µg/head of bromocriptine administered orally every one, two, and four weeks with three replications each. Eggs were collected daily followed by hatching. Observation of reproductive organs and blood sampling for prolactin observation were carried out at the end of the study. The results of the study show that the administration of bromocriptine with different frequencies has no significant differences in feed consumption, egg production, egg mass, hen day production, feed conversion ratio, hatchability, hatching weight as well as ovary weight, oviduct weight, abdominal fat weight, and number of follicles. On the contrary, the administration of bromocriptine had significant differences in fertility and prolactin hormone concentration. It can be concluded that bromocriptine administration with different frequencies affects Alope and Kalosi chickens, especially in fertility and prolactin hormone concentration in the blood.

KEY WORDS Alope, Kalosi, bromocriptine, egg production, prolactin.

INTRODUCTION

Native chickens are widely spread in Indonesia as the result of domestication of the jungle fowls (Cahyono *et al*. 2012). These chickens have relatively low egg productivity and slow growth and it is characterized by non-uniform genetic traits. The genetic diversity can be seen from the color of feathers, body size and production capabilities that are not uniform (Wiranata *et al*. 2013). Efforts to improve the genetic quality of native chickens have been made by conducting purification and crossbreeding. Therefore, various local chicken strains have been formed including Alope chicken and Kalosi chicken. Alope chicken is formed through the purification of well-adapted local chickens that are selected based on their growth performance. Kalosi chicken is a crossbreed of several local chicken types that previously existed.

The native chickens have low egg production due to the onset of brooding behavior (Has *et al*. 2022). Brooding usually starts between 3 or 4 days after the last egg produc-

tion and continues for 21 or 22 days (Sharp *et al*. 1979). Brooding is caused by the secretion of prolactin hormone (luteotropic hormone) produced from the anterior hypophysis which causes the cessation of egg production (Suyadi and Wahjuningsih, 2021). Prolactin hormone inhibits FSH and LH which play a role in follicle maturation and ovulation (Mulyatini, 2011).

One type of anti-prolactin that can be used is bromocriptine (2-Bromo-α-Ergocriptine Methanesulfonate) (Bana *et al*. 2021). Bromocriptine is a dopamine agonist commonly used for the treatment of hyperprolactinemia (Freeman *et al*. 2000). One technology that has been used is the administration of anti-prolactin in the form of bromocriptine to reduce broodiness and increase egg production. Previous studies have shown that the use of bromocriptine reduces prolactin hormone levels in chickens which leads to increased egg production.

The administration of bromocriptine as much as 100 µg/kg BW to White Leghorn chickens at 17-36 weeks of age caused the concentration of prolactin hormone in the blood until 72 weeks of age to be lower than the control treatment (David *et al*. 2003). Local chickens (Bangladesh and India) treated with bromocriptine 640 µg/kg BW for 12 weeks also produced higher egg production with lower pause day and showed lower brooding behavior compared to those without bromocriptine (Reddy, 2021). Anti-prolactin at a dose of 120-1400 µg/kg showed that the concentration of prolactin hormone in the blood decreased as the dose of anti-prolactin (bromocriptine) increased while the control treatment (without bromocriptine) showed a higher concentration of prolactin hormone in the blood (Bana *et al*. 2021). In Bangladeshi local chickens, the administration of bromocriptine can significantly increase egg production in each laying period (33 eggs/laying period) whereas pause days and brooding time significantly decreased (Barman *et al*. 2022).

The frequency of bromocriptine administration differs in several studies where bromocriptine administration with a frequency of once a day within a certain time range showed significant differences in both blood prolactin concentrations, egg production, pause day, and brooding properties (Reddy, 2021). Meanwhile, bromocriptine administration with a frequency of once a week also showed significant differences in egg production and pause day (Dawod *et al*. 2021). Seeing from the results of previous studies that bromocriptine administration at certain doses can increase egg production, reduce pause days, and extend the laying period, it is necessary to conduct further research by looking at the effect of bromocriptine administration with different frequencies in types of native chickens.

MATERIALS AND METHODS

Ethical approval

The Animal Ethics Committee of the Faculty of Veterinary Medicine, Udayana University approved the experimental design for this study with certificate number (B/221/UN14.2.9/PT.01.04/2023).

Experiment design, animal and management

This study was conducted at the Poultry Production Laboratory, Faculty of Animal Science, Hasanuddin University and Hasanuddin University Hospital. A total of 120 Alope and Kalosi chickens consisting of 96 hens (48 each) and 24 cocks (12 each) aged 43 weeks were randomly alloted based on completely randomized design of 2 types of chickens and 4 levels of bromocriptine administration frequencies with 3 replications. Based on the design, the animals were divided into 24 units containing 4 hens and 1 cock (sex ratio of 1:4). Bromocriptine (Bromocriptine Mesylate, Cat. No. 3525002016-OPA-143245672, Cimahi-Indonesia) was provided orally at a dose of 600 µg/head based on previous research by Rachman (2023) and administrated every 1, 2 and 4 weeks. Accordingly, the 4 treatment groups are:

P0: no bromocriptine administration (control)
P1: administration bromocriptine every 1 week
P2: administration bromocriptine every 2 weeks
P3: administration bromocriptine every 4 weeks

The chickens were reared in the plot of 1.25 × 2.40 m in size covered by sawdust and equipped with hanging feeder, nipple and nesting eggs. Chickens were fed commercial feed of 100 g/head/day provided in the morning and evening in the same amount of 50 g/head. Drinking water was provided *ad libitum* and lighting utilizes sunlight at 06.00-18.00 WITA and was assisted by lamp lighting at 18.00-22.00 WITA.

Eggs were collected daily in the afternoon and cleaned of any debris attached to the shell using a cloth soaked in disinfectant. The cleaned eggs were then selected based on egg weight, egg shape, and shell surface. The eggs selected were 40-55 g in weight, normal shape, and smooth shell surface. The eggs were then stored in a room at 18-21°C for 7 days and then fumigated using a mixture of KMnO4 (PK powder) (brand, catalog, country of manufacture) and 10% formalin (brand, catalog, country of manufacture) in a ratio of 1:2 before the eggs incubated in the hatching machine. The hatching machine used was an automatic hatching machine consisting of setter and hatcher.

The setter and hatcher were cleaned and set at same temperature of 37.7 °C with relative humidity of 60 and 65%, respectively. On the 18th day of incubation, candling was done to determine fertile and in fertile eggs. Fertile eggs were then transferred into the hatcher and infertile eggs were removed.

Parameters measured

Production performance includes egg production, feed consumption, hen day production, egg mass, and feed conversion ratio. Total egg production was obtained by recording egg produced by the hens each day. Eggs with mushy shells or cracked or broken shells were still counted. Consumption was determined by counting feedings and feed residues, and then subtracting total feedings from feed residues. Hen egg production (HDP) was calculated by dividing the total egg production on that day by the number of hens present on that day. Egg Mass was calculated by multiplying HDP by the average weight of eggs produced. Feed Conversion Ratio (FCR) was calculated to determine the amount of feed required to produce one kg of eggs.

Reproductive performance includes fertility, hatchability, hatching weight, reproductive organ weight and follicle number. On day 18th of incubation, the percentage of fertile eggs was calculated by candling the eggs and hatchability was calculated by counting the number of eggs that successfully hatch from the number of fertile eggs. Then the chicks were weighted for hatching weight measurement. Measurement of reproductive organ weight was carried out by cutting the chicken first and then performing surgery after that weighing the reproductive organs including oviduct weight, ovary weight, and abdominal fat weight. Then take the ovary to observe follicles classified by follicle size and count the number of follicles based on follicle size including large yellow follicles (LYF) (diameter>10 mm), small yellow follicles (SYF) (diameter 5-10 mm), and white follicles (WF) (diameter<5 mm).

Blood samples from each chicken were taken from the wing branchial vein using a 3 mL syringe for analysing concentration prolactin hormone. The blood serum was separated and placed into eppendorf tubes and stored in a freezer at 19 °C. Concentration of prolactin hormone was Analyzed using KIT (Bioassay Technology Laboratory, Cat. No. E0209Ch, Zhejiang, China) with enzyme-linked immunosorbent assay (ELISA) methods.

Statistical analysis

Data were analyzed using SPSS version 20 (SPSS, 2011) with two-way analysis of variance and a general linear model of a factorial experiment 2 × 4 based on completely randomized design of 3 replications of 4 hens per replication.

RESULTS AND DISCUSSION

The effects of chicken types, bromocriptine administration frequencies, and their interaction on production performance are presented in Table 1. This study showed that chicken type, frequency of bromocriptine administration, and their interaction had no significant effect (P>0.05) on hen day production (HDP), feed consumption, egg weight, and feed conversion ratio. However, It appear that Kalosi chickens show higher egg production and feed consumption as well as lower feed conversion compared to Alope chickens.

Observations on HDP conducted for 12 weeks (Figure 1) indicated that the frequency of bromocriptine administration did not improve of egg production in Kalosi chickens. HDP in chickens that did not receive bromocriptine (control) was consistently higher than chickens that received bromocriptine. On the other hand, the response of Alope chickens showed an increase in HDP in hens that received bromocriptine weekly and biweekly, except at the end and mid of the observation period, HDP from weekly and biweekly bromocriptine administration decreased sharply.

Reproduction performance of Alope and Kalosi chickens, frequency of bromocriptine administration, and interaction of chicken type with bromocriptine frequency can be seen in Table 2. Bromocriptine administration with different frequencies and its interaction (chicken type and frequency of bromocriptine administration) significantly increased fertility (P<0.01) but not affect hatchability, hatching weight, oviduct weight, ovary weight, abdominal fat weight, number of large yellow follicles, small yellow follicles, and white follicles (P>0.05).

The frequency of bromocriptine administration on fertility was significantly higher in the control, once a week, and once every 2 weeks compared to once every 4 weeks (P<0.01), but the control, once a week, and once every 2 weeks were not different. The interaction between Alope chickens and the frequency of bromocriptine administration once every 2 weeks had a significant effect on fertility (P<0.01) but did not have a significant effect on hatchability and hatching weight.

Prolactin concentration data of Alope and Kalosi chickens, frequency of bromocriptine administration, and interaction of chicken type with bromocriptine frequency can be seen in Table 3. The interaction between two (breed of chicken and frequency of bromocriptine administration) influenced the concentration of prolactin hormone in the blood (P<0.01) but did not affect the breed of chicken and frequency of bromocriptine administration (P>0.05).

The interaction between the Kalosi chicken type and the frequency of bromocriptine administration was not significantly different in each treatment.

Table 1 Production performance of Alope and Kalosi chickens administrated different frequencies of bromocriptine

Source	Feed intake (g)	Hen day production (g)	Egg mass (g)	Feed convertion ratio
Chicken type				
Alope	86.63±6.89	41.08±6.05	19.81±3.03	4.58±0.61
Kalosi	90.92±8.45	45.41±14.50	21.05±9.26	3.81±1.21
Bromocriptine administration frequency[1]				
P0	93.66±8.08	49.66±13.57	24.08±6.75	4.24±0.78
P1	87.98±9.73	44.83±10.12	21.75±4.98	4.19±0.39
P2	86.85±8.10	40.50±10.48	18.88±6.44	4.40±0.59
P3	86.59±4.27	38.00±8.62	17.02±7.98	3.96±1.88
Interaction				
P0 × Alope	88.77±9.55	38.33±7.37	18.38±3.31	4.80±0.60
P1 × Alope	87.12±7.86	42.00±5.29	20.25±2.10	4.28±0.22
P2 × Alope	86.89±8.88	42.66±4.59	20.13±3.37	4.42±0.45
P3 × Alope	83.73±3.03	41.33±9.07	20.49±4.42	4.58±0.61
P0 × Kalosi	98.55±0.53	61.00±4.58	29.77±2.40	3.67±0.47
P1 × Kalosi	88.85±13.15	47.66±14.29	23.26±7.13	4.09±0.55
P2 × Kalosi	86.82±9.22	38.33±15.50	17.63±9.36	4.39±0.83
P3 × Kalosi	89.45±3.45	34.66±8.38	13.54±10.18	3.11±2.35
P-value				
Chicken type	0.207	0.280	0.624	0.088
Bromocriptine administration frequency	0.405	0.197	0.233	0.903
Interaction	0.720	0.233	0.093	0.471

P0: control; P1: frequency of bromocriptine once a week; P2: frequency of bromocriptine once every 2 weeks and P3: frequency of bromocriptine once every 4 weeks.

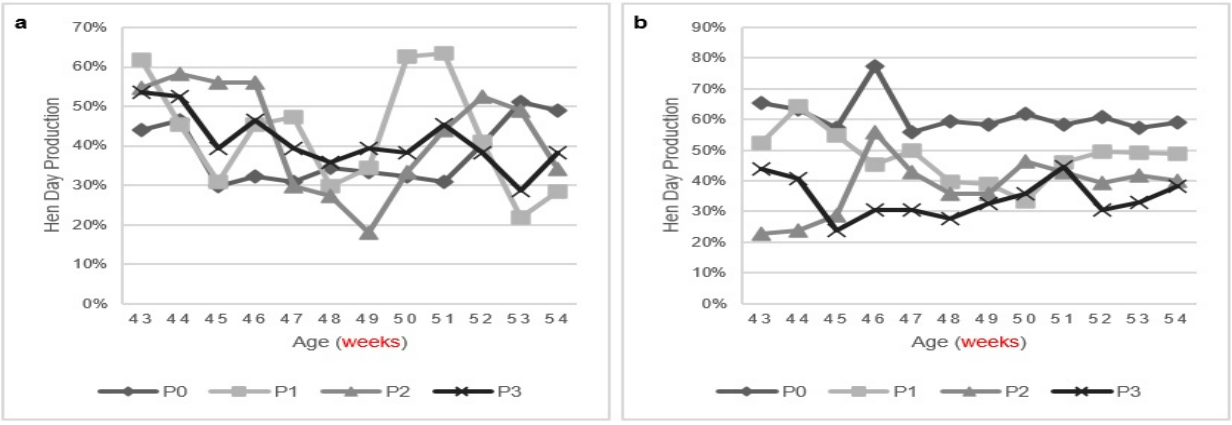

Figure 1 Hen day production of Alope (a) and Kalosi (b) chickens administrated different frequencies of bromocriptine
P0: control; P1: frequency of bromocriptine once a week; P2: frequency of bromocriptine once every 2 weeks and P3: frequency of bromocriptine once every 4 weeks

However, the interaction in Alope chickens with the frequency of bromocriptine once a week and once every two weeks was significantly higher ($P<0.01$) than the control and once every four weeks. However, once a week with once every two weeks was not different and neither was the control with once every four weeks. However, the concentration of prolactin hormone in the control tended to be higher than that in the every 4 weeks.

The total average feed consumption of both chicken types and treatment groups was 88.77 g/head/day. According to Trisiwi (2017) the feed consumption of free-range chickens is 86-100 g/head/day. Meanwhile, according to Rori *et al*. (2019) the consumption of layer-phase Native chickens is 86.73-87.63 g/head/day.

According to Nuraini *et al*. (2012) the quality, quantity of feed, livestock activity, age, and health of livestock greatly affect the feed consumption of super native chickens. Furthermore, Prawitasari *et al*. (2012) assume that feed quality is also a determining factor in egg production.

The nature of brooding arises as a result of high levels of prolactin hormone in the blood plasma. The high prolactin hormone in the blood plasma can be overcome by giving anti-prolactin (bromocriptine).

According to Barman *et al*. (2022) when regularly given bromocriptine, plasma prolactin levels are lower than those not given bromocriptine. Administration of bromocriptine can increase egg production by reducing brooding time and laying lag time.

Table 2 Reproduction performance of Alope and Kalosi chicken administrated different frequencies of bromocriptine

Source	Hatchery			Reproductive organ weights			Follicles		
	Fertility (%)	Hatchability (%)	Hatchin Weight (g)	Oviduct (g)	Ovary (g)	Abdominal Fat (g)	LYF (> 10 mm)	SYF (5-10 mm)	WF (< 5 mm)
Chicken type									
Alope	70.75±9.63	83.00±21.20	31.24±1.23	50.40±7.04	46.14±8.06	106.58±60.78	4.66±1.55	11.00±5.79	52.50±23.33
Kalosi	73.16±14.28	88.50±17.64	33.32±2.89	52.12±16.43	46.89±17.76	88.43±36.84	4.66±1.77	11.00±7.22	60.16±18.83
Bromocriptine administration frequency[1]									
P0	71.83±12.15^{b}	81.16±23.70	31.93±1.97	52.68±10.77	47.11±7.61	109.25±83.29	4.83±0.98	12.83±8.49	54.16±29.88
P1	74.66±6.94^{b}	84.33±26.97	31.22±1.13	43.51±15.70	48.86±22.84	97.08±43.32	4.66±2.33	11.66±6.21	69.83±13.25
P2	79.83±5.81^{b}	92.33±9.43	33.07±3.89	57.61±13.63	45.46±11.72	89.81±34.69	4.83±0.40	11.50±3.72	57.50±20.36
P3	61.50±14.69^{a}	85.16±15.86	32.91±2.06	51.23±5.96	44.61±10.39	93.88±35.21	4.33±2.33	8.00±6.95	43.83±12.46
Interaction									
P0 × Alope	62.00±8.66^{ab}	89.66±13.05	31.14±2.10	47.90±12.37	43.43±4.99	142.46±116.70	5.00±0.00	11.00±3.46	55.33±40.50
P1 × Alope	68.66±1.52^{abc}	75.66±38.73	30.76±0.86	46.63±5.41	55.46±8.51	127.23±28.36	5.66±0.57	11.33±6.65	70.00±14.10
P2 × Alope	84.33±4.75^{d}	87.33±11.93	31.51±0.31	55.20±0.70	44.56±8.51	65.63±16.12	5.00±0.00	14.33±1.52	43.66±15.14
P3 × Alope	68.00±1.00^{abc}	79.33±21.54	31.60±1.54	51.86±4.65	41.10±2.10	91.00±13.80	3.00±2.64	7.33±9.45	41.00±11.78
P0 × Kalosi	81.66±2.08^{cd}	72.66±31.89	32.72±1.86	57.46±8.27	50.80±8.90	76.03±20.42	4.66±1.52	14.66±12.58	53.00±24.06
P1 × Kalosi	80.66±3.21^{cd}	93.00±9.64	31.71±1.33	40.40±23.63	42.26±33.18	66.93±34.06	3.66±3.21	12.00±7.21	69.66±15.50
P2 × Kalosi	75.33±1.15b^{cd}	97.33±2.30	34.63±5.42	60.03±21.13	46.36±16.40	114.00±31.53	4.66±0.57	8.66±2.88	71.33±15.27
P3 × Kalosi	55.00±20.29^{a}	91.00±7.93	34.22±1.77	50.60±8.13	48.13±15.11	96.76±53.70	5.66±1.15	8.66±5.50	46.66±15.01
P-value									
Chicken type	0.477	0.526	0.049	0.403	0.584	0.532	1.000	1.000	0.382
Bromocriptine administration frequency	0.009**	0.819	0.511	0.361	0.727	0.855	0.945	0.671	0.233
Interaction	0.007**	0.504	0.863	0.720	0.438	0.167	0.142	0.700	0.593

P0: control; P1: frequency of bromocriptine once a week; P2: frequency of bromocriptine once every 2 weeks and P3: frequency of bromocriptine once every 4 weeks.
The means within the same row with at least one common letter, do not have significant difference (P>0.05).
** (P<0.01).

Table 3 Prolactin concentration in the blood plasma of Alope and Kalosi chicken administrated different frequencies of bromocriptine

Source	Prolaktin concentration (ng/mL)
Chicken type	
Alope	66.55±25.89
Kalosi	58.34±17.59
Bromocriptine administration frequency[1]	
P0	76.16±26.77
P1	53.40±12.56
P2	55.13±27.08
P3	65.09±15.24
Interaction	
P0 × Alope	98.83±11.82^{c}
P1 × Alope	45.42±13.93^{a}
P2 × Alope	43.12±7.62^{a}
P3 × Alope	78.84±3.69^{bc}
P0 × Kalosi	53.49±10.54^{ab}
P1 × Kalosi	61.39±3.10^{ab}
P2 × Kalosi	67.14±36.65^{ab}
P3 × Kalosi	51.34±0.91^{ab}
P-value	
Chicken type	0.207
Bromocriptine administration frequency	0.072
Interaction	0.003**

P0: control; P1: frequency of bromocriptine once a week; P2: frequency of bromocriptine once every 2 weeks and P3: frequency of bromocriptine once every 4 weeks.
The means within the same row with at least one common letter, do not have significant difference (P>0.05).
** (P<0.01).

Hen day production (HDP) in Alope and Kalosi chickens ranged from 41.08-45.41% the frequency of bromocriptine administration ranged from 38.00-49.66% and the interaction of the two ranged from 34.66-61.00%. The HDP obtained in this study was higher than the previously reported by Biswas *et al*. (2010) that normal egg production of unselected or domesticated native chickens is about 19-25% and Nataamijaya (2008) which is 30-40%. However, it tends to be lower than other studies which reported that native Iranian chickens produce 50-70% (Hashemi, 2012; Hesabi Nameghi, 2012; Gheisari *et al*. 2016; Javaheri Barfourooshi *et al*. 2022).

Egg mass values in Alope and Kalosi chickens ranged from 19.81-21.05 g, frequency of bromocriptine administration ranged from 17.02-24.08 g and their interaction ranged from 13.54-29.77 g. The egg mass value obtained in this study was lower the previously reported by Javaheri Barfourooshi *et al*. (2022) that the age of 37-48 weeks in Hyline W-36, Marandi, Golpayegan, Isfahan chicken strains were 45.21 *vs*. 28.87 *vs*. 34.62 *vs*. 35.62 g respectively.

HDP and egg mass values can be expressed as measures to increase egg production. While the value of egg mass depends on the percentage of daily egg production and egg weight. If egg mass increases, egg production increases,

otherwise if egg mass decreases egg production decreases (Amrullah, 2003).

The feed conversion ratio (FCR) obtained for 12 weeks in Alope and Kalosi chickens ranged from 3.81-4.58, the frequency of bromocriptine administration ranged from 3.96-4.40, and the interaction between the two ranged from 3.11-4.40. According to Nururrozi *et al*. (2018) the standard FCR of native chickens that is said to be good in maintenance until the 60th day is around 4-6. Furthermore, Lokapirnasari *et al*. (2011) the higher the FCR, the worse it will be, meaning that the use of feed is less economical. The calculation of FCR is intended to determine the ability of chickens to convert feed consumed into eggs and see the response of chickens to the quality of feed provided.

Fertility in Alope and Kalosi chickens ranged from 70.75-73.16%, frequency of bromocriptine administration ranged from 61.50-79.83%, and their interaction ranged from 55.00-84.33%. The fertility obtained in this study was higher than in previous research in the average percentage of the fertility of eggs of broiler breeds from IB with Tolaki chickens was 50.54%. Fertility is a condition that indicates fertility and the ability of the parent to produce offspring (Helendra *et al*. 2011).

Giving dopamine agonists (bromocriptine) can reduce prolactin values and can restore fertility. In addition, fertility can also be influenced by sex ratio, age of livestock, length of egg storage, and temperature in the machine during hatching. According to Suriani *et al*. (2022) factors affecting fertility are the ratio of males and females, the age of livestock, the interval between mating time and hatching egg storage, feed, spermatozoa abnormality, egg production, nation, season, and light.

The hatchability of Alope and Kalosi chickens ranged from 83.00-88.50%, the frequency of bromocriptine administration ranged from 81.16-92.33% and the interaction of the two ranged from 72.66-97.33%. The results obtained were greater than the results of previous research by Susanto and Suliswanto, (2013) that the standard value of hatchability of native chickens is 60% and Zakaria (2010) obtained the average hatchability of free-range chicken eggs is 71.67%. The high hatchability obtained in this study is likely due to the influence of crosses, this is in accordance with the opinion of Warwick *et al*. (1990) which states through crosses of different breeds, the hatchability of eggs can be increased because crosses can reduce homozygous genes and increase heterozygosity.

The hatching weight of Alope and Kalosi chickens ranged from 31.24-33.32 g, the frequency of bromocriptine administration ranged from 31.22-33.07 g and the interaction of the two ranged from 30.76-34.63 g. The hatching weight obtained in this study was lower than the others researchs of which reported that Tolaki chickens had a hatching weight of 39.83 g. However, the results obtained were greater than the research of Zakaria (2010) in the hatching weight of native chickens was 31.82 g. According to some research there is a tendency for the weight of male DOC to be greater than female DOC or male chicken embryos to be heavier than female chicken embryos because male embryos have heavier skeletal muscles than females.

Oviduct weights in Alope and Kalosi chickens ranged from 50.40-52.12 g, the frequency of bromocriptine administration ranged from 43.51-57.61 g and the interaction of the two ranged from 40.40-60.03 g. The results obtained were greater than the research of Yuwanta (2010) which reported that oviduct weights in laying hens were 40-60 g. According to Nurmeiliasari *et al*. (2020) oviduct weight illustrates the availability of egg-forming material in the reproductive tract so that it can produce good egg quality. Dharmayanti *et al*. (2019) added that the shape and size of the oviduct or oviduct can affect the index of the egg. Laying hens that are not yet sexually mature have oviduct weights with standard weight sizes, as age increases and production activities increase the weight of the oviduct (Pratama *et al*. 2020).

Ovary weights in Alope and Kalosi chickens ranged from 46.14-46.89 g, the frequency of bromocriptine administration ranged from 45.46-48.86 g and the interaction of the two ranged from 41.10-55.46 g. The results obtained were greater than the research of Nurmeiliasari *et al*. (2020) which reported that the ovary weight was 36-40 g and Salang *et al*. (2015) produced an ovary weight of 35.31 g in active laying hens. According to some researchs ovarian development is very massive in the grower phase. Furthermore, the ovaries are the site of sexual steroid hormone synthesis, gametosis, and follicle development and maturation. Ovary weight is very important to know because the heavier the ovaries, the productivity of the parent will also increase.

Abdominal fat weights in Alope and Kalosi chickens ranged from 88.43-106.58 g, the frequency of bromocriptine administration was 89.81-109.25 g, and the interaction between the two ranged from 65.63-142.46 g. The amount of fat deposits or residual secretions of egg component formation contained in the reproductive tract can affect the weight of the oviduct and ovaries.

According to Horhoruw (2012), fat deposition can occur due to genetic factors, age, and level of egg production in chickens. According to some researches excessive fat in chickens has caused one of the major problems facing the poultry industry. The more fat that is present in the reproductive tract, it can interfere with reproductive activity (Pratama *et al*. 2020).

The number of large yellow follicles (LYF) in Alope and Kalosi chickens amounted to 4.66 ± 1.55 - 4.66 ± 1.77 follicles, the frequency of bromocriptine administration ranged from 4.33-4.83 follicles, and the interaction between the two ranged from 3.00-5.66 follicles. Small yellow follicles (SYF) in Alope and Kalosi chickens amounted to 11.00 ± 5.79 - 11.00 ± 7.22 follicles, the frequency of bromocriptine administration ranged from 8.00-12.83 follicles, and the interaction between the two ranged from 7.33-14.66 follicles. While white follicles (WF) in Alope and Kalosi chickens ranged from 52.50-60.16 follicles, the frequency of bromocriptine administration ranged from 43.83-69.83 follicles, and the interaction between the two ranged from 41.00-71.33 follicles. According to Pratama *et al*. (2020), the more follicles that develop cause the reproductive tract to actively stimulate the growth of cells and tissues, so that the weight and length of the reproductive tract increase, and after sexual maturity there will be an increase in reproductive tract activity followed by a progressive increase in the weight and length of the reproductive tract. Furthermore, Salang *et al*. (2015) stated that the more follicles the higher the productivity. Furthermore, Nurmeiliasari *et al*. (2020) states that the more mature yellow follicles are produced, the more follicles will be ovulated so that more eggs will be produced.

The concentration of prolactin hormone in Alope and Kalosi chickens ranged from 58.34-66.55 ng/mL, the frequency of bromocriptine administration ranged from 53.40-76.16 ng/mL, and the interaction between the two ranged from 43.12-98.83 ng/mL. The concentration of prolactin hormone in blood plasma in this study was higher than previously reported by Scanes *et al*. (1980) that at 15-23 weeks of age in chicken strains WPR/DY, WPR/SY, WL/DY, and WL/SY were 37.6 ± 4.1 ng/mL, 36.4 ± 5.1 ng/mL *vs.* 29.4 ± 1.9 ng/mL *vs.* 22.3 ± 2.5 ng/mL, respectively. However, in general, the concentration of prolactin hormone in blood plasma in this study tended to be lower than the age of 3-12 weeks, namely 82.3 ± 7.8 ng/mL *vs.* 81.3 ± 10.1 ng/mL *vs.* 60.0 ± 7.7 ng/mL *vs.* 47.0 ± 6.0 ng/mL. This observation is in agreement with previous studies in chickens where it was observed that early growth stages are associated with high plasma prolactin concentrations (Chiasson *et al*. 1979; Harvey *et al*. 1979).

Prolactin hormone concentration decreased with the frequency of bromocriptine administration. The control treatment (without bromocriptine administration) showed the highest prolactin hormone concentration. The high concentration of prolactin in the control group indicates that the prolactin hormone plays a very important role in inducing brooding in chickens. According to Bana *et al*. (2021) high concentrations of prolactin hormone are associated with brooding behavior in several poultry species to play an important role in production performance. Furthermore, Molik and Blasiak, (2015) assume that bromocriptine can inhibit prolactin secretion.

Prolactin can inhibit gonadotropin-stimulated ovulation and estrogen production at the ovarian level in chickens. Increased prolactin secretion as a cause of reduced circulating gonadotropins, ovarian regression, and a shift from egg-laying to the incubation phase. Prolactin interferes with follicular steroidogenesis in avian species. Anti-prolactin to reduce high prolactin concentrations. Prolactin at high levels suppresses FSH-induced estradiol production via the aromatase enzyme system, resulting in reduced steroidogenic potential within the follicle. However, this reduced steroidogenic potential cannot produce enough progesterone to elicit the positive feedback from LH required for ovulation. In addition to increasing egg production and cutting the length of laying breaks, bromocriptine administration has also been shown to reduce broodiness (Barman *et al*. 2022).

Increased prolactin hormone in the hen will cause folliculogenesis to not occur so that steroid hormones such as estrogen and progesterone will not be produced. If the estrogen hormone is not produced, it will cause the hen to not show symptoms of lust and will not accept the male to perform copulation activities. Furthermore, the progesterone hormone that is not produced will cause inhibition of LH release, so that the follicles that have been formed will not ovulate and even regress. The occurrence of an increase in prolactin hormone causes a decrease in estrogen and progesterone hormones which causes no symptoms of lambing and also the process of egg formation, so that egg production is inhibited (Safitri and Plumeriastuti, 2023).

CONCLUSION

This study showed that the frequency of bromocriptine administration has a beneficial effect on increasing fertility. The interaction of the chicken type with the frequency of bromocriptine administration had a positive effect on fertility and prolactin hormone concentration in blood plasma. However, blood plasma prolactin concentrations in Kalosi chickens showed no difference. Thus, the administration of bromocriptine as an anti-prolactin can inhibit the brooding process and can work specifically by minimizing the action of prolactin in the blood plasma.

ACKNOWLEDGEMENT

The authors would like to thank the Ministry of Education, Culture, Research and Technology for providing funding for this research under Grant Number: 35/IV/KS/06/2022.

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