Refeeding Postmolting Method to Improve Weekly Production Performance of Rejected Laying Hens with Low Mortality

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ABSTRACT

This research aimed to investigate the influence of gradually feeding rejected laying hens after molting on the performance of production. This research used 6,000 rejected laying hens of 80 weeks old in Subur Farm. Molting method was a modification method by reducing the feed gradually. At the beginning of this research, the feed was given 120 g/laying hens/day and it would be reduced by 10 g/laying hens/day until it reach 50 g/laying hens/day. In the next phase, all chickens fasted for seven days then the chicken was given 10 g/laying hens on the first day. The feed was increased 10 g/laying hens every two days up to 120 g/laying hens/day. Data Collection of Feed conversion ratio (FCR), mortality rate, amount of feed, and egg production were taken at the start of re-feeding. The results showed that during the period of molting until refeeding, mortality was 3.6%, an increase in egg production was seen since week 1, peak of production was 78% at week 9 with FCR 2.3. The results of statistical analysis showed significant differences (P<0.05) on the percentage of egg production between time periods after the treatment of feed reduction. As the conclusion, molting followed by refeeding in rejected laying hen influences weekly production performance by extending peak production period, optimal FCR and daily egg production.

Keyword: FCR, Peak production, Refeeding, Rejected laying hen

Introduction

Molting period will take place naturally in the chickens of 1.5-2 years of age and will last for 3-4 months. Postproduction chickens (rejected chicken) are considered only as broilers. The rejecting period in big chicken farms is no longer determined on the basis of low production rate, but on the time when new egg layers enter the farms so that occasionally the rejected chickens still have egg production potential. Molting method aims at providing the chickens with resting period for next production period. Forced molting by fasting the chickens is used to shorten the resting period. There have been some studies of the forced molting of the layers of 66 weeks of age with refeeding and illumination regulation treatments (Fukuma and Ishibashi, 1997); of the layers of 90 weeks with the parameters of blood biochemicals and tissue histology (Mert and Yildirim, 2016); of the chickens of 1-1.5 years of age with the supplementation of snail flour feed (Kiptiyah et al., 2012); of the chickens of 84 weeks and 64 weeks of age with different molting treatments (Oguike et al., 2005); of the rejected chickens of 60-70 years of age with molting method and different feed composition and the parameter of the number of molted feathers (Fitroh et al., 2016). The study will use the forced molting of the postproduction chickens that are usually considered as broilers and sold in traditional markets.

Layers will culminate in egg production if their production percentage is stable in 5 successive weeks and the egg production does not increase for any longer. In a laying cycle, the egg production of chickens would constantly decrease in a long period of time (Salang et al., 2015). Normally, the decrease in egg production rate was in the ranges of 0.4-0.5% per week. At the age of 80 weeks the production rate was 75% and in such condition chickens were ready for rejection (Anonymous, 2018). Generally, traditional chicken farms in Indonesia rejected the layers of 100 weeks of age, while modern chicken farms would reject the chicken of 80 weeks of age. Chickens at that age were classified into non-productive ones, usually sold as broilers, and it inflicted significant economic loss. Bain and Dunn (2016) suggested that one of the challenges in developing layers was long life cycle in which 500 eggs were produced in 100 weeks. The study by Salang et al. (2015) indicated that the weight of the ovariun of the rejected chickens was not
significantly different from that of the chickens in the production period, meaning that the rejected chickens were still able to produce eggs. Mulyono et al. (2008) described that the forced molting in the study was conducted by totally fasting the chickens for 6 weeks and followed by the restriction of corn consumption. The recent study would introduce the molting method that has been modified by considering animal welfare and gradually reducing the supplied feed. The gradual reduction of the feed aimed at preventing sudden change in the condition of the chickens. The parameters that would be daily observed include the number of deaths, the weight of individual eggs, production percentage, and feed conversion ratio (FCR) that could describe the performance of weekly reproduction during the refeeding period of 15 weeks. It was expected that the results of the study could be useful as alternative molting method of reference and the refeeding of rejected chickens for reproduction efficiency by improving the mortality rate.

Materials and Methods

The study used 6,000 rejected layers of 85 weeks of age of Subur Farm. The chickens were individually raised in battery-warmed coop at the ambient temperature of 20°C - 23°C in Nglingi Village, Pakem of Sieman district. The feed was of commercial one with the gross protein content of 17-19%, the gross fat content of 9%, the gross fiber content of 7%, the ash content of 145, the calcium content of 3.25 – 4.25%, the phosphor content of 0.45%, and the aflatoxin content of 50 ppb. All of the chickens in the study would be given the same molting treatment by initially reducing feed and then refeeding for 15 days. The number of deaths, the weight of individual eggs, the production percentage, and the FCR would be observed during the refeeding. Data would be gathered from each of the coops (K1 to K6). Each of the coops contained 1,000 rejected chickens. The data were the daily ones that would be further processed into weekly ones.

The study began with the reduction of the feed quantity and then it was continued by fasting of the feed without any reduction of drinking water intake. It began once the chickens have undergone the molting procedure. The molting treatment was given by reducing 10 g/chicken/day of the feed (on the first day) and gradually continuing the reduction of the feed up to 50 g/chicken/day (on the eighth day). On the 9th day the chickens were fasted (without any discontinuation of drinking water supply) for 7 successive days (up to the 15th day). The refeeding stage began on the 16th day and the chickens were given 10 g/chicken/day. The feed supply was increased by 10 g/chicken in two days till the feed supply reached 120 g/chicken/day (on the thirty eighth day). The reproduction performance was daily observed during the refeeding stage. The observation included the number of deaths, the weight of individual eggs, the production percentage, and the feed conversion rate (FCR). The collected data were statistically analyzed using ANOVA to find out the impact of the refeeding on the number of the deaths, the weight of the individual eggs, the production percentage and the FCR every week.

Results and Discussion

Molting was a physiological process taking place in adult birds as indicated by the change in feathers and the decrease in egg production (Mert and Yildirim, 2016). Regeneration and remodeling of the reproduction system took place during the molting process (Sundaresan et al., 2007). The results of the study showed that the production performance improved, including the number of the deaths, the number of those that survive, the number of eggs, the weight of the eggs in kg, the FCR, and the weight of the eggs during the refeeding stage (Table 1).

Table 1. Data on laying hens production and mortality per week during refeeding

| Week | Mortality | Number of lives | Number of eggs | Kg of egg | FCR average | Weight individual of eggs average (kg) |
|------|-----------|----------------|----------------|-----------|-------------|----------------------------------------|
| 1    | 3         | 3952           | 2593           | 159.7a    | 24.75b      | 0.062                                  |
| 2    | 7         | 4470           | 6532           | 419.7a    | 10.65b      | 0.064                                  |
| 3    | 6         | 4950           | 12068          | 793.7a    | 6.24a       | 0.066                                  |
| 4    | 14        | 4982           | 19815          | 1344.6b   | 3.63b       | 0.068                                  |
| 5    | 18        | 4635           | 28277          | 1545.8c   | 3.00c       | 0.055                                  |
| 6    | 11        | 4837           | 26695          | 1815.2    | 2.66c       | 0.068                                  |
| 7    | 14        | 4947           | 29879          | 2002.9    | 2.47c       | 0.065                                  |
| 8    | 16        | 4944           | 31893          | 2149.6    | 2.3c        | 0.067                                  |
| 9    | 12        | 4874           | 32053          | 2091.86   | 2.33c       | 0.065                                  |
| 10   | 15        | 4874           | 31412          | 2034.2    | 2.40c       | 0.065                                  |
| 11   | 11        | 4950           | 30662          | 2004.9    | 2.47c       | 0.065                                  |
| 12   | 14        | 4948           | 30210          | 1967      | 2.52c       | 0.065                                  |
| 13   | 20        | 4882           | 30393          | 2160.2    | 2.26c       | 0.071                                  |
| 14   | 13        | 4688           | 29745          | 1935.2    | 2.53c       | 0.065                                  |
| 15   | 14        | 3423           | 21032          | 135.9     | 2.52c       | 0.065                                  |

* = best FCR

* same abjad in the column showed significant different (p<0.05)
The weight of individual eggs

The molting procedure followed by the refeeding of the rejected layers of 85 weeks of age was proven to increase the production percentage up to 78% and the increase in the production started in sixth week. It was higher than that reported by Moustafa et al. (2010), which was 64.5% and takes place in the period of 7 - 10 weeks; 68.20% (Achmad et al., 2010); 70.8% (Mulyono et al., 2008) and 66.2% (Rahman et al., 2012). The increase in the egg production in the study was consistent with the study by Rahman et al. (2012) reporting that the egg production of the chickens with molting treatment increases and relatively constant over time as compared to those without any molting treatment. The results of statistical analysis showed that there was significant difference (P<0.05) in the weight of individual eggs inter-periods of time (from the 1st week to the 6th week) after the refeeding, while there was not any significant difference in the periods of time from the 9th week to the 15th week.

Feed conversion ratio (FCR)

The results of the study showed that the refeeding after the molting procedure in the rejected layers also increased the number of eggs and the weight of the eggs each week from the 1st week (Figure 1). The number and the weight of the eggs would be stable in the 8th week to the 9th week. The biggest number of egg production was 32.05±25.2 eggs in the 9th week, while the highest egg weight was 26.838±60.5 kg in the 8th week. The number and the weight of the eggs were stable from the 9th week to the 15th week, while the weight of individual eggs did not increase though there was a significant increase in the egg production and in the daily egg weight (Figure 2). The weight of the individual eggs would increase along with the increase in the age (John-Jaja et al., 2016).

The decrease in the egg production took place in old birds and it was followed by the increase in the size of the eggs. It was because of the decrease in follicle recruitment rate that would
have significant impact on the growth of the follicles and the development of the eggs (Joyner et al., 1987). The results of the study showed that the weight of the individual eggs was stable in the range of 6.2±0.06 g and it was equivalent to that of the eggs of the chickens of 72 weeks of age (John-Jaya et al., 2016), which was 6.0 g in the chickens of 50 weeks of age (Rath et al., 2015), 6.91-7.81 g in the New Black Breed chickens of 28-60 weeks of age, and 6.5-6.91 g in the Hisex Brown chickens in the 60th week (Tumova et al., 2011).

The results of the study showed that the best FCRs in the refeeding period after the molting procedure was in the range of 2.3 and 2.6 in the 8th and 13th weeks after the refeeding. Normally, the FCR of the rejected chickens without any molting treatment reached 2.57, while it reached 2.23 in the rejected chickens with molting treatment (Mulyono et al., 2008); 2.13 at the age of 22 weeks (Bozkrutt et al., 2011); 2.20-2.25 in the chickens of 26-18 weeks of age (Bovera et al., 2014); 2.13, 2.01 dan 1.99 in the chickens raised in small, medium and big flocks (Farooq et al., 2002). The increase in egg production after refeeding resulted from cell improvement process in ovariun that had significant impact on the improvement of the function of the ovariun after refeeding (Oguike et al., 2005). The fasting treatment for 72 hours and 168 hours was able to decrease vasoactive intestinal polypeptide (VIP) secretion from hypothalamus so that the stimulation of prolactin hormone of anterior pituitary was not adequate. The decrease in the prolactin hormone secretion caused the increase in the secretion of the follicle stimulation hormone (FSH) and luteinizing hormone (LH) of the anterior pituitary. The follicle stimulation hormone stimulated the growth of yolk follicle and the luteinizing hormone played an important role in ovulation process that stimulated the ovarium to increase the number of the follicles (Kiptiyah et al., 2012). Gjorgosvska et al. (2008) suggested that the FSH content of blood during the molting treatment was 25.16 ng/ml, 10 days and 20 days after the molting treatment, which were 60.41 ng/ml and 61.62 ng/ml for each. The LH contents in blood plasma during 2.08 ng/ml molting treatment, 10 days and 20 days after the molting treatment were 5.71 ng/ml and 12.64 ng/ml for each. Oguike et al. (2005) suggested that there was not any significant difference in the weight of the ovariun before the molting treatment and after 35 days after the molting treatment. It was expected that it was the initial regeneration period of the ovariun, while the regeneration took place on the 21st day after the molting treatment as indicated by the growth of yolk follicle. The results of statistic analysis showed that there was significant difference (P<0.05) in the FCR inter-periods of time (from the 1st week to the 6th week) after refeeding process, while there was not any significant difference in the period of the 6th week to 15th week.

**Production percentage**

The application of the molting method to the rejected chickens could extend the production period of layers. In Indonesia layers will be rejected at the age of 80-100 weeks with the egg production of only ±50%. The results of the study showed that the egg production could be 73%-79% in 9 weeks after refeeding. Normally, the production peak of layers would last for 5 weeks during the rearing period and will gradually and constantly decrease (Salang et al., 2015). The increase in the production performance will be observed after the molting process as indicated by the increase in yolk and eggshell percentage. It is because of the reduction of fat accumulation in uterus epithelial gland that will improve the performance of the uterus epithelial gland (El-Sagheer et al., 2014). Molting method can be used to improve production potential, especially by considering economic aspect (Sharma and Vishnu, 2013).

**Mortality rates**

The results of the study showed that the number of deaths during the molding process and the refeeding was 3.5% of the total population with the mean of 0.02% per week. It was a little bit bigger than the number reported in the study by Bar et al. (2003) with the mortality rates of only 2.7% and 2.8%. The difference in the mortality rate might be caused by the difference in the rejected chicken that were used, the time and the molting type that was applied. The mortality rate of layers in Indonesia reached 0.5% monthly or 6% annually (Nurcholis et al., 2009).

**Conclusion**

The refeeding after molting improves the weekly production performance of layers and increase the weight of eggs with stable weight of individual eggs and optimal FCR.

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**References**

Anonymous. 2018. Commercial management guide. https://www.hyline.com/userdocs/pages/BRN-COM.ENG.pdf. Accessed 7 Juli 2019.

Achmad, R., Y. Sukra, Barizi, and A. P. Sinurat. 2010. Hubungan antara penurunan bobot badan dan peningkatan produksi ayam petelur (dekalb warren) dalam program cekaman luruh bulu. Jurnal Veteriner 11: 58-63.

Bain, M. M., Y. Nys, and C. Dunn. 2016. Increasing persistency in lay and stabilising egg quality in longer laying cycles. what are the challenges?. British Poul. Sci. 57: 330-338.
Bar, A., V. Razaphkovsky, D. Shinder, and E. Vax E. 2003. Alternative procedures for molting induction: practical aspects. Poult. Sci. 82: 543-550.

Bovera, F., I. Francesco, P. Giovanni, D. Carmelo, R. Fabrizio, P. Daniela, A. A. Youssef, S. A. Saber, Hassan and N. Antonino. 2014. Effect of fasting period and feed form on post molt performance and egg quality in laying hens. J. Poult. Sci. 34: 255-262.

Bozkrutt, M., K. Küçükyılmaz, V. Ayhan, M. Çabuk and A. U. Çatlı. 2011. Performance of layer or breeder breeder hens ovaries in response to different probiotic preparations. Italian J. Anim. Sci. 10: 162-169.

El-Sagheer, M., H. Y., El-Hammady, H. H. M., Hassanian, and H. A. Hassan. 2014. Effect of fasting period and feed form on post molt performance and egg quality in laying hens. J. Poult. Sci. 34: 619-634.

Farooq, M., M. A. Mian, F. R. Durrani and M. Syed. 2002. Feed consumption and efficiency of feed utilization by egg type layers for egg production. Livestock Research for Rural Development 14: 76-79.

Fitroh, M. N., M. A., Pagala, and H. Has. 2016. Pengaruh metode force molting yang berbeda terhadap rontok bulu ayam petelur aftir. J. Tropical Anim. Sci. Tech. 3: 87-92.

Fukuma, Y. and T. Ishibashi. 1997. Effect of crude protein level and refeeding method of postmolt diet on performance and egg quality in layers after forced molting. Jpn. Poult. Sci. 34: 255-262.

Gjorgosvka, N., K. Filev and R. Konakchieva. 2008. Influence of induce molting on hormonal status of aged laying hens. Karmiva, 50: 19-25.

John-Jaja, S. A. A., B. U. H. Udoh, and S. C. Nwokolo. 2016. Repeatability estimates of egg weight and eggshell weight under various production periods for bovan nera black laying chicken. Beni – Suf University Journal of Basic and Applied Sciences 5: 389-394.

Joyner, C. J., M. J. Peddie, and T. G. Taylor. 1987. The effect of age on egg production in the domestic hen. Gen. Comp. Endocrinol. 65: 331-336.

Kiptiyah, Hartanto, and Lina. 2012. Pengaruh ranggas paska dan suplementasi tepung bekicot terhadap pertumbuhan folikel yolk ayam (Gallus Turcicus). Sainstis 1: 43-54.

Mert, N. and B. A. Yıldırım. 2016. Biochemical parameters and histopathological findings in the forced molt laying hens. Brazilian J. Poult. Sci. 18: 711-718.

Moustafa, G. Z., W. Awer and E. M. Badawy. 2010. Effect of induced molting on performance of cobb broiler breeders under field condition. Arch. Geflügelk. 74: 87-93.

Mulyono, A. M. W., A. K. Sariri and W. T. Husodo. 2008. Penerapan teknologi force molting pada ayam petelur aftir; kajian parameter produksi, organ pencernaan dan reproduksi, pertahanan tubuh. Sains Peternakan 6: 10-17.

Nurcholis, D. Hastuti, and B. Sutiono. 2009. Tatalaksana pemeliharaan ayam ras petelur periode layer di populer farm desa kuncen kecamatan mijen kota semarang. Mediangro 5: 38-49.

Oguike, M. A., G. Igoebi, S. N. Ibe, S. M. Uzoukwu, C. Akomas and M. O. Ironkwe. 2005. Morphological characteristics and egg production of forced-moulit layers under different moult induction techniques. African J. Biotech. 9: 1001-1004.

Rahman, A. I., O. P. Bonsu, and M. Yaro. 2012. Effect of forced molting on performance of exotic hy-line brown layer birds under tropical climatic conditions. J. Anim. Sci. Adv. 5: 481-486.

Rath, P. K., P. K. Mishra, B. K. Mallick, and N. C. Behura. 2015. Evaluation of different egg quality traits and interpretation of their mode of inheritance in white leghorns. Veterinary World 8: 449-452.

Salang, F., L. Wahyu, E. Queljoe, and D. Y. Kattli. 2015. Kapasitas ovarium ayam petelur aktif. Jurnal Mipa Unsrat 99: 102.

Sharma, P. and G. Vishnu. 2013. Induced molting in layers – A review. Agri. Reviews 34: 137-144.

Sundaressan, N. R., D. Anish, K. V. Sastry, V. K. Saxena, J. Mohan, and K. A. Ahmed. 2007. Cytokines in reproductive remodeling of molting White Leghorn hens. J. Reprod. Immunol. 73: 39-50.

Tumova, E., M. Englmaievo, Z. Ledvina, and V. Charvatova. 2011. Interaction between housing system and genotype in relation internal and external egg quality parameters. Czech J. Anim. Sci. 56: 409-498.