American Journal of Animal and Veterinary Sciences

Original Research Paper

Effect of Rearing Method and Varying Energy Levels on Performance and Growth Rate of Male Kamang Ducks

Sabrina, Husmaini, Firda Arlina and Linda Suhartati

Faculty of Animal Science, Andalas University, Padang, West Sumatra, Indonesia

Article history
Received: 18-10-2021
Revised: 16-03-2022
Accepted: 26-5-2022

Corresponding Author:
Sabrina
Faculty of Animal Science
Andalas University, Padang,
West Sumatra, Indonesia
Email: sabrina@ansci.unand.ac.id

Abstract: This study was conducted to determine the performance of male Kamang ducks reared with pools and without pools with three different levels of ration energy. This study used a Randomised Complete Block Design (RCBD) with a divided plot design with the main plot consisting of pools, and without pools, subplots consisted of ration energy levels of E1 (2700 Kcal/kg), E2 (2900 Kcal/kg) and E3 (3100 Kcal/kg) with three groups. The study raised 90 male Kamang ducks. The treatment began at two weeks of age and ended at the 10^{th} week Each cage consisted of 5 Kamang ducks per treatment making a total of 90 ducks. The variables observed were ration consumption, body weight gain, feed conversion, and growth rate. The results showed that there was is no interaction between the duck rearing method with varying ration energy levels on ration consumption, body weight gain, ration conversion, and growth rate ($p>0.05$). Also, the level of ration energy did not affect ration consumption, body weight gain, ration conversion, and growth rate ($P>0.05$). However, the maintenance of ducks with and without pools was significantly different ($p<0.05$) with the average body weight gain and feed conversion. The study concludes that rearing ducks using ponds showed the best results at 2700 Kcal/kg (E1) energy level with an average ration consumption of 5907.7 g/duck, weight gain of 1232. 51 g/duck, and feed conversion ratio of 4.82.

Keywords: Energy Level, Kamang Ducks, Pool, Performance, Without Pool

Introduction

Kamang duck is one of the local duck breeds with good prospects in egg production in west Sumatra. The male and female Kamang ducks can be used as broiler ducks. The population of ducks in Indonesia has shown a significant increase of about 6.77%, from 44,356,543 tails in 2012, to 47,359,722 tails in 2016 (Kementan, 2016). The population of ducks in Tilatang Kamang District, Agam Regency, is 36,120 ducks, spread over several villages, namely Nagari Koto Tangah with as many as 26,793, Gadut with 3,700, and Kapau with 5,627 ducks. This shows that ducks have an essential role in meeting animal food needs and can be developed.

Ducks are semi-aquatic animals that under natural conditions will spend a large part of their lives in or around water (Babington and Campbell, 2022). Ducks need sufficient clean water to drink, dip their whole head so that it becomes clear and avoid stuffy noses with feed and mud Besides, the pond also lowers the body temperature when the environment is hot (Nicol *et al.,* 2017). During hot weather, ducks kept in cages equipped with ponds will move and play more in the water and require more time and energy to dry their feathers. The signal of a decrease in body temperature will reach the thermoreceptor center in the hypothalamus, transmitting this signal to the center for regulating feed consumption (hunger or fullness), which stimulates the ducks to consume more feed (Baile and Mayer, 1970).

However, ducks reared in cages without ponds will require lower energy and higher feed consumption. Similarly, Sinurat *et al*. (1992), consumption of local ducks will increase if fed with low energy and vice versa will decrease if given high energy. However, suppose there is an increase in ambient temperature above the neutral zone. In that case, thermoreceptors in the hypothalamus will detect and will transmit this signal to the feed regulation center (hunger/fullness center), which causes appetite pressure so that ducks consume less feed (Sabrina, 2014).

Furthermore, Sinurat (2000) highlighted that the energy requirement of the ducks in the starter phase is 3100 Kcal/kg with a protein content of 17-20%. The nutritional needs of ducks are the quantity and quality of food substances needed by the duck's body to carry out its life activities (Supriyadi, 2009). Most of the energy needs is used for basic living needs. Energy for basic life includes the need for basal metabolism and normal activity and meat and fat tissue formation. Also, Zurmiati *et al.* (2017) stated that ducks could increase ration consumption on low-energy rations. Feeds with high energy and protein tend to accelerate growth and improve feed conversion. Excess energy can be converted into body fat, resulting in body weight gain at harvest (Widodo, 2002). In addition, it can achieve a lack of energy in the body by converting body fat into energy, resulting in a decrease in body weight (Tillman *et al*., 1989).

Materials and Methods

Research Materials

This study used 90 male Kamang ducks reared from two weeks to ten weeks of age. The cages used in this study were nine colony cages measuring 3 × 5 meters with a pool and nine colony cages measuring 2 × 2.5 meters without a pool. Each cage unit contained five ducks. Each cage was equipped with a drinking and rations container; the heat source was a 60-watt lamp/unit. The tools used consist of scales and stationery.

Research Methods

The experimental design used was a Randomised Complete Block Design (RCBD) split-plot pattern of 2 × 3 with three groups. The main plot (A) is duck care, and subplot E is the energy level of the ration.

The main plot consisted:

A1: With pool
A2: Without a pool

Subplot consisted:

E1: Energy level of 2700 Kcal/kg
E2: Energy level of 2900 Kcal/kg
E3: Energy level of 3100 Kcal/kg

The content and composition of the ingredients of rations with different energy levels are presented in Table 1 and Table 2.

Table 1: Proximate composition, mineral and metabolisable energy of the rations

Ingredients	Crude protein (%)	Crude fat (%)	Crude fiber (%)	Calcium (%)	Phosphor (%)	ME (Kcal/kg)
Corn*	8.28	2.90	2.66	0.37	0.19	3300
Rice bran*	12.90	4.09	16.15	0.62	0.26	1640
Fish meal*	38.00	1.52	2.80	5.50	2.88	3080
Soya bean meal*	45.00	2.49	7.50	0.63	0.32	2240
Top mix***	-	-	-	5.38	1.14	-
Coconut oil**	-	100.00	-	-	-8600	

Source :
*Nuraini and Latif (2012)
**Analysis of Non-ruminant nutrition laboratory, faculty of animal husbandry, unand (Batubara, 2012)
***Scott *et al*.,(1982)

Table 2: Composition, nutritional content and metabolism energy of ingredients

Ingredients	E 2700	E 2900	E 3100
Corn	46.00	50.00	58.00
Bran	21.50	15.50	6.00
Fish flour	14.00	14.00	14.00
Soybean residue	17.00	18.00	19.00
Top mix	1.00	0.50	00.50
Coconut oil	0.50	2.00	02.50
Total	100.00	100.00	100.00
Protein (%)	19.55	19.55	19.44
ME (Kcal/kg)	2725.60	2910.60	3084.60
Crude fat (%)	3.34	4.74	5.11
Crude fiber (%)	6.36	5.57	4.32
Calcium (%)	1.24	1.20	1.17
Phosphor (%)	0.61	0.60	0.59

Note: Arranged according to the table 1

Research Variables

The variables measured in this study are as follows:

a. Ration consumption = Total feed consumed/day - Leftover feed/day(g/duck)
b. Body weight gain = initial body weight/week - Final body weight/week (g/duck)
c. Feed Conversion (FCR) = $\frac{Total\ Feed\ Consumption\,(kg)}{Boday\ weight\ Gain\,(kg)}$
d. Growth rate is calculated by using the Brody (1945) formula

Statistical Analysis

The data obtained were processed by using a Randomized Block Design (RBD) with the SAS (Statistical Analysis System) application.

Results

Ration Consumption

The effect of the use of pools and without pools with three ratio energy levels, in each treatment can be seen in table 3.

Based on the analysis of variance, it was found that there was no interaction (P>0.05) between ducks on different levels of ration energy. The average rectal temperature of ducks using the pool (41° to 41.3°C) and without the pool (41° to 41.4°C), respectively, while the range of temperature in the duck cage during the study was 23° to 25.5°C. Duck care with pool and without pool showed no significant influence (P>0.05) on the average consumption of male Kamang ducks. It means that duck care did not influence the average consumption of male Kamang ducks.

Weight Gain

The effect of duck care with Pools and without Pools with some energy levels on the weight, gain of male Kamang ducks in each treatment during the study can be seen in Table 4. Based on the diversity of body weight gain analysis, it was found that the interaction between duck care with pools and without pools with different levels of ration energy had no significant effect (P>0.05) on the average weight gain of male Kamang ducks. This is because the treatment of duck care and the provision of different energy levels did not affect body weight gain. Energy levels also had no significant effect (P>0.05) on body weight gain.

Growth Rate

The influence of duck care with pools and without pools on several levels of ration energy on the growth rate of male Kamang ducks in each treatment during the study can be seen in Table 5. Based on the diversity analysis results, it was found that the interaction between duck care with pools and without pools on different levels of ratio energy had no significant influence (P>0.05) on the average rate of growth of male Kamang ducks. The interaction of duck care factors with energy levels also had no significant influence (P>0.05) on ratio consumption and body weight gain. The average growth rate obtained was also the same.

Feed Conversion

The influence of duck care with pools and without pools on several levels of ration energy on the conversion of ration in each treatment during the study can be seen in Table 6. Based on the diversity analysis results, it was found that the interaction between duck care with pools and without pools on different levels of ratio energy had no significant influence (P>0.05) on the average conversion of ratio. It was due to the interaction of duck care factors with energy levels which had no significant influence (P>0.05) on ration consumption and body weight gain. Thus the average feed conversion results were also obtained. Different ration energy levels showed no significant influence (P>0.05) on feed conversion.

Table 3: Average consumption of rations during the study (g/duck)

	Subplot (Energy level)			
Mainplot (Duck care)	E1	E2	E3	Average
A1 (Pool)	5877.4	5833.4	6012.30	5907.70
A2 (Without pool)	5910.0	6078.6	5989.40	5992.67
Average	5893.7	5956.0	6000.85	

Note: Ns = had

Table 4: Average weight gain of ducks during the study (g/duck)

	Factor E (Energi level)			
Factor A (Duck care)	E1	E2	E3	Average
A1 (With pool)	1235.55	1233.42	1228.57	1232.51[a]
A2 (Without pool)	1096.67	1122.20	1048.40	1089.09[b]
Average	1166.11	1177.81	1138.48	

Table 5: Average growth rate of Male kamang ducks

	Factor E (Energy level)			
Factor A (Duck care)	E1	E2	E3	Average
A1 (Pool)	0.2020	0.2077	0.2023	0.2040
A2 (Without pool)	0.1978	0.1903	0.1913	0.1918
Average	0.1978	0.1990	0.1986	

Note: Ns = had no signifi

Table 6: Average of feed conversion

	Factor E (Energy Level)			
Factor A (Duck care)	E1	E2	E3	Average
A1 (With pool)	4.79	5.82	4.91	4.82^{a}
A2 (Without pool)	5.42	5.42	5.73	5.52^{b}
Average	5.10	5.09	5.32	

Note: a b Different superscripts by column show significant influence (P<0.05)

Discussion

Ration Consumption

The study by Suharno and Amri (2003) stated that research on intensive duck care in water pool cages or without a water pool showed that food consumption was almost the same. It is because the temperature of duck cages maintained by using a pool is the same as the maintenance of ducks without a pool. The average temperature of the duck cages kept with ponds and without ponds during the study was 23° to 25.5°C. Also, Wilson *et al.* (1980) highlighted that the ideal temperature for raising ducks is between 18.3°C and 25.5°C. The cage temperature in this was perfect for ducks, so the average consumption of rations obtained remained the same without the pool.

The provision of different energy in the ration also showed no significant effect on the average consumption of the male Kamang duck. There was no significant difference in the consumption of rations with three energy levels of E1, E2, and E3, which were 5934.2 g/duck, 5981.0 g/duck, and 6000.85.10 g/duck, respectively. According to Zurmiati *et al*. (2017), the energy requirement in the ration for the growth of Pitalah ducks is 2700 Kcal/kg. In treatments E1 and E2, the energy content was 2700 Kcal/kg and 2900 Kcal/kg. If the ducks consumed E1 and E2, then the energy needed by the ducks is fulfilled. Whereas at the E3 level, the energy used was 3100 Kcal/kg, if the ducks consumed E3 ration, the duck energy requirements exceed E1 and E2.

Rahayu *et al.* (2011) stated that poultry will meet energy needs if the energy in the ration is low, poultry will eat more and vice versa if the energy content in the feed is high, the amount of feed consumed by poultry will be small The duck will stop eating if its energy needs are fulfilled. When the nutrients in the ration have not met the animal's requirement, the duck will continue to eat so that there will be a waste in terms of quantity.

Weight Gain

There was no influence of using different energy levels in the ratio because the energy consumed meets energy needs. Most of the energy needs is used for the basic needs of livestock. Murtidjo (2006) stated that the energy obtained from feed consumed by poultry could be used for movement and other production processes.

Ducks raised with pools had a significantly increased body weight than duck care without pools with the average weight gain of ducks with pools being 1235.51 g/duck, while the average weight gain of ducks without pool was 1089.09 g/head. It happened due to the availability of feed aside from the rations provided, such as water moss and small insects in pools. Whereas in duck care without pools, the feed was provided only from the ration. Therefore, a good weight gain was found in duck care with pools. Likewise, the opinion of Babington and Campbell (2022) stated that Ducks like areas or edges of water for resting, standing, and foraging simultaneously with other ducks, such as lakes or pools. Similarly, Pangemanan *et al.* (2019) explained that ducks released in rivers or swamps usually look for feed in the form of snails or other small insects.

Furthermore, ducks with pools utilized the intake energy for the growth process, whereas ducks without pools used intake energy to maintain body temperature and release heat. Thus, the weight gain of ducks with a pool was higher than those without the pool. According to Abbas (2009), the rate of heat flow depends on the temperature between the skin and body surface area. The high body weight gain of male Kamang ducks in A1 treatment showed that duck care with pools is more profitable in terms of growth compared to duck care without pools.

Growth Rate

The growth rate of livestock was determined by the number of rations consumed. If the rations consumed are relatively more, the growth becomes fast. Otherwise, if the amount consumed is relatively small, growth will be slow (Tillman *et al.*, 1989). Similarly, Blakely and Blade (1998) stated that the level of ration consumption will affect the growth rate and final weight because the growth rate is essentially the accumulation of feed consumed into livestock bodies.

The absence of several different levels of ration energy on the growth rate was due to the same average consumption of male Kamang ducks. Likewise, ducks that are raised in pools and without pools show the same response to growth rates. It indicated that the duck care of male ducks in pools and without pools with some level of ration energy shows the same response. In this study, ducks were also maintained in their original environment, namely in the Kamang area, where ducks adapted to their environmental conditions. The use of pools was not able to improve production performance, especially growth rates. According to Kurniawan *et al.* (2021), an animal's growth rate is influenced by several factors, namely species, sex, environment, and feeding in sufficient quantities.

Feed Conversion

There was no effect of using various energy levels on feed conversion because the average consumption of the Kamang male duck ration was the same. Scott *et al.* (1982) stated that the size of feed conversion is influenced by the number of rations consumed and the body weight gain of the livestock. In addition, Manin (1997) stated that an increase in feed consumption is not always proportional to the increase in body weight because each type of livestock has a different ability to digest the feed consumed. Also, Budiarta (2014) stated that the more efficient the poultry turns their feed into meat, the better the conversion value. The conversion rate for duck rations with pools was 4.82, which was lower than for ducks without pools at 5.52. It was due to the fact ducks in pools had a higher body weight gain than ducks without pools.

Conclusion and Recommendations

The current study concluded that duck rearing using pools showed the best results at an energy level of 2700 Kcal/kg (E1) with an average ration consumption of 5907.7 g/duck, weight gain of 1232.51 g/duck, and feed conversion of 4.82.

Acknowledgment

The author would like to thank you very much for the funding support from PNBP Faculty of Animal Science DIPA Andalas University in Number:
002.e/UN.16.06.D/PT.01/SPP/ FATERNA/2020.

Author’s Contributions

Sabrina: Designed and performed experiments and drafted the manuscript.

Husmaini: Performed experiments and statistically analyzed the data.

Firda Arlina: Performed experiments Interpreted the data and wrote the draft paper.

Linda Suhartati: Performed experiments, and wrote the draft paper and publication.

Ethics

This review is original and was not published elsewhere. It can be confirmed that all authors have read and approved the manuscript and that no ethical issues are involved.

References

Abbas, M. H. (2009). Fisiologi Pertumbuhan Ternak. Andalas University Press, Padang.

Babington, S., & Campbell, D. L. (2022). Water for Domestic Ducks: The Benefits and Challenges in Commercial Production. Frontiers in Animal Science. doi.org/10.3389/fanim.2022.782507

Baile, C. A., & Mayer, J. (1970). Hypothalamic centres: feedbacks and receptor sites in the short-term control of feed intake. Physiology of digestion and metabolism in the ruminant, 254-263.

Brody S. (1945). Reprinted1974. Bioenergetics and Growth: With Special Reference to the Efficiency Complex in Domestic Animals. Hafner Press. A Division or Macmillan Publishing Co, Inc. New York. P. 489-493, 498,502.

Batubara, L. (2012). Pengaruh penggunaan jamur tiram (Pleuterus ostreatus) dalam ransum terhadap total kolestrol, HDL, LDL plasma darah ayam broiler. Skripsi (Unpublished). Fakultas Peternakan Universitas Andalas, Padang.

Blakely, J & D. A. Bade. (1998). *Ilmu Peternakan*. Terjemahan: B. Srigandono. Gadjah Mada University Press, Yogyakarta.

Budiarta, D. H. (2014). Pengaruh Kepadatan Kandang Terhadap Konsumsi Pakan, Pertambahan Bobot Badandan Konversi Pakan Pada Ayam Pedaging (Doctoral dissertation, Universitas Brawijaya). http://repository.ub.ac.id/id/eprint/137242/

Kementan. (2016). Statistik Peternakan dan Kesehatan Hewan. Direktorat Jenderal Peternakan dan Kesehatan Hewan Kementerian Pertanian Republik Indonesia, Jakarta.

Kurniawan, E., Husni, G, & Adhianto, K. (2021). Comparison of Growth Performance of Peranakan Ongole Cattle in Purwodadi Dalam Village and Wawasan Village, Tanjungsari District, South Lampung Regency, Journal of Research and Innovation of Animals 5(1): 57-63. doi.org/10.23960/jrip.2021.5.1.57-63

Manin, F. (1997). Penggunaan Tepung Eceng Gonddok dan Azolia Dalam Ransum Ternak Itik Lokal Jantan. Tesis (Unpublished). Fakultas Peternakan. Universitas Andalas, Padang.

Murtidjo, B. A. (2006). Pedoman Meramu Pakan Unggas. Cetakan ke-17. Penerbit Kanisius, Yogyakarta

Nicol, C. J., Bouwsema, J., Caplen, G., Davies, A. C., Hockenhull, J., Lambton, S. L., ... & Weeks, C. A. (2017). Farmed bird welfare science review. Department of Economic Development, Jobs, Transport and Resources. doi.org/10.1016/j.applanim.2016.09.004

Nuraini, S., & Latif, S. A. (2012). Fermented product by Monascus purpureus in Poultry diet: Effects on laying performance and egg quality. Pakistan Journal of Nutrition, 11(7), 507.

Rahayu, I., Sudaryani, T., & Santosa, H. (2011). Panduan Lengkap Ayam. Penebar Swadaya. Jakarta.

Sabrina. (2014). Respon Fisiologis dan Performans Itik Pitalah yang Dipelihara pada Ketinggian Tempat dan Protein Ransum yang Berbeda. Disertasi (Unpublished). Pascasarjana Universitas Andalas, Padang.

Scott, M. L., Nesheim, M. C., & Young, R. J. (1982). Nutrition of the Chicken. 3rd edi. Scott and Associates, Ithaca, NY, USA, 119.

Sinurat, A. D., Bestari, J., Winarno, R. M., Setiadi, P., & Wahyuni, S. (1992). Pengaruh imbangan asam amino, energi metabolis ransum terhadap penampilan itik. Prosiding pengolahan dan komunikasi hasil-hasil penelitian unggas dan aneka ternak. Pusat Penelitian dan Pengembangan Peternakan, Ciawi. Bogor.

Sinurat, A. P. (2000). Penyusunan ransum ayam buras dan itik. Pelatihan proyek pengembangan agribisnis peternakan, Dinas Peternakan DKI Jakarta, 20. doi.org/10.14334/Pros.Semnas.TPV-2020-p.597-608

Suharno, B., & Amri. K. (2003). Beternak Itik Secara Intensif. Cetakan kedelapan. Penebar Swadaya. Jakarta.

Supriyadi, M. M. (2009). Panduan Lengkap Itik. Penerbit Penebar Swadaya, Jakarta.

Tillman, A.D., Hartadi H, Reksodiprodjo S, Prwawirokusomo S, & Lebdosoekojo L. (1989). Ilmu Makanan Ternak Dasar. Gajah Mada University Press, Yogyakarta.

Widodo, W. (2002). Nutrisi dan pakan unggas kontekstual. Proyek Peningkatan Penelitian Pendidikan Tinggi Direktorat Jenderal Pendidikan Tinggi Departemen Pendidikan Nasional, Jakarta.

Wilson, E. K., Pierson, F. W., Hester, P. Y., Adams, R. L., & Stadelman, W. J. (1980). The effects of high environmental temperature on feed passage time and performance traits of white Pekin ducks. Poultry Science, 59(10), 2322-2330. https://www.sciencedirect.com/journal/poultry-science/vol/59/issue/10

Zurmiati, Wizna, Abbas, M. H, & Mahata, M. E. (2017). Effect of The Balance Energy and Protein Ration on the Growth of Pitalah Duck Which is Given Probiotic of Bacillus amyloliquefaciens. Indonesian Journal of Animal Science, 19 (2): 85-92. doi.org/10.25077/jpi.19.2.85-92.2017