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Effect of Restricted Feeding on Sexual Maturity and Productivity of Padjadjaran Quail

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Abstract

This study aimed to determine the effect of feed restrictions on the age of sexual maturity and productivity of Padjadjaran quail**.** The experimental study used a completely randomized trial design (CRD) with 4 treatments and each treatment repeated 5 times. The research object used Padjadjaran quail aged 7-9 weeks fed with SP-22 commercial feed containing 2798 kcal/kg metabolic energy and 18.28% protein. The treatment used was P_0 = providing ad libitum feed, P_1 = providing 90% ad libitum feed, P_2 = providing 80% ad libitum feed, P_3 = providing 70% ad libitum feed. The parameters used were age at sexual maturity, egg production (% Quail-Day), egg weight, and body weight at sexual maturity. The results of the study concluded that ad libitum feeds had a significant effect on sexual maturity and Quail Day Production. However, feeding more than 90% ad libitum feed could reduce Padjadjaran quail productivity.
Keywords: dietary restrictions, age at sexual maturity, Padjadjaran quail, quail productivity.

Pengaruh Pembatasan Pemberian Ransum terhadap Kematangan Seksual dan Produktivitas Puyuh Padjadjaran

Abstrak

*Penelitian ini bertujuan untuk mengetahui pengaruh pembatasan ransum terhadap umur dewasa kelamin dan produktivitas puyuh Padjadjaran**.** Penelitian eksperimental dengan menggunakan rancangan percobaan acak lengkap (RAL), memiliki 4 perlakuan dan masing-masing diulang sebanyak 5 kali. Objek penelitian yang digunakan puyuh Padjadjaran umur 7-9 Minggu dan menggunakan ransum komersil SP-22 yang mengandung 2798 kkal/kg energi metabolis dan 18,28% protein. Perlakuan yang digunakan yaitu P_0 = Pemberian ransum secara ad libitum, P_1 = Pemberian ransum 90 % dari ad libitum, P_2 = Pemberian ransum 80 % dari ad libitum, P_3 : Pemberian ransum 70 % dari ad libitum. Parameter yang digunakan adalah umur dewasa kelamin, produksi telur (% Quail-Day), bobot telur, dan bobot badan dewasa kelamin. Hasil penelitian dapat disimpulkan bahwa pemberian ransum secara ad libitum berpengaruh nyata pada umur dewasa kelamin dan Quail Day Production, namun pemberian ransum lebih dari 90 % ad libitum dapat menurunkan produktivitas puyuh Padjadjaran.*
Kata kunci: pembatasan ransum, umur dewasa kelamin, puyuh Padjadjaran, produktivitas puyuh.

Introduction

Quail have become a poultry farm commodity that is easily found throughout Indonesia, as their spread has reached remote areas. This spread can improve human welfare because this livestock produces animal protein products like meat and eggs. Quail cultivation has been widely practiced by breeders for its advantages, one of which is the rapid age of sexual maturity of quails and does not require large areas of land. *Coturnix coturnix japonica* quail is already known by the community as local quail. One of the *Coturnix coturnix japonica* quails selected purely at the Universitas Padjadjaran breeding center is the Padjadjaran quail (Neonnub *et al*., 2020).

Quail in the growth phase usually have a high feeding intensity, resulting in increased body weight gain. The correlation between high body weight and increased feed consumption, results in excess feed and energy. Excess consumption will change the fat accumulated in abdominal fat so that the quail has excess body weight and reduces productivity.

Quails fed ad libitum will grow faster, followed by an earlier age of sexual maturity. In birds, rapid sexual maturity results in a shorter egg-laying period. This situation will

undoubtedly be detrimental to breeders. Feed restriction is a strategy to regulate quail growth according to the quail's age requirements. There are many methods of feed restriction, but restricting feed according to quantity is the most efficient and best method (Sahraei, 2012). This study aims to determine the effect of feed restrictions by reducing the amount of feed given according to the nutritional needs of quail age.

Materials and Methods

In total, 100 female Padjadjaran quails were used in this research. The quails were selected purely at the Universitas Padjadjaran Breeding Center. The quails were kept at 7-9 weeks. This study used 20 experimental units, and each experimental unit was filled with five quails. An experimental study with a completely randomized design (CRD) was done with four treatments, each repeated five times. The research data were processed using the SPSS 17 application and analyzed for variance (ANOVA). If the results obtained were significant or significantly different, then it was continued with Duncan's Multiple Range Test. The quails were fed commercial SP-22 feed containing 2798 Kcal/kg of metabolic energy and 18.28% protein, bought from PT. Sinta Prima Feedmil.The treatment used is as follows:

P_0: Provision of feeds ad libitum
P_1: Provision of 90% ad libitum feed
P_2: Provision of 80% ad libitum feed
P_3: Provision of 70% ad libitum feed

Ad libitum feed data were obtained from a preliminary study using laying quail at the same age and from the same breeder. Drinking water is provided ad-libitum. Nutritional content of the commercial feed can be seen in Table 1.

Measured Parameters

The parameters measured in this study are as follows:

1. Age at Sexual Maturity
   The age of sexual maturity is indicated by the age at which the quail lays eggs.
2. Quail Productivity
   a. Egg Production (% Quail-day)
      Egg Production is calculated based on the ratio between the number of eggs per day and the number of live quail multiplied by 100%.
   b. Egg Weight (grams)
      Egg weight is produced by weighing each egg.
   c. Body Weight at Sexual Maturity (grams)
      Produced from body weight at the age of first laying eggs.

Results and Discussion

Age at Sexual Maturity

Our study found that feed consumption, protein consumption, and energy consumption for each treatment were as follows P_0= 22.00 gram/head/day, 4.02 gram/head/day, and 61.55 kcal/head/day, respectively. P_1 = 19.80 gram/head/day, 3.61 gram/head/day, and 55.40 kcal/head/day. P2 = 17.60 gram/head/day, 3.21 gram/head/day, and 49.24 kcal/head/day. P3 = 15.40 gram/head/day, 2.81 gram/head/day, and 43.08 kcal/head/day. The effect of restricted feed treatment on the age of sexual maturity, egg production, egg weight, and body weight of sexual maturity can be seen in Table 2.

Table 2 shows that the feed restriction treatment had a significant effect ($P<0.05$) on the sexual maturity of the Padjadjaran quail. Sexual maturity in quails is determined by the quail's age when it first lays eggs. Providing ad libitum feeds ($P<0.05$) significantly affects the quail's sexual maturity age, so the quails lay eggs faster. In contrast, in the P_1, P_2, and P_3 treatments with a feed restriction of 70–90%, it turned out that there was no significant effect ($P > 0.05$). The quail fed with ad libitum feeds reached sexual maturity in 35 days, and quails treated with feed restriction by giving 90–70% of ad libitum feeds were sexually mature at 42–44 days old. This result is in line with Ocak dan Erener (2005), who found that the age of sexual maturity in quail fed with limited and crumble feed is 42 days, and quail fed with 90–70%, respectively, reached sexual maturity in 43–47 days.

The P_0 treatment significantly accelerate the age of sexual maturity because the consumption of feeds in the P_0 treatment was so high that when their basic needs have been met, the quail will be ready to lay eggs. Feed consumption is a decisive factor because the quail will keep eating when its nutritional needs are unmet. Conversely, when its nutritional needs are met, the quail will consume fewer feeds (Garnida, 2022).

Egg Production

Table 2 shows that feed restrictions significantly affect egg production ($P<0.05$), especially in the early stages of production. The P_0 treatment had a significant effect on the quail's egg production ($P<0.05$), while treatment P_1 with 90% ad libitum feed was not significantly different ($P>0.05$) compared to P_0, P_2, and P_3 treatments. The quail egg production between P_0 and P_1 treatment entirely differs. The highest egg production was seen in treatment with an ad libitum feed, with 23.99% egg production. Egg production smaller in the P_1, P_2, and P_3 treatments was 12.84%, 10.45%, and 10.09%, respectively compared to treatment P_0.

Egg production in the early egg-laying phase was smaller because the metabolic energy obtained during the study was 2798 kcal/kg, which was smaller than the SNI quality standard. In the layer phase, quail requires metabolic energy of 2900 kcal/kg (Akbarillah et al., 2011). Damayanti, et al (2018) reported that egg production in early sexual maturity would remain relatively low, for the bird has only entered its initial egg-laying phase. Ratriyanto *et al*. (2019) reported that egg production with a crude protein content of 18.00% resulted in a low egg production, average of 22.68%. This report is similar to the egg production obtained in this study

Based on the protein and energy consumption, the most efficient treatment was P_1 = 3.61 gram/head/day and 55.40 kcal/head/day by giving a feed of 90% ad libitum. These results are not much different from the study conducted by Widjastuti dan Kartasudjana (2006), which found that limiting the 90% feed with protein consumption of 3.49 grams/head/day and energy consumption of 50.55 kcal/head/day is considered sufficient for quail growth. This protein meets the quail's basic needs, production, and growth period. In addition to protein consumption, the type of local quail used during the study affected the slow growth rate, which would affect egg production (Utomo *et al*., 2014)

Egg Weight

Ad libitum and restricted feeds had no significant effect ($P>0.05$) on egg weight. The highest egg weight was obtained from the P_0 treatment of 9.91 ± 0.372, and the lowest was from the P_3 treatment, namely 9.65 ± 0.874. The size of the egg weight in the early laying phase is still considered normal. Achmanu (2011) states that quail egg weight is 9-10 grams or about 8% of body weight. Egg weight at the beginning of laying is usually relatively small, but it will increase in size with the addition of feed consumption. The absence of differences in the size of the egg weight is thought to be due to the availability of protein.

Egg weight was influenced by feed consumption, environment, protein, and fat contained in the feed (Achmanu, 2011; Zahra *et al*., 2012). Damayanti et al. (2018) found that feed containing 22% protein meets the quails' needs to produce optimal egg production. In treatments P_1, P_2, and P_3, quails limiting 90%-70% feed were shown to have a smaller egg weight due to lower energy and protein consumption. Widjastuti dan Kartasudjana (2006) stated that on certain days when quails do not produce eggs, the body accumulates the protein so that the availability of this protein will form one more egg, thus making the next laid eggs larger.

Body Weight at Sexual Maturity

Table 2 shows that the body weight of Padjadjaran quail's at sexual maturity did not significantly affect feed restrictions ($P>0.05$). Still, treating P_1 (90%) and P_2 (80%) with feed restrictions resulted in greater body weight than the treatment P_0 and P_3 with 175.95 and 177.51 grams. The P_3 treatment resulted in a small average body weight due to the high depletion rate. The study by Hassan *et al*. (2003) showed that the body weight obtained with a 15% feed restriction resulted in 181.30 grams, similar to the body weight obtained. A limitation of 90% ad libitum feed yields 198.02 grams with an age of 42 days of sexual maturity. The average initial body weight for laying eggs is high due to the late age of sexual maturity (Diwayani *et al*., 2012).

Table 1. Nutritional Content of SP-22 (commercial feed)

Nutrients	Value		SNI (Standar Nasional Indonesia) Quality Requirements
Water content	12% *	5.10% **	Max 14%
Ash	14% *	10.07% **	Max 14%
Proteins	20-22% *	18.28% **	Minimum 20-22%
Fiber	6% *	6.52% **	Max 7%
Fat	4-7% *	7.43% **	Max 7%
Metabolic Energy		2 798 kcal **	Minimum 2800 kcal
Carbohydrate		57.70% **	

Notes:
* Nutritional content of the SP-22 commercial feed
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Table 2. The effect of treatment on the age of sexual maturity and quail productivity.

Parameter	Treatment (±SD)			
	P_0	P_1	P_2	P_3
Age Maturity Gender (Days)	35 ± 4.438[a]	42 ± 3.286[b]	44 ± 3.834[b]	43 ± 5.196[b]
Quali Day Production (%)	23.99 ± 10.674[a]	12.84 ± 6.632[ab]	10.45 ± 7.913[b]	10.09 ± 8.932[b]
Egg Weight (grams)	9.91 ± 0.372	9.73 ± 0.200	9.77 ± 1.018	9.65 ± 0.874
Body Weight Adult Gender (grams)	175.95 ± 21,380	198.02 ± 11,779	192.73 ± 11.163	177.51 ± 16,589

Notes: Different letters in the same column indicate a significant difference (P<0.05).

In treatments of P_1 and P_2, the quail's weights at sexual maturity were higher because of the delay in age, respectively P_1 = 8 days P_2 = 10 days. In line with Hertamawati *et al*. (2019) statement, the limitation of the feed with metabolic energy of 2900 kcal/kg can delay the age of sexual maturity by 9 days, and the body weight of the age of sexual maturity with a feed limit of 90% = 172.40 grams while the feed limit of 80% = 169.60 grams. This result is smaller because the metabolic energy at the time of the study was 2798 kcal/kg, so it affected increased feed consumption and body weight. The factor of small body weight for sexual maturity affects the age of sexual maturity. Reducing body weight due to feed restrictions may delay egg production due to body weight and body fat, so this is an essential factor that quails are ready to lay eggs. (Hertamawati *et al*., 2019)

Conclusion

Ad libitum feeds significantly affect the age of sexual maturity and Quail Day Production. However, feeding more than 90% ad libitum with a metabolic energy content of 2798 kcal/kg can reduce the productivity of Padjajdjaran quail.

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