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Reproductive Interval in Indonesian Native Laying Hens by Losing Brooding Characteristics

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Abstract: ***Brooding behavior in Indonesian native chicken is a characteristic under hormone stimulation due to high concentration of prolactin hormone. This characteristic delays egg production causing low reproductive efficiency. The objective of this research was to evaluate the physiological status detected in body temperature (^oF) and reproductive interval indicated by brooding period (day) and resting period of egg production (day) after brooding treated with different levels of acetaminoven in a paracetamol tablet. This research was conducted at Matali village, East Kotamobagu district, North Sulawesi province of Indonesia, involving 40 female birds at 10 months old with the average of 1.5 kg live weight (LW) and 10 male birds at 1 year old (ratio of 1:5). Each flock of ten female birds was raised in a fencing house size of 500x400x200 cm and fed ration ad libitum. This trial was arranged in a completely randomized design consisted of four treatments and ten replication at each treatment. All eggs of the female birds were taken when they were showing brooding behavior. Study was conducted in birds showing brooding behavior using treatments as follows: first, the female birds were not fed acetaminoven as traditional management (A0); second, the female birds were fed acetaminoven orally with level of 40 mg/kg LW/day (A40); third, the female birds were fed acetaminoven orally with level of 60 mg/kg LW/day (A60); and forth, the female birds were fed acetaminoven orally with level of 80 mg/kg LW/day (A80). The results showed that body temperature averages at egg production were 105 ^oF. However, those temperature at brooding period increased significantly ($P<0.01$) from 106 to 109 ^oF among treatments of acetaminoven leves. Brooding periods were significantly different ($P<0.01$) among four treatments, where the treatments of A0, A40, A60, and A80 were 38 days, 11 days, 7 days, and 4 days, respectively. The resting periods of egg production after brooding periods were not significantly different ($P>0.05$) among four treatments, ranging from 7 days to 8 days. Therefore, inhibition of prolactin hormone of brooding period by treatments of acetaminoven levels of 40 to 80 mg per kg LW reduced brooding behavior period of 70% to 91% without changing the resting period of egg production and reduce consequently the reproductive interval from 46 days to 11 days.***

Keywords: Brooding characteristics, reproductive interval, Indonesian native laying hen.

1. Introduction

Indonesian native laying hens have potential to be developed to support the need of animal protein in the product of eggs and meat for more than 60 percents of the Indonesian rural community [8]. The laying hen farming represents one of the essential activities in many rural areas of Indonesia [8], which might be comparable with the importance of the sheep farming as one of the essential activities in many rural zones of Eastern European countries [3]. Generally, native Indonesian laying hens were managed by house farmer using the traditional method causing egg productivity of 40 to 60 eggs per head per year [8], while the commercial laying hens are able to produce 260 to 280 eggs per head per year [1]. Low egg productivities of Indonesian native laying hen were caused by the human being factor of incapable management of house farmer called traditional management and the animal factor of bird brooding behavior as a characteristic under hormone stimulation due to high concentration of prolactin hormone [9] that might prolong reproductive interval and reduce consequently the reproductive efficiency. Brooding behavior of birds exists at phase of natural hatching egg and phase of maternal character in raising chicks. This characteristics practically reduced opportunity of the next egg production [8]. Brooding behavior of Indonesian native laying hen needs to be inhibited by different intensive management to recover them into normal bird hormonal system causing high instinct of egg productivity.

Instinct of brooding in native laying hen was caused by hormonal stimulation due to high prolactin hormone concentration in blood and low concentration of Luteinizing Hormone [9]; [7]. High concentration of prolactin hormone at hypothalamus center in birds might cause increase of body temperature for brooding period [7]. Therefore, physiological status of brooding birds could be measured in term of increasing body temperature (Celcius or Fahrenheit).

Cyclooxygenase enzyme plays role to activate the prolactin hormone [13]. This enzyme activity could be inhibited by acetaminoven compound [7] contained in parasetamol tablet [4]. This treatment might reduce synthesis of prolactin hormone, change the physiological status and stop brooding instinct of birds. Physiological status and brooding behavior of the Indonesian native laying hens by inhibiting prolactin hormone using accurate dose of acetaminoven per kg live weight (LW) of bird have not been fully documented. Reproductive interval of Indonesian native laying hen could be measured by observation in term of brooding period and egg resting period [1]. The objective of this research was to evaluate the physiological status detected in body temperature (^oF) and reproductive interval indicated by brooding period (day) and resting period of egg production (day) after brooding treated by adding different levels of acetaminoven.

2. Materials and Methods

2.1 Bird measurement

This research was conducted at Matali village, East Kotamobagu district, North Sulawesi province of Indonesia, involving 40 female birds at 10 months old with the average of 1.5 kg live weight (LW) and 10 male birds at 1 year old (ratio of 1:4). Ten female birds and one male bird were

raised in each fencing house (500x400x200 cm) and fed ration *ad libitum*. All ten fencing houses were completed the nests (ten nests in each fencing house). Ration was formulated using ingredient of yellow corn (40 percents), rice bran (30 percents) and commercial concentrate (30 percent) with nutrient contents of ration were protein (16.11 percent), crude fiber (8.76 percents), fat (5.50 percents), Calcium (4.23 percents), Phosphor (1.32 percents) and gross energy (3820.70 kcal/kg).

This trial was arranged in a completely randomized design consisted of four treatments and ten replication at each treatment [11]. All eggs of the female birds were taken when they were showing signal of brooding behavior at the first day (stay in nest along day). Study was conducted in birds showing brooding behavior by using treatments as follows: in fencing house A, the female birds were not fed acetaminoven (control treatment) as traditional management (A0); in fencing house B, the female birds were fed acetaminoven orally with level of 40 mg/kg LW/day (A40); in fencing house C, the female birds were fed acetaminoven orally with level of 60 mg/kg LW/day (A60); and in fencing house D, the female birds were fed acetaminoven orally with level of 80 mg/kg LW/day (A80).

In this study, brooding period (BP) in day unit was defined as difference between starting day of brooding behavior and ending day of brooding behavior [1]; [12]; [10]. In addition, resting period of egg production (RP) in day unit was defines as difference between ending day of brooding behavior and initial day of the next egg production [1]. Therefore, reproductive interval (RI) could be mathematically measured [1] as follows: RI (day) = BP (day) + RP (day).

2.2 Statistical Analysis

Data were analyzed using the Insert Function Procedure of the related statistical category in datasheet of Microsoft Office Excel [5]. The physiological status (daily rectal temperature, ^{o}F) during brooding period and reproduction interval (day) were included as dependent variable, while four treatments acetaminoven levels were included as independent variable in the analysis of variance model [11]. The significant difference in the model was tested using honestly significant difference [2].

3. Results and Discussion

All variables related to physiological status and reproductive interval measured in bird of each treatment were presented in Table 1. The results showed that the averages of body temperatures at egg production were 105 ^{o}F. However, those at brooding period increased significantly (P<0.05) from 105 to 109 ^{o}F (A0), from 105 to 108^{o}F (A40), from 105 to 108^{o}F (40), from 105 to 107 ^{o}F (A60), and from 105 to 107 ^{o}F (A80) among treatment of acetaminoven levels.

Body temperatures at the initial treatment (ending day of egg production) among four treatments were not significantly different, ranging from 105 ^{o}F to 106 ^{o}F. Body temperatures of birds in this ending period of egg production were in agreement with those reported by researchers [10], ranging from 105.80 ^{o}F to 107.60 ^{o}F. However, body temperatures of birds at brooding period among four treatments were significantly different (P<0.05). This study showed that additional treatment of acetaminoven content of 40 mg to 80 mg per kg LW in paracetamol tablet of Indonesian native laying hen at brooding period reduced body temperature of birds, ranging from 105 ^{o}F to 106 ^{o}F (Table 1). Reduction of this body temperature of bird was due to acetaminoven activity inhibiting the cyclooxygenase enzyme playing role to activate the synthesis of prolactin hormone [13].

As reported by scientists [7] that cyclooxygenase enzyme could be inhibited by adding chemical compound containing the acetaminoven. Decrease of prolactin hormone synthesis and change of bird physiological status gave the impact on extinction of brooding instinct [13]; [4]. This study indicated that application of the acetaminoven levels of 40 to 80 mg per kg LW/day were able to extinguish brooding behavior and to reduce reproductive interval in Indonesian native laying hen.

Table 1: Averages of body temperature during egg production, brooding period and reproductive interval

Variable	Treatment			
	A0	A40	A60	A80
Physiological status:				
Body temperature at egg production (^{o}F)	105± 0.23^{a}	105±0.19^{a}	105± 0.17^{a}	105 ± 15^{a}
Body temperature at brooding period (^{o}F)	109 ± 0.41^{b}	108±0.37^{b}	107± 0.39^{b}	107± 0.33^{b}
Body temperature at ending treatment (^{o}F)	106± 0.24^{a}	105±0.27^{a}	106±0.22^{a}	105± 0.23^{a}
Reproductive interval:				
Brooding period (day)	38 ± 0.81 ^{a}	11 ± 0.92^{b}	7 ± 0.87 ^{c}	4 ± 0.94 ^{d}
Resting period of egg production (day)	8 ± 0.64	8 ± 0.69	8 ± 0.87	7 ± 0.92
Total of reproductive interval (day)	46 ± 0.78^{a}	19 ± 0.89^{b}	15 ±0.86 ^{c}	11 ± 0.89 ^{d}

Physiological status: the values bearing different superscript in the same column differ significantly (p< 0.05).
Reproductive interval: the values bearing different superscript in the same row differ significantly (p< 0.05).

Birds without additional acetaminoven as control (A0) showed brooding behavior in the period of 38 days. Application of additional acetaminoven levels of 40 mg, 60 mg and 80 mg per kg LW/day in birds reduced brooding period of 27 days (71 percents) in (A40), 31 days (82 percents) in (A60), and 34 days (90 percents) in (A80), respectively compared with control (A0) of 38 days (Table 1). However, application of those levels of acetaminoven did not affect significantly the resting period of egg production ranging from 7 to 8 days. This study was in agreement with result reported by researcher [8] finding the resting period of egg production of 7 days in local laying hens. Therefore, inhibition of prolactin hormone of brooding period by treatments of acetaminoven levels of 40 to 80 mg per kg LW reduced brooding behavior period form 27 days (71 %) to 34 days (90%) without changing the resting period of egg production. Consequently, the reproductive interval also linear reduced from 27 days (58 percents) to 35 days (70 %) compared with control (A0) of 46 days. Results of this study were in agreement with those reported by researchers [12];

[6] obtaining that application of 60 mg per kg LW per day of paracetamol tablet was able to extinguish brooding behavior within 7 to 12 days.

4. Conclusions

Application of the acetaminoven levels of 40 to 80 mg per kg LW/day was able to extinguish brooding behavior and to reduce reproductive interval in Indonesian native laying hen. Birds without additional acetaminoven as control (A0) showed brooding behavior in the period of 38 days and body temperatures of 105 to 106 ^{o}F. Application of additional acetaminoven levels of 40 mg, 60 mg and 80 mg per kg LW/day (A40) reduced brooding period of 27 days (71 percents) in (A40), 31 days (82 percents) in (A60), and 34 days (90 percents) in (A80), respectively compared with control (A0) of 38 days in Indonesian native laying hens. Application of acetaminoven levels did not affect significantly the resting period of egg production ranging from 7 to 8 days in Indonesian native laying hens. Application of acetaminoven levels of 40 to 80 mg/kg LW/day reduced linearly the reproductive interval from 27 days (58 percents) to 35 days (70 %) compared with control (A0) of 46 days.

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