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NUTRITIONAL EVALUATION ON SOME KAWI YELLOW SWEET POTATO FLOUR (IPOMOEA BATATAS L.) AND IMPLEMENTATION AS SUBSTITUTION OF CORN STARCH ON COMPONENT OF BETA CAROTENE AND CHOLESTEROL TO ARABIC LAYING HENS

Rahmaniya Nita*
Postgraduate Program, Animal Science Faculty University of Brawijaya, Indonesia

Sjofjan Osfar, **Djunaidi Irfan H.,** Lecturers
Animal Nutrition and Feed Department, Faculty of Animal Science, University of Brawijaya, Indonesia

*E-mail: dhesyayumisakura@gmail.com

ABSTRACT
This study used Arabic laying hens at age 5-month (Silver Braekels) which used 150 heads with the finished feed from the factory and the addition of sweet potato flour (*Ipomoea batatas* L.) 0%, 2%, 5%, 7% and 10%). The research method was field experiment (in vivo) with Complete Random Design. The treatments used in this study were 5 treatments and 5 replications, each replication was filled 6 Arabic laying hens. The treatment did not give a significant difference (P> 0.05). On feed consumption, HDP, egg mass, feed conversion, IOFC, and cholesterol, however, the treatment has no significant effect (P> 0.05) on feed intake, HDP, egg mass, feed conversion, IOFC and cholesterol. Based on the results of the study, it can be concluded that the addition of 2%, 5%, 7%, 10% sweet potato flour gave the best result because the highest value on feed intake (81.32 ± 09) and HDP (75.39 ± 2.38), egg mass (25.13 ± 1.5), feed conversion (3.64 ± 0.68), IOFC (55.43 ± 2.62) and cholesterol (508.232 ± 2.60). The result of evaluation on some sweet potato flour showed that Kawi yellow sweet potato flour had a higher content of carbohydrate and β-carotene than other potato and showed the same result to the production of Arabic laying hens.

KEY WORDS
Feed conversion, egg mass, feed intake, IOFC, cholesterol.

In accordance with the needs of the average energy sufficiency rate, Indonesian population at the consumption level of 2200 Kcal/ person/day with the level of energy availability of 2550 g/person/day, and the average protein adequacy rate of 50 g. The consumption rate is 55 g/person/day at the level of availability, while the minimum fat consumed adequacy rate is equivalent to 10% of the total energy and a maximum of 25% of the total energy.

Consumption sourced from fat averaged 20% (Deptan, 2013). Consumption of animal protein is about 11 g/day/capita. The feed for Arabic laying hens requires 17% protein content and 2850 Kcal/kg of energy. According to Kholis and Sitanggang (2002), the protein content of 16% is sufficient for egg production for Arabic laying hens that is older than 18 weeks. Gunawan (2002) stated with a battery cage and 10% protein rations and ME 2500 Kcal/kg, egg production reached 48.5%. Tajufri (2013) free-range chicken with protein 18% and energy 2700 Kcal/kg produces the highest production and weight of eggs compared to 14-16% protein and energy 2400, 2600, 2700 in Kcal/kg. Sweet potato (*Ipomoea batatas* L) is a type of tuber that has a lot of advantages over other tubers and is the fourth source of carbohydrate in Indonesia, after rice, maize, and cassava. Purple sweet potato as a local food can be found in West Java, Central Java, East Java, Papua, and Sumatera. For the Indonesian population, the data from the tubers is 164.17 cal/capita /day (Suprapti, 2009: 43). Sweet purple potato has potential as raw material. Carbohydrate content of 27.64 g. Tuber powder can be used as raw material, both in the form of flour and mixed flour.

MATERIALS AND METHODS

Phase 1 Proximate and β-carotene study of the best test result was continued in the second phase of this study. The experiment was using Arabic laying hens of 5-month (Silver Braekels) as much 150 tails with the finished feed from plant and addition of yellow sweet potato flour (*Ipomoea batatas* L.). The content of dietary feeding treatment can be seen in Table 1. The research method used is field experiments (in vivo) with Complete Random Design. The treatments used in this study were 5 treatments and 5 replications, each replication was filled with 6 Arabic laying hens. Feed treatment provided include:

T0: 55% corn flour + 0% Yellow sweet potato flour + 25% concentrate + 20% bran
T1: 53% corn flour + 2% Yellow sweet potato flour + 25% concentrate + 20% bran
T2: 55% corn flour +5% Yellow sweet potato flour + 25% concentrate + 20% bran
T3: 55% corn flour + 7% Yellow sweet potato flour + 25% concentrate + 20% bran
T4: 55% corn flour + 10% Yellow sweet potato flour + 25% concentrate + 20% bran

RESULTS AND DISCUSSION

The use of variety in dry matter proximate test showed that Kawi purple sweet potato flour 94,51 gave the best result. Because Kawi purple sweet potato flour had the high water content of 70,46 g according to Table 1 on proximate test on Cilembu potato 93,21% had material dry and low will affect feed quality due to the nutrient availability parameter in the low feed. According Trisyulianti et al (2001) stated that besides the highest content of dry ingredients, the lowest moisture content in the feed.

Table 1 – Ingredients of Feed Substances in Proximate

Feed ingredients	dry matter (%)	ash content (%)	crude protein (%)	crude fiber (%)	rough lines (%)
Purple sweet potato	94,51	3,54	4,63	3,32	0,88
Cilembu sweet potato	93,21	3,35	2,64	3,18	0,87
White sweet potato	94,50	2,24	4,15	2,60	1,08
Kawi Yellow sweet potato	94,24	3,38	2,58	3,09	1,12
Kawi Purple sweet potato	93,22	3,10	2,93	3,69	1,09

Source: Results of NMT Laboratory Analysis (2017).

The content of Ash content in white potato 2,24% decreased and in purple sweet potato flour 3.54 has a high ash content which can be seen in Table 1 due to burning in the old will reduce the water content and organic compounds also decreased, the content of ash content is still considered very low that given to Arabic laying hens and has not fulfilled SNI feed of Arabic laying hens content of ash content 1,2% the Ash content according to the researchers.

The result of analysis of crude protein on proximate test on Kawi purple sweet potato flour has a high yield on proximate analysis that is 4,63%. Because Kawi purple sweet potato has a high water content that is 65,5 g according to Table 4. This figure according to requirement protein of Arabic laying hens based on SNI 1.69 crude protein test according to protein content analysis (AOAC, 1995). Result of crude fiber analysis on proximate test of yellow sweet potato flour t is 3,69% high enough number and white sweet potato that is 2,60 low figure on yellow sweet potato flour crude fiber content according to Table 1 contained in Kawi yellow sweet potato 0.7. Because Kawi yellow sweet potato has a high water content of 5.49% according to Table 2. This figure is according to the requirement of the protein of Arabic laying hens based on SNI 20,05 g. The crude fiber test is according to the protein content analysis (AOAC, 1995). Crude fiber is an indigestible compound in the human or animal digestive organs. Crude fiber is very important in the assessment of the feed quality because this figure is an index and determine the nutritional value of this food (Sudarmadji, 2010). Result of crude fat analysis on proximate test to Kawi purple sweet potato flour is 1.09% high in Kawi yellow sweet potato flour, low number on Cilembu sweet potato in crude

fat test, coarse fat content contained in Cilembu sweet potato 0.87 in accordance with Table 1 because the Kawi purple sweet potato has a high water content of 7% according to Table 1 so that the fat is a few. This number complies with the protein requirement of the laying hens based on SNI 20.05 Crude protein test according to protein content analysis (AOAC, 1995).

Table 2 – β-Carotene Compound Contents of Kawi Yellow Sweet Potato Flour

Parameter	Kawi Yellow Sweet Potato Flour	Volume
B- Carotene	16,64 (mg/g)	1000 ppm

Source: Results of Laboratory Analysis MRCPP Ma Chung Malang (2017).

β-carotene is an organic compound that is insoluble in water and polar organic solvents such as methanol and ethanol. β-carotene belongs to the carotenoid pigment group having biological activity as provitamin A (Andarwulan, 1989). Based on Table 2 it can be seen that the content of β-carotene 16.64 mg/g addition of Kawi yellow sweet potato flour. This is due to the absence of β-carotene content in sucrose and sorbitol. So that the content of β-carotene contained in Kawi yellow sweet potato. B-carotene has been shown to effectively prevent the oxidation of biomolecules and lipid membranes, especially at low oxygen pressures. The ability of ß-carotene as an antioxidant at this low oxygen partial pressure is very important in the biological system, because the antioxidant system is usually effective at relatively high oxygen pressure, whereas antioxidant properties are also needed in certain places far from the source of oxygen. Therefore, ß-carotene may be a complement to other antioxidants, such as vitamin C and vitamin E that are effective at normal oxygen pressure (Silalahi, 2006).

Effect of addition of Kawi yellow sweet potato flour yellow in feed to the appearance of production of Arabic laying hens. The result of this research of Kawi yellow sweet potato (*Ipomoea batatas* L) on Arabic laying hens performance yielding data below.

Effect of addition of sweet potato starch yellow kawi in a feed to the appearance of production of Arabic chicken laying. Result of research of Kawi yellow sweet potato flour (*Ipomoea batatas* L) on Arabic laying hens performance yielding data below.

Table 3 – Effect of in Kawi yellow sweet potato flour (*Ipomoea batatas* L) feed against Effect of Arabic laying hens Production

	Treatment				
Variables	P0	P1	P2	P3	P4
Feed consumption (g/tail/day)	79.12±5.14	81.32±09	80.23±2.8	80.31±1.19	81.07±2.32
HDP (%)	74.68 ±2.49	74.04 ± 1.3	75.39 ± 2.38	74.20 ± 1.7	73.57 ± 1.72
Egg mass (g/tail/day)	24.36 ± 2.72	22.99 ± 3.6	22.53 ± 3.32	25.13 ± 1.5	22.20 ± 2.26
Feed conversion	3.27 ± 0.41	3.62 ± 0.67	3.64 ± 0.68	3.20 ± 0.24	3.68 ± 0.45
IOFC (Rp)	23.70 ± 2.01	45.54±1.34	22.53±3.66	25.13±1.74	55.43±2.62
Cholesterol	507.87±2.22	508.232±2.60	508.13±3.17	507.668±2.69	507.842±1.64

Note: the treatment did not give a significant difference (P> 0.05).

The highest feed intake showed on T1 showed (81.32 ± 0.89 g/tails) with the addition of 2% Kawi yellow sweet potato flour feed intake has a good value then T4 with average value as much (81,07 ± 2,32 g/ (80.31 ± 1.19 g / head), T2 with average values (80.23 ± 2.28 g/tail), T0 with a mean value of (79.12 ± 5.14 g/tail) by not addingKawi yellow sweet potato flour. Feed intake (g/tail) is calculated by weighing the amount of feed given (g) minus the amount of feed remaining (g) carried out every 24 hours. (Anggorodi, 1985). The feed intake each week then summed to determine total feed consumption during the study. Feeding is done by restricted to facilitate feeding on Arabic Laying hens. According to Suprijatna et al., (2005) that chicken consume feed to meet the need for the ongoing biological processes in the body normally so that the process of growth and egg production is optimal. The results of analysis the consumption of laying hens shows the level of potatos using Kawi sweet potato flour has differently (P <0.05) on the consumption of Arabic laying hens feed because there is β-carotene content in the sweet potato.

HDP showed at treatment T2 with average value as much (75.39 ± 2.38) with addition of 5% Kawi yellow sweet potato flour then T4 treatment with a mean value of 73.57 ± 1.72 with the lowest value and the addition of 10% Kawi yellow sweet potato flour, T0 with an average rating of 74.68 ± 2.49, P1 with an average rating of 74.04 ± 1.39, T3 with average value as much (74.20 ± 1.73) with the addition of 7% Kawi yellow sweet potato flour. The results of the analysis shows that the feed intake of Arabic laying hens showed that the use of Kawi sweet potato flour did not give a real effect (P <0.05) on the consumption of Arabic laying hens feed because there is β-carotene content in sweet potato.

This result is in accordance with the statement of Amrullah (2003). stated that the main factor which influences the egg production is the amount of feed intake and the content of feed substances in the feed. The feed factors that affect egg production is the protein content of the feed because approximately 50% of the dry weight of the eggs consists of proteins. Anggorodi (1985). Australianingrum (2012) suggests that egg production is strongly influenced by the level of protein in the diet. Similarly, North and Bell (2002) that the amount consumed affects livestock production, where high consumption of feed will produce high production as well.

Egg Mass indicates that the peak content shows T3 with a mean value of (25.13 ± 1.51) by adding a 7% Kawi yellow sweet potato flour. Feed mass egg treatment to decrease due to added feed treatment then decreased also high favorites for feed consumption. According to the meaning, Sri and Isna (2015) are compared with the weight of T4 eggs with an average value of as much (22.20 ± 2.26). The results of analysis shows that 7% Kawi yellow sweet potato flour did not significant difference (P <0.05) on feed intake of Arabic laying hens.

Conversion of rations shows the level of efficiency used for livestock, and determines the economic value of each ration which is closely related to the cost of production of feed can be said to have a low value of T3 with average value (3.20 ± 0.24) with the addition of 7% Kawi yellow sweet potato flour and produced a high production of T4 with an average value of 3.68 ± 0.45 with the addition of 10% Kawi yellow sweet potato flour. Statistics analysis showed that the value of chicken feed conversion (P <0.05) was significantly higher, able to minimize the conversion value of feed to produce maximum egg weight. The higher the IOFC value, the better because if high IOFC means the acceptance of chicken sales is also high (Rasyaf, 2006).

Based on the analysis of the various research data indicated that the peak content showed T4 with the average value (55.43 ± 2.62) by adding 10% Kawi yellow sweet potato flour and then the lowest IOFC at T2 with average value (22.53 ± 3.66) with the addition of 7% Kawi sweet potato flour later followed by T0 with average score (23.70 ± 2.01), T1 with average score (45.54 ± 1.34), T3 with average value (25.13 ± 1.74). IOFC can be seen can the results of show that use of 7% Kawi yellow sweet potato flour did not significant difference (P <0.05) on feed consumption of Arabic laying hens, this is because contains good β-carotene for the laying hens.

According to Rasyaf (2006), IOFC value is strongly influenced by the amount of ration consumption. Increasing the amount of ration consumption causes the cost required for production is also increasing. According to Ramayanti (2009), the average IOFC of medium type roosters maintained for 8 weeks with a density of 10 m^2 cages ranged from 1.75 to 2.19, whereas the mean IOFC of medium-type chicken with a density of 10, 12, 14 and 16 tail/m^2 maintained for 7 weeks in postal cages ranging from 1.33 to 1.54 (Bujung, 2009).

Arabic laying hens have a resemblance to native chicken eggs both shape, color, size, and nutritional content. Arabic laying hens also have higher production compared to native chicken. But nowadays chicken eggs increasingly feared because of the rampant news about eggs as one source of fat and cholesterol. Total fat in chicken egg yolks ranged from 31.92% -34.80% (Kusmanto, 2004), and cholesterol by 5.20% (Rahayu, 2003). Based on analysis of various research data showed that the lowest content showed treatment T3 507,668 ± 2,69 mg/dl by adding 7% Kawi yellow sweet potato flour when compared with control feed with high average value eat cholesterol content hence not good or decrease and the highest content showed in the treatment of T1 508.23 ± 2.60 mg/dl. The results of statistical analysis

showed very significant effect (P> 0.01). This is due to the provision of Kawi yellow sweet potato flour containing β-carotene is good for Arabic laying hens. Low cholesterol content in egg yolks due to crude fiber which is high on Kawi yellow sweet potato flour. The results of this study are consistent with (Frandson, 1992) Cholesterol is the most important sterol of the animal organs and is classified into lipids (fat).

CONCLUSION

From the results of β-carotene, the test did not give a real difference in the provision of Kawi yellow sweet potato flour against the production of Arabic laying hens.

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