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by Artikel 6

Submission date: 01-Apr-2024 01:17PM (UTC+0700)
Submission ID: 2336707249
File name: 2018_NUTRITIVE_CONTENT-WAHYU_WIDODO-ADI.pdf (509.98K)
Word count: 3280
Character count: 17608

INNSPUB

International Journal of Biosciences | IJB |
ISSN: 2220-6655 (Print), 2222-5234 (Online)
http://www.innspub.net
Vol. 12, No. 3, p. 18-23, 2018

RESEARCH PAPER OPEN ACCESS

Nutritive content assessment of organic feedstuff from various regions in East Java Province, Indonesia as potential exploration efforts of local poultry feed

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Key words: Corn, Organic feedstuff, Rice bran

http://dx.doi.org/10.12692/ijb/12.3.18-23 Article published on March 15, 2018

Abstract

Utilization of local organic feedstuff will secure long-term feeds ascertained and indirectly secure the availability of long-term poultry meat. As a first step is to look at the potential nutritional content of local organic feedstuff. So far there has been no study specifically looking at the nutritional content of local organic feedstuff. The purpose of this study was to compare the nutritive content of organic feedstuff from various regions in East Java as potential exploration efforts of local poultry feed. The method in this study was a quantitative method. This study took place in East Java Province. The location was selected by the consideration that this location was potential for organic feedstuff. This research was conducted from May to January 2016. The data were quantitative to determine how much the nutrition potential of organic feedstuff (rice brand and corn) is. The analysis was descriptive analysis. The results all of the nutritional content of rice bran and corn samples obtained good results in accordance with the content commonly found in the literatures. Rice bran from Bondowoso showed the best performance with crude protein content of 11.27%, with low crude fiber content of 5.45%, from Mojokerto showed the best performance with the calcium content of 49.95 mg/100g and phosphorus of 4.98 mg/100g. Corn from Sumenep showed the best performance with crude protein content of 11.75% and extract ether of 9.14%, from Bondowoso showed the best performance with calcium (26.84 mg/ 100g) and phosphorus (13.42 mg/100g).

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Introduction

The livestock industry has always dominated the availability of feed that leads into the unpredictable long-term prices of poultry feed and therefore makes it hard for farmers to get normal prices.

The prices of feeds are gradually increasing in Indonesia (Krishna and Umiyasih, 2006; Handoko, 2014) day by day. Consequently, there is an economic inefficiency, especially in the prices of boiler chicken feed (Cang 2004, Krishna & Umiyasih 2006, Jarmani *et al*. 1999).

There are three main factors that should be calculated as they contribute to the quality and quantity of poultry feed, which are: the availability of poultry feed in the poultry area, the price of poultry feed, and the nutritional contents of poultry feed. Those three factors influence five components of poultry feedstuff constituting the largest feed namely rice bran, corn and vegetable oil as energy-source feed, soybean meal and fish meal as protein-source feed (Widodo 2014, Suci *et al.* 2010, Dewanto *et al*. 2002).

The price of poultry feedstuff directly influences the poultry feed per se. Generally, energy-source feedstuff like corn, sorghum, and other grains are relatively inexpensive except vegetable oil. Meanwhile, protein-source feedstuff are expensive. The protein-source feedstuff as the main composition of poultry feed include beans meal and animal products which are mostly imported from other countries (Widodo 2014, Widyaratne & Zijlstra 2007).

In addition, a perspective shift in middle-high consumers starts to emerge in terms of feed security. Consumers expect organic products to be healthier (Huber & Vijver 2010, Huis, 2013, Dvorska *et al.* 2007).

During this time, in the poultry market we found feed with materials containing hazardous chemical substances. The consumers who are increasingly aware of a secure intake eventually start looking for an alternative safe intake for their health.

An alternative way for solving this problem could possibly be proposed through an organic feed. An organic feed is a feed composed from various nutritional contents that do not contain any hazardous chemical substance.

The criteria for feedstuff mainly derived from organic feed (especially from agricultural product) are preliminary based on several characteristics, such as: the crop rotation, the use of improved varieties, the intercropping or poly-culture cultivation system, and the use of biological pest control instead of chemical one. Organic food is defined as originating from certified 'organic' production according to International Federation of Organic Agriculture Movements standards, which exclude the use of synthetic inputs such as synthetic fertilizers and crop protective, as well as of GM seeds, synthetic additives and irradiation (Huber & Vijver 2010, Paul *et al.* 2007).

The organic feed from local potential feedstuff can replace manufactured feed functionally. A local potential feedstuff will have affordable economical values (Sinurat 1999, Wirawati & Putri 2015).

In addition, the sustainability of potential local feedstuff will be easy to maintain as many regions in Indonesia generally have adequate feed safety that has not been utilized optimally. Utilization of local organic feedstuff will secure long-term feeds ascertained and indirectly secure the availability of long-term poultry meat.

As a first step is to look at the potential nutritional content of local organic feedstuff. So far there has been no study specifically looking at the nutritional content of local organic feedstuff. Therefore, a comprehensive study is needed in comparing the nutritional content of organic feedstuff from different regions of East Java as a potential exploration effort of local poultry feed. This study aims to compare the nutritional content of organic feedstuff from various regions in East Java as a potential exploration effort of local poultry feed.

Materials and methods

The settings of this research were several regions in East Java intentionally selected due to the consideration that those regions have potential organic ingredients. Four regency was selected for this research, which are: Mojokerto, Sumenep, Bondowoso and Malang. This research was conducted from May to December 2015. This study used both primary and secondary data. The primary data were gained through direct observation to examine the potential of organic poultry feedstuff (rice bran and corn) and to measure the laboratorial analysis on nutritional contents of the ingredients. Meanwhile, the secondary data were gained through documentation of the locations producing organic ingredients, both rice bran and corn, from governmental and private institutions in Indonesia.

Informants in this study were people or parties that have provided valuable information related to organic feedstuff ingredients (rice bran and corn). The informant choice consideration was purposively established. The data were collected through observation process and subsequently analyzed through nutrition proximate analysis in Nutrition Laboratory, Agricultural and Animal Science Faculty, University of Muhammadiyah Malang to figure out the dry matter, ash, crude protein, extract ether, crude fiber Ca and P with the complete analysis is below.

Ash content: Samples, after preheating, were heated at high temperature. The residue was weighed. Total carbohydrates. Samples were rendered soluble in boiling water. Amylum was converted to soluble carbohydrates. The carbohydrates were hydrolyzed to monosaccharide and subsequently analyzed by the Luff–Schoorl method.

Raw fiber: Samples were boiled in acid and diluted in alkaline solution. Remaining solid substances were incinerated.

Crude fiber: Samples were hydrolyzed with HCl and subsequently extracted with petroleum diethyl ether. The extract was evaporated and the residue was weighed. Moisture: Samples were dried and weighed before and after drying.

Protein: The protein content was determined by the Kjeldahl method. Samples were destructed converting organic nitrogen to ammonium. Ammonium was converted to ammonia. Protein content was calculated from the nitrogen amount. Fatty acids. Fat was saponified and subsequently transformed to fatty acid methyl esters using methanol and BF_3 (alkaline conditions; NEN-EN-ISO 5509:2000, NEN-EN-ISO 5508:1995). The fatty acid methyl esters were analyzed by GC with flame ionization detector. Quantification was carried out using external calibration of reference compounds (Huber & Vijver 2010).

The analysis of the data used descriptive and interpretative analysis of quantitative method through several protocols: (1) *open coding*; (2) *axial coding*; and (3) *selective coding* by carefully explaining the comparison of nutrition contents of organic feedstuff ingredients from various regions in East Java.

Result and discussion

The results of proximate analysis on both organic feedstuff from rice bran and corn are presented in Table 1.

The analysis result of nutritional contents in overall rice bran samples showed that the highest of dry content was gained from Bondowoso (91.15%) while the lowest one was from Mojokerto (89.94%). The highest of ash was gained from Malang (19.98%); while the lowest one was from Bondowoso (7.88%). Rice bran from Bondowoso had the highest of crude protein (11.27%); while another district in Bondowoso also revealed the lowest of crude protein that was 5.22%. The highest of extract ether was gained from Sumenep (11.85%); while the lowest one was from Malang (4.45%). Rice bran from Malang had the highest of crude fiber (24.91%); while the lowest one was from Bondowoso (5.45%).

Table 1. Nutritive content of organic feedstuff.

Ingredients	Dry matter (%)	Ash (%)	Crude protein (%)	Extract ether (%)	Crude fiber (%)	Ca (mg/ 100 g)	P (mg/ 100 g)
Rice bran from Bondowoso 1	91.15	16.29	5.22	9.77	24.31	49.360	24.680
Rice bran from Bondowoso 2	90.28	7.88	11.27	10.89	5.45	49.622	24.811
Rice bran from Mojokerto 1	89.84	9.37	10.88	10.85	7.83	46.490	23.245
Rice bran from Mojokerto 2	90.78	17.57	7.36	4.84	22.32	49.958	24.979
Rice bran from Malang	89.52	19.98	8.20	4.45	24.91	45.954	22.977
Rice bran from Sumenep 1	90.20	9.37	8.68	9.43	15.75	49.330	24.665
Rice bran from Sumenep 2	90.13	8.12	8.71	11.85	10.76	47.949	23.975
Corn from Bondowoso 2	87.96	2.38	8.28	8.52	2.34	25.860	12.930
Corn from Mojokerto 2	85.10	3.15	9.97	8.10	3.39	26.845	13.423
Corn from Malang	88.97	2.22	7.82	9.00	1.78	25.459	12.730
Corn from Sumenep	86.64	2.82	11.75	9.14	2.49	24.877	12.438

The analysis result of calcium and phosphorus in overall rice bran samples showed that the highest of calcium content was gained from Bondowoso (49.622 mg/100g); while the lowest one was from Sumenep (45.954 mg/100g). Meanwhile, the highest of phosphorus content was gained from Mojokerto (24.979 mg/100g); and the lowest one was from Sumenep (22.977 mg/100g).

The results showed nutrient contents or rice bran from all sample was not significant differences with the other research previous such as rice bran contains the energy of 2400 kcal (Ketaren, 2002), 2.400 kcal/kg (Sinurat 1999). Protein rice bran was 12.0% (Ketaren, 2002), 12.0 (Sinurat 1999), 12.63% (Mucra 2005). Carbohydrates of rice bran was 54.6 grams (Anomymous 2013). Moreover rice bran contains fat 4.74% fat (Mucra 2005); 13.82% crude fiber (Ketaren, 2002), 16.27% (Mucra 2005); 0.2% (Ketaren, 2002), 0.20% (Sinurat 1999), 0.51% (Mucra 2005); 1.00% (Ketaren, 2002), 1.0% (Sinurat 1999), and 0.58% (Mucra 2005). Besides, it also contains 0 IU Vitamin A, 0.82 milligrams Vitamin B, and 0 milligram Vitamin C. Comparatively seen on the above explanation, the estimation of nutritional content of rice bran is still considered general. It means that the organic farming could still sustain the nutritional contents despite the absence of chemical fertilizers or pesticides.

It has been showed at the Table 1 that the rice bran from Bondowoso had the best quality containing highest rate of both crude protein and extract ether, but containing low crude fiber. Meanwhile, the rice bran from Mojokerto had the best quality containing the highest rate of both calcium and phosphorus content.

The analysis result of nutritional contents in overall corn samples showed that the highest of dry content was gained from Malang (88.97%); while the lowest one was from Mojokerto (85.10%). The highest of ash was gained from Mojokerto (3.15%); while the lowest one was from Malang (2.22%). Corn from Bondowoso had the highest of crude protein (11.75%); while Malang revealed the lowest of crude protein (7.82%). The highest of extract ether was gained from Sumenep (9.14%); while the lowest one was from Mojokerto (8.10%). Corn from Mojokerto had the highest of crude fiber (3.39%); while the lowest one was from Malang (1.78%).

The analysis result of calcium and phosphorus in overall corn samples showed that the highest of calcium content was gained from Bondowoso (26.845 mg/100g); while the lowest one was from Malang (24.877 mg/100g). Meanwhile, the highest of phosphorus content was gained from Bondowoso (13.423 mg/100g); and the lowest one was from Malang (12.438 mg/100g).

The results showed nutrient contents of corn from all sample was not significant differences with the other research previous such as corn contains a metabolic

energy of 3.430 kcal/g (Purnomo, 2013), 3300 kcal/kg (Ketaren, 2002), 3390 Kcal/Kg (Pasaribu *et al*. 2009); 3.300 (Sinurat 1999), 3.9% fat (Purnomo, 2013), 3.55% (Pasaribu *et al*. 2009), 1% (Auliah 2013), 3,73% (Mucra 2005); 2% crude fiber (Purnomo, 2013), 3.78% (Ketaren, 2002), 2.90% (Pasaribu *et al*. 2009), 3.80% (Mucra 2005); 0.02% calcium (Purnomo, 2013), 0.02% (Ketaren, 2002), 0.02% (Sinurat 1999), 0.37 (Mucra 2005); 0.3% phosphorus (Purnomo, 2013), 0.30% (Ketaren, 2002), 0.3% (Sinurat 1999), 0.23% (Mucra 2005). Despite the relatively low contain of crude fiber, corn still has high protein (8.5%) (Purnomo, 2013), 8.5% (Ketaren, 2002), 8.90% (Pasaribu *et al*. 2009), 8.5% (Sinurat 1999), 9.7% (Mucra 2005); 3.2 mg of vitamin C (Dewanto *et al.* 2002). In spite of containing 8.5% protein, the use of corn as poultry feed is primarily due to the energy consideration. Based on several literatures, corn emerges as the major poultry feedstuff due to its complete contents. The proximate analysis on nutritional content of corn showed there was no difference compared to other literatures, which indicates that organic farming does not drastically change any nutritional contents.Regarding the Table 1, it showed that the corn from Sumenep had achieved the best quality with relatively low crude fiber but containing relatively high rate of crude protein and extract ether compared to other regions. Meanwhile, the corn from Bondowoso had the best quality containing relatively high rate of both calcium and phosphorus contain.

Conclusion

The result of nutritional contents in overall samples: rice bran and corn indicated good outcomes in accordance with general literatures. The rice bran from Bondowoso had the best quality containing the highest rate of both crude protein and extract ether but relatively low rate of crude fiber. Meanwhile, the corn from Sumenep had the best quality containing relatively low rate of crude fiber but high rate of both crude protein and extract ether. In terms of calcium and phosphorus content, the rice bran from Mojokerto had best quality containing the highest rate of calcium and phosphorus. Meanwhile, the corn from Bondowoso had the best quality containing the highest rate of calcium and phosphorus.

Acknowledgement

Gratitude is devoted to Ministry of Research and Technology Directorate General of Higher Education for funding this research. Gratitude is also directed to Directorate of Research and Community Service University of Muhammadiyah Malang for the opportunity to carry out this research.

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