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PALM OIL REPLACEMENT BY KEPAYANG OIL (*Pangium Edule Reinw*) IN DIETS ON THE QUAIL GROWTH PERFORMANCES

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ABSTRACT

Currently, the utilization of palm oil as a feed ingredient competes with human needs; thus, we must explore new sources of oil that may be used as alternative feed. Kepayang oil is a new form of feed oil due to its high content of unsaturated fatty acids, which helps in quail growth. The goal of this investigation is to see how replacing palm oil in rations with kepayang oil affects quail growth. The study used 200 female quail 21 days old, kepayang oil, commercial palm oil, mineral mix, maize meal, fish meal, bran, soy cake, lysine, methionine, and 20 units of the quail's cage "battery" type. The investigation used a block randomized design (BRD) with four treatments and five groups, each with a different level of palm and kepayang oil. If the treatment has a significant effect, the Duncan multiple test should be performed. We discovered that replacing palm oil in quail diets with kepayang oil reduced feed intake but had no significant effect on quail weight gain ($P > 0.05$). Furthermore, incorporating 3% kepayang oil into the quail diet had no effect on the feed efficiency ratio or day of first laying ($P > 0.05$). As a consequence, between the ages of 21 and 49 days, palm oil can be replaced with kepayang oil up to 3% of the total ration with no negative effects on feed intake, body weight gain, feed efficiency, or the age of the first egg laid.

Keywords: Palm Oil, Kepayang Oil, Quails and Growth

INTRODUCTION

The most important thing in determining the success of a livestock business is feed. Quality feed will produce good performance for the growth and production of livestock. Factors of feed quality or nutrition that become a benchmark in livestock growth are protein and energy. The problems that are often encountered in fulfilling livestock nutrition are energy. Where the use of energy is still less than the minimum limit that has been set, several other alternatives are used, including supplementation of fat or oil as an energy source for livestock.

There are various oils that can be used in poultry feed, one of which is vegetable oil. Vegetable oil is oil obtained from plant processing, including stems, leaves, fruit, seeds, fruit peels and flowers through an extraction process (Mahandari et al., 2011) which has the potential and can be used in a mixture of quail rations, namely kepayang oil (*Pangium edule Reinw*). Cakrawati (2006) reported that kepayang oil has the advantage of containing linoleic fatty acid by 42.2%, linolenic acid (omega-3) by 3.97%, and oleic acid, which is quite high, approximately 39.4%, when compared to palm oil, which only contains 1% Omega-3 (Fauzi et al., 2008). In addition, kepayang oil contains energy of 3863 kcal/kg (Sibbald, 1983). The use of kepayang oil in poultry rations as an energy source has never been evaluated before. Referring to the energy content of kepayang oil, the replacement of palm oil with kepayang oil in the ration may not have a negative effect on the growth of quail. This is in accordance with the opinion of Fadzil (2016), that supplementation of vegetable oil into

rations such as coconut oil and soybean oil by 3% of the total ration can increase growth and feed efficiency in quail. In this study, we examined the impact of substituting kepayang oil for palm oil in the diets on the growth of 200 female quails under certain condition monitoring. Our hypothesis was that substituting kepayang oil for palm oil in the ration would significantly improve quail growth.

MATERIALS AND METHODS

Place and time of research

This research was conducted at the Experimental Cage of Fapet Farm, Faculty of Animal Husbandry, Jambi University for 5 weeks.

Research Materials and Equipment

The material used in this study was 200 female quails aged 21 days which were obtained from Mr. Eko's breeding farm in Pagardrum, the rations used were formulated using feed ingredients such as commercial palm oil with the brand name "Bimoli Special" and mineral mix which are widely available in the market, the Kepayang oil used is obtained from the Plantation and Forestry Service of UPTD KPHP (Production Forest Management Unit) Sarolangun, while yellow corn, fish meal, fine bran, soybean meal, lysine, and methionine obtained from the Shinta Poultry Shop warehouse in Talang Bakung.

The equipment used in this study were 20 units of battery-type quail cages with length, width and height of 60x45x45 cm3 per unit equipped with a feeder, a drinking bowl, a dung container, and an incandescent lamp. Each cage unit is filled with 10 quails. The scales used to weigh the feed and body weight of the quail are digital scales from the Camry brand with a capacity of 5 kg with an accuracy of 1 gram.

Research methods

Cage preparation.The cages that will be used are group cages that are insulated based on the treatment of 20 quails. Before use, the cage was cleaned first by washing the cage with clean water and disinfecting the cage. After the cage is dry and ready to use, the quail can be put into the cage. The cage environment must always be clean, this is so that the quail are not susceptible to disease.

Preparation of rations.The rations used were formulated using feed ingredients such as palm oil, kepayang oil, yellow corn, fish meal, fine bran, soybean meal, fish meal, lysine, methionine and mineral mix. The rations are arranged according to the nutritional and nutritional needs of the quail.

Table 1. Nutrients of Feed ingredient content for ration treatments

Nutrients	DM	CP	Fat	CF	Ca	P	Lys	Met	EM (Kkal/kg)
Yellow Corn	86.30a	10,12a	5.41b	2.14a	0.83a	0.25a	0.20b	0.18c	2835a
Fish Meal	92.58a	48,50a	9.83b	4.02a	24.66a	1.10a	0.40b	1.30c	2839a
Rice Bran	89.37a	8.90a	14.88b	13.21a	0.42	1.50a	-	0.16c	2780a
Soy Bean Meal	95.56a	44,20a	7.55b	3.36a	0.84a	0.20a	2.90b	0.6c	3458a
Palm Oil	-	-	100	-	-	-	-	-	4157d
Kepayang Oil	-	-	100	-	-	-	-	-	3863d
Mineral Mix	-	-	-	-	-	-	-	-	-
Lys	-	-	-	-	-	-	0.25	-	-
Meth	-	-	-	-	-	-	-	0.25	-

Description: a). Results of Lab Analysis: Feed Science and Technology, Faculty of Animal Husbandry, Bogor Agricultural University (2017).b). Radhitya (2015). c). Hartadi et al. (1980). d) Sibbald (1983). e). PT. Medion, Bandung.

Table 2. Composition of ingredients for treatment rations (%)

Ingredients	Treatments (%)			
	T1	T2	T3	T4
Kepayang Oil	0	1	2	3
Palm oil	3	2	1	0
Yellow Corn	40	40	40	40
Fish Meal	10	10	10	10
Rice Bran	15	15	15	15
Soybean Meal	27.5	27.5	27.5	27.5
Mineral Mix	4	4	4	4
Methionine	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25
Amount	100	100	100	100

Table 3. Food substance content of treatment rations.

Nutrients	Treatments (%)			
	T1	T2	T3	T4
Dry Matters	83.46	83.46	83.46	83.46
Crude protein	22.39	22.39	22.39	22.39
Crude Fat	10.01	10.01	10.01	10.01
Crude Fiber	4.36	4.36	4.36	4.36
Calcium	4.39	4.39	4.39	4.39
Phosphorus	0.95	0.95	0.95	0.95
Lysine	0.92	0.92	0.92	0.92
Methionine	0.39	0.39	0.39	0.39
EM (kcal/kg)	2911.65	2908.69	2905.72	2902.76

Note: *Calculated based on Tables 1 and 2

Placement of Quail Treatment. Treatment quail in cages were placed randomly. The quail were numbered and weighed then the coefficient of homogenity was calculated. The results of the coefficient of homogenity of quail body weight in this study was 15.59%, so the design used was a Randomized Block Design (RBD) and quail were divided into 5 groups based on body weight from the smallest to the largest. Furthermore, the cages were sorted from number 1 to 20 then randomized treatment and groups were carried out first. After that, 10 quails that had been grouped based on body weight were placed in each cage unit randomly according to their group.

Data collection. Body weight was measured on the first day of maintenance at the age of 21 days, then routine weighing was carried out at the end of every 2 weeks. Body weight weighing is carried out by fasting the quail for 6 hours before being weighed, this is intended so that the digestive organs are empty so that the results of the weighing are truly body weight. Meanwhile, the weighing of ration consumption was carried out at the end of 1 week during maintenance by calculating the difference between the ration given and the remaining ration.

Research Design

This study used a Randomized Block Design (RBD) with four treatments and five replications as a group. The quail used during this research had a growth period of 21 days. The treatment given is:
T1 = Ration containing 3% Palm Oil + 0% Kepayang Oil
T2 = Ration containing 2% Palm Oil + 1% Kepayang Oil
T3 = Ration containing 1% Palm Oil + 2% Kepayang Oil
T4 = Ration containing 0% Palm Oil + 3% Kepayang Oil

Data Analysis

The data obtained were analyzed using analysis of variance (ANOVA). If there is a significant effect, it is continued with Duncan's Multiple Distance Test to determine the difference between treatments (Steel and Torrie, 1989).

RESULTS AND DISCUSSION

Feed Consumption

Data from observations and calculations of the average feed consumption of all groups and treatments given during the study are listed in Table 4. The treatment of replacing palm oil with kepayang oil during the age period of 21-35 and 35-49 days had no effect on feed consumption ($P>0.05$). During the period of 21–49 9 (whole period), there was decreased feed consumption ($P< 0.05$). It is possible that the effect of replacing palm oil with kepayang oil has had an effect because there is enough time to convert the nutrients into the energy the body requires, whereas the time in the 21-35 day period and the 35-49 day period is shorter, which explains why there is no impact. Furthermore, the results of the 21-35 and 35-49 day periods concurred with Sumiati et al. (2022) and Pitargue et al. (2019), who found no effects on feed intake. In contrast, Mahgoub et al. (2019) discovered that birds fed diets supplemented with rosemary oil ingested more feed than those fed the control diet, and they justified their findings by claiming that herb and rosemary extracts have a desirable odor that makes the feed more palatable, which may have changed the increase in consumption of feed. Furthermore, Abd El-Hack et al. (2015) found that the consumption of feed was closely connected to the amount of oil in the diet, which can be attributable to the higher palatability of these medicinal plants.

Duncan's Multiple Distance Test results show that the feed consumption of T3 is not different from that of T1. However, replacing palm oil with kepayang oil at a rate of 2% to 3% reduces ration consumption. This may be related to the ration that received kepayang oil supplementation. Based on the research that has been done, the higher the kepayang oil content in the ration, the more pungent the smell of the ration will be. According to Bozkurt et al. (2014), dietary addition of essential oils reduced feed intake in chicks somewhat. One probable explanation for the decreased feed consumption is that essential oils have an unpleasant odor, which makes the palatability of the diet unappealing to birds. The relationship between ration and palatability is influenced by several factors, including taste, smell and color of the feed ingredients in the ration (Djulardi, et al. 2018). According to Devi et al. (2023), a decrease in feed intake may be attributable to the turmeric's altered smell, palatability, and strong aroma.

The amount of feed consumed in this trial was sufficient to feed quail. This is in accordance with the results of research by Subekti and Hastuti (2008) that the consumption of quail rations in the growth phase is 20 grams/head/day.

Table 4. Average feed consumption by group and treatment of quail in each age period (g/quail/day).

AGE (Days)	TREATMENTS			
	T1	T2	T3	T4
21-35	17.61±1.91	16.23±1.03	16.93±1.59	17.04±1.87
35-49	25.54±1.01	24.05±2.43	24.32±1.78	23.40±2.50
21-49	21.58±0.73a	20.14±1.70b	20.74±1.15ab	20.22±1.28b

Notes: Superscripts of different letters in the same line are significantly different P<0.05). T1 = 3% Palm Oil and 0% Kepayang Oil, T2 = 2% Palm Oil and 1% Kepayang Oil, T3 = 1% Palm Oil and 2% Kepayang Oil, and T4 = 0% Palm Oil and 3% Kepayang Oil.

The amount of feed consumption can be influenced by several factors, one of which is the amount of energy. The feed consumption is also influenced by the nutritional content of the feed (Hernandez et al., 2004; Fan et al., 2008). Furthermore, Fan et al. (2008) stated that the provision of feed containing high energy can reduce feed consumption which is closely related to the growth of poultry. The level of consumption will decrease if the amount of protein and energy in the ration is high, and vice versa will increase if the amount of protein and energy in the ration is low (Hernandez et al., 2004).

The metabolic energy contained in 1 kg of palm oil is 4157 kcal, while the energy content contained in 1 kg of kepayang oil is 3863 kcal. In treatment T4 the consumption was significantly lower than T1. Based on the energy content of kepayang oil, the consumption of treatment rations should have been higher but the results obtained were the opposite. It is suspected, the quality of metabolic energy in kepayang oil is better than palm oil, although the energy content in palm oil is higher than kepayang oil. Cabuk et al. (2014) reported that supplementation of a mixture of essential vegetable oils in quail rations showed the same level of consumption. In addition, Sudibya et al. (2008) reported that tuna fish oil and lemuru fish oil supplementation as an energy source showed the same level of consumption. This is because the metabolic energy content is almost the same. The metabolic energy content of tuna fish oil and lemuru fish oil are 8260 kcal/kg and 8280 kcal/kg, respectively.

Another factor is thought to be due to the higher content of unsaturated fatty acids in kepayang oil compared to unsaturated fatty acids in palm oil, causing the consumption of treatment rations to decrease because the energy needs of the quail's body have been met. Cakrawati (2006) reported that the content of unsaturated fatty acids contained in kepayang oil include oleic (Omega-9) of 39.4%, linoleic (Omega-6) of 3.97%, and linolenic (Omega-3). by 3.97%. In contrast to kepayang oil, palm oil also contains unsaturated fatty acids but is not as complete as in kepayang oil. The largest fatty acid content in palm oil is palmitic acid (43.2%–44.4%) and oleic acid (39.8%–41.4%), linoleic at 5-14%, and linolenic at 1% (Japir et al., 2017).

Weight Gain

Data from observations and calculations of average body weight gain from all groups and treatments given during the study are listed in Table 5.

During the 21-35-day age period, substituting kepayang oil for palm oil reduced quail body weight gain slightly (P< 0.05). In line with this, Abd El-Hack et al. (2015) discovered that supplementing meat quail diets with 0.75 g kg-1 of the oil mixture slightly reduced daily weight gain, in the three to six week period and the total period (one to six weeks), when

Table 5. Average body weight gain by group and treatment in each age period (g/quail/day).

AGE (Day)	TREATMENTS			
	T1	T2	T3	T4
21-35	4.18±0.10a	4.04±0.13b	4.21±0.12a	4.15±0.04ab
35-49	2.91±0.22	2.87±0.34	3.04±0.26	3.02±0.21
21-49	3.54±0.12	3.45±0.16	3.61±0.11	3.59±0.11

Notes: Superscripts of different letters in the same line are significantly different (P<0.05).
T1 = 3% Palm Oil and 0% Kepayang Oil, T2 = 2% Palm Oil and 1% Kepayang Oil,
T3 = 1% Palm Oil and 2% Kepayang Oil, and T4 = 0% Palm Oil and 3% Kepayang Oil.

compared to the control group. When viewed at the age period of 35-49 and 21-49 days, the replacement of palm oil with kepayang oil had no significant effect on quail body weight gain (P>0.05). However, when viewed numerically at the age period of 35-49 days, the growth of quail decreased. This is presumably because in the 35-49 day age period, the utilization of nutrients consumed by quail is not only to meet basic living needs, but also to meet production needs.

In addition, the ration with the replacement of palm oil with kepayang oil had a significant effect (P<0.05) in reducing ration consumption (Table 9), however, the resulting body weight gain was not different. This fact shows that the quality of kepayang oil is better than palm oil. This is in accordance with the results of research from Fadzil (2016) that supplementation of vegetable oil into rations such as coconut oil and soybean oil by 3% of the total ration can increase growth and feed efficiency in quail. In addition (Peebles et al., 2000) reported that the use of several types and levels of oil in broiler rations resulted in higher body weight.

Donaldson (1985) reported that an increase in fat content (oil) in a balanced diet stimulated growth, because the energy and protein intake per gram obtained was the same at all oil content levels, so that the increase in growth with an increase in the fat content of the feed was a reflection of the greater total energy. and nutrient intakes. This increase could be due to improved palatability or increased nutrient density according to the oil added to the feed. The advantage of using oil in the diet can only be obtained if the amount of other food substances is also increased in order to get a balance with the increase in the high level of oil as an energy source.

Feed Efficiency

Data from observations and calculations of the average of feed efficiency from all groups and treatments given during the study are listed in Table 6.

Based on the results of analysis of variance (ANOVA) treatment of quail at various levels of replacement of palm oil with kepayang oil in the ration. Age periods of 21-35, 35-49, and 21-49 days or during the study, showed no significant difference (P>0.05) on the efficiency of the use of rations. Based on the average number of data in T1 and T4 each age period is relatively the same. This demonstrates that substituting kepayang oil for palm oil at 3% of the total ration has the same efficiency value. This is contrary to the perception (Abedpour et al., 2017) that the inclusion of some vegetable oil in quail rations can improve the efficiency of ration usage. In the 21-35 day age period, feed consumption was more efficient than the 35-49 day age period. This is presumably because the growth rate of quail in the 21-35 day age period is better or higher and the ration consumed in the 21-35 day age period can be utilized properly in the body so that the ration consumption is more efficient. In contrast to the age period of 35-49 days, the growth rate is already

Table 6. Average percentage of feed efficiency by treatment in each age period (percent/quail/day).

AGE (Day)	TREATMENTS			
	T1	T2	T3	T4
21-35	23.95±2.62	24.91±1.00	25.00±1.74	24.57±2.51
35-49	11.38±0.70	12.03±1.98	12.61±1.96	13.06±2.01
21-49	16.43±0.64	17.22±1.44	17.45±1.21	17.86±1.70

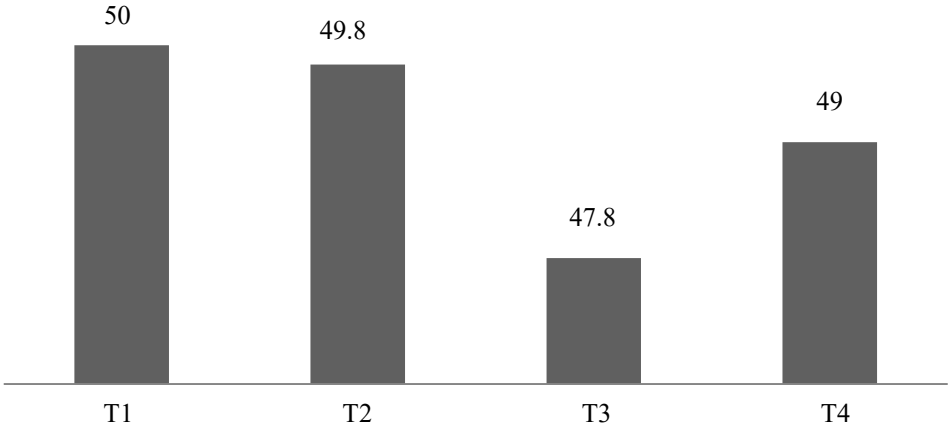
Note: T1 = 3% Palm Oil and 0% Kepayang Oil, T2 = 2% Palm Oil and 1% Kepayang Oil, T3 = 1% Palm Oil and 2% Kepayang Oil, and T4 = 0% Palm Oil and 3% Kepayang Oil .

began to slow down along with the utilization of the ration in the body which was not better than the previous period.

Feed efficiency is the ratio between the body weight gain produced and the amount of feed consumed. Card and Nesheim (1972) stated that the value of the efficiency of the use of feed indicates the amount of body weight gain resulting from one kilogram of feed. Feed efficiency is the opposite of feed conversion, the higher the feed efficiency value, the less amount of feed needed to produce one kilogram of meat. Fat and energy in the ration can improve feed efficiency because higher levels of fat and energy in the ration cause livestock to consume less feed but produce high body weight gain.

Age of First Egg Laying

Graph 1. Average percentage of age at first laying by group and treatment.



Note: T1 = 3% Palm Oil and 0% Kepayang Oil, T2 = 2% Palm Oil and 1% Kepayang Oil, T3 = 1% Palm Oil and 2% Kepayang Oil, and T4 = 0% Palm Oil and 3% Kepayang Oil .

Based on the results of analysis of variance (ANOVA) of quail treatment at various levels of replacement of palm oil with kepayang oil in the ration, the results were not significantly different (P>0.05) with respect to age at first laying. The average age at first laying at T1, T2, T3, and T4 showed relatively the same results. This shows that replacing palm oil with kepayang oil up to 3% of the total ration does not provide a bad effect on the age of first egg laying in quail, even based on the number of age at first laying, T4 was faster than T1.

The average age at first egg laying at T1, T2, T3, and T4 was 50, 49, 47, and 49 days old, respectively. This is in line with the results of research (Masroh et al., 2014) which reported that the age of first laying eggs in quail fed commercial rations was 47

days. However, this is different from the results of Nasution's (2007) study which reported that the age of first egg laying in quail fed on mineral rations was 41 days. The average age for laying quail's first eggs is 42 days. There are several factors that can slow down the lifespan of the first egg. These factors include age, genetics, nutritional value, stress, and light. This evidence by the results of Pitaloka's research (2017) that the average age of first laying in quail given palm cake to a level of 37.5% in the ration is 51 days.

CONCLUSION

Palm oil can be replaced with kepayang oil up to 3% of the total ration between the ages of 21 and 49 days (during the growing period) with no negative effects on feed intake, body weight gain, feed efficiency, or the age of the first egg laid.

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