

Chemical Quality of Native Chicken Meat Given a Rationer Containing Fermented Japanese Papaya Leaf Flour (*Cindoscolus Aconitifolius*)

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ABSTRACT

The need for animal protein originating from native chickens is increasing over time. One of the obstacles that farmers often face in raising broiler chickens is the cost of feed. That feed costs are 60-70% of total production costs. Japanese papaya leaves are one of the substitute feeds that can be given to native chickens. However, Japanese papaya leaves must be fermented first. The nutritional content of Japanese papaya leaves in 100 grams, namely: water 85 ml, protein 5.7 grams, iron 11.4 mg, phosphorus 39 mg, calcium 199 mg, potassium 217 mg, vitamin C 165 mg, flavonoids (23.72 %) alkaloids (17.45%), saponins (12.49%) and tannins (5.72%). This research was carried out in two stages, namely in the field and the laboratory, using a completely randomised design with five treatments and three replications, each containing five chickens. The five treatments are Ration, adding 0%, 6%, 12%, 18% and 24% fermented papaya leaf flour. After harvest, chemical analysis of native chicken meat will be conducted at the Basic Laboratory of the Faculty of Agriculture, Warmadewa University. Adding fermented Japanese papaya leaf flour to native chicken feed does not affect the meat quality of native chickens. However, it tends to increase the protein content of the meat even though statistically, it has no significant effect. Using the fermentation method, utilising agricultural waste can improve the quality of feed ingredients.

INTRODUCTION

Native chicken is a local Indonesian chicken that has become embedded in people's daily lives and is used as a source of animal protein. The market for animal protein originating from native chickens has increased over time (Trisnayuni et al., 2019).

Native chicken is a broiler and egg-laying chicken widely cultivated in Indonesia. Native chickens result from a cross between laying hens and male native chickens. Native chickens have a faster growth rate than native chickens (Aenih et al., 2016). Native chickens kept until ten weeks of age have a slaughter weight ranging from 837.5 – 903.8 g (Munira et al., 2016). The characteristics of native chicken are that they can be produced in large quantities with uniform weight, the growth rate is faster than native chickens, they have a low mortality rate, they are easy to adapt to the environment, and their meat has a taste that is no different from native chickens (Kaleka, 2015).

Japanese Papaya leaves are very easy to find, and old leaves are rarely used, even though they contain feed substances that can increase chicken productivity (Muharlieni & Nurgiartiningsih, 2015). Papaya leaves contain the enzyme papain, which can help digestion and absorption of protein but have high levels of crude fiber (Kiha et al., 2012). Too much crude fiber in feed ingredients will speed up the rate of digestion so that it cannot be digested completely (Prawitasari et al., 2012). The crude fiber content in Papaya leaves reaches 14.68%, and the compound gives a bitter taste (alkaloid), so further biological/physical/chemical processing is needed (Siti et al., 2016). Papaya leaves contain tannins, active compounds that act anti-bacterial (Tuntun, 2016). Tannin is an anti-nutritional compound inhibiting nutrient absorption and binding feed protein. The heating process, in general, can reduce the tannin content of feed ingredients (Wahyuni & Sjoftan, 2018). Japanese papaya comes from Yucatan, Mexico, and Central America. They were first discovered in an open forest area. This plant is called Chaya in the area and is used by locals as a vegetable and medicine (Wicaksana, 2012).

Fermentation is a process of change in an organic substrate through the activity of enzymes produced by microorganisms (Suprihatin, 2010). Fermentation is also one of the efforts that can be made to change cheap and low-quality feed ingredients into better-quality feed ingredients (Windari et al., 2014). The use of bacteria in the fermentation process has several advantages. Lactobacillus bacteria can break down proteins into amino acids, but apparently, their ability to increase PK levels is only 4.77% (Mirzah & Muiz, 2015). Fermented products usually have higher nutritional value than the original ingredients. This is not only caused by catabolic microbes that break down complex components into simpler substances that are easier to digest but also because of the enzymes produced by the microbes themselves (Winarno, 2002).

One of the obstacles farmers often face in raising broiler chickens is the feed cost – it is stated that feed costs are 60-70% of total production costs. Innovative efforts are needed to reduce high feed costs by utilizing alternative feed ingredients that are cheap, easy to obtain, and have good nutritional content (Aenih et al., 2016).

From this description, it is necessary to research the chemical quality of native chicken meat given fermented Japanese papaya leaf flour.

LITERATURE REVIEW

Native Chicken

Native chickens result from a cross between laying breeds and native chickens. Native chickens have a faster growth rate than native chickens (Aenih et al., 2016). Native chickens reared until ten weeks of age have a slaughter weight ranging from 837.5 - 903.8 (Munira et al., 2016). Native chickens have the same flavour and carcass appearance as native chickens, which is an added value to native chickens (Kaleka, 2015). The maintenance of native chickens is generally divided into 2 phases: the starter and finisher phases. Native chicken feed must consider metabolic energy (EM) and protein levels. Native chickens require 12% PK nutrition and 2,500 kcal/kg EM during their growth (Setyawan & Sitanggang, 2017). Native chickens have another advantage: high adaptability to various environmental conditions (Mubarak et al., 2018). The performance of native chickens can be maximised because it is supported by several factors, one of which is good or quality feeding.

Nutritional Requirements of Native Chicken

Protein is a complex component consisting of amino acids, essential and non-essential. It is one of the metabolites that need to be considered both in ratio metabolites and in assessing the quality of an ingredient because protein is one of the nutrients livestock needs for body tissue formation. A good balance between protein, essential amino acids and metabolic energy can produce maximum productivity in poultry. Protein is also a body-building substance because it can be used as a source of energy when carbohydrates and fats cannot fulfil the body's energy needs of the bird (Aryanti et al., 2013).

The crude protein requirement of crossbred native chickens in the starter phase is 20%-24%, while for crossbred native chickens in the finisher phase, crude protein is required at 15%-19% (Kaleka, 2015). Energy is the driver of all poultry life activities. By definition, energy results from the oxidation of nutrients (carbohydrates, fats, and proteins) that occur during the metabolic process. The metabolic energy requirement of crossbred native chickens for the starter phase is 2,900 kcal/kg. In contrast, for native chickens in the finisher phase, metabolic energy requirements tend to be lower than in the starter phase (Kaleka, 2015).

Nutritional Content of Native Chicken Meat

Enzymes found in fresh meat can degrade fat and protein, two essential nutrients, leading to the eventual rotting of meat. Because of its high nutrient content, high moisture content, and plenty of vitamins and minerals, meat is prone to spoiling. How meat looks, feels, chews, is soft, smells, and tastes are all significant factors that might affect how consumers evaluate meat's quality at first and later. Moreover, meat products must be evaluated based on their objective qualities, including pH, cooking shrinkage, water-binding capability, and meat colour. The qualities of healthy chicken flesh include the following: The flesh is brilliant white-yellow – not dark, pale, or bluish – and the chicken skin is clean, bright, and white-yellow. The qualities of healthy chicken flesh include the following: The flesh is brilliant white-yellow – not dark, pale, or bluish – and the chicken skin is clean, bright, and white-yellow. The meat feels

juicy and is not sticky (not dry). (4). particular meat smell (no strong, fishy, or unpleasant smell), (5). Dangerous meat, which meets specific criteria, will put consumers' health at risk. Some of these criteria include: (1). sick creatures (2). animals receiving medicine, mainly antibiotics (3). 4. Rotten flesh; and (5) abnormal meat colour. The composition of chicken meat is 20.6% protein, 4.7% fat, 1% ash, and 73.7% water. Sodium, potassium, magnesium, calcium, iron, phosphate, sulphur, chloride, and iodine comprise its 4% mineral composition (Anggorodi, 1995).

Japanese Papaya Leaf (Cindoscolus Aconitifolius)

Papaya leaves are very easy to find, and old leaves are rarely used, even though they contain feed substances that can increase chicken productivity (Muharlieni & Nurgartiningasih, 2015). Papaya leaves contain papain enzymes that can help digestion and absorption of protein but have high levels of crude fibre (SK) (Kiha et al., 2012). Crude fibre that is too high in feed ingredients will accelerate the digestion rate so that it cannot be digested completely (Prawitasari et al., 2012). Papaya leaves contain tannins, active compounds that act antibacterial (Tuntun, 2016). Tannins bind to bacterial cell walls and inhibit the process of protein degradation (Christina et al., 2017). Tannins are antinutritional compounds that can inhibit the absorption of nutrients and bind feed proteins. The heating process can generally reduce the tannin content of feed ingredients (Wahyuni & Sjojfan, 2018). Papaya leaves in the form of flour have a protein content of 20.89%, so that they can be utilised as a protein source and a feed ingredient (Sarjuni & Mozin, 2011). The SK content in Papaya leaves reaches 14.68%, and the compound gives a bitter taste (alkaloid), so further processing is needed biologically / physically / chemically (Siti et al., 2016).

In the Journal of Medicinal Plants Research, the following nutritional content of Japanese papaya leaves in 100 gr, namely: 85ml water, 5.7gr protein, 11.4mg iron, 39mg phosphorus, 199mg calcium, 217mg potassium, 165mg vitamin C, flavonoids (23.72%) alkaloids (17.45%), saponins (12.49%) and tannins (5.72%). The content of flavonoid compounds, coumarin derivatives and others present in plants can counteract oxidative stress in the human body if consumed. These compounds help counteract oxidative stress because they can maintain the balance of oxidants and antioxidants. According to Adeniran et al. (2013), the content of these compounds can provide pharmacological effects, including antimicrobials and antioxidants. Oxidative stress occurs when the antioxidant content is less than oxidants and free radicals in the body (Prasonto et al., 2017). According to Grubben et al. (2004), Japanese papaya leaves contain water, fat, carbohydrates, protein, calcium, phosphorus, β -carotene, iron, thiamine, riboflavin, niacin and ascorbic acid and several types of flavonoids. Similar research by Obichi et al. (2015) found that Japanese papaya leaves contain tannins, phytates, saponins, flavonoids, alkaloids and vitamin C, an antioxidant.

Fermentation

Beneficial alterations are brought about by the fermentation of food materials by microbes. These include increased shelf life and improved nutritional and digestibility of the ingredients. The nutritional content of fermented products is typically higher than that of the original ingredients. This

is caused by the bacteria' enzymes and the catabolic microorganisms that reduce complicated materials into simpler, easier-to-digest forms (Winarno, 2002). Fermentation can lead to advantageous changes in feed quality, including increased digestibility and nutritional content (Lunar, 2012). Another attempt to transform inexpensive, low-quality feed ingredients into more expensive, high-quality feed ingredients is fermentation. One method that can be used to transform inexpensive, low-quality feed components into higher-quality feed ingredients is fermentation (Windari et al., 2014). Microorganisms assist in the process of fermentation. There are several benefits to using bacteria in the fermentation process. Amino acids can be produced from proteins by *Lactobacillus* bacteria. Nevertheless, they can only raise PK levels by 4.77% (Mirzah & Muiz, 2015). Beneficial alterations occur when microorganisms ferment food; these include enhanced food quality in terms of digestibility and nutrients and longer shelf life. The nutritional content of fermented products is typically higher than that of the original ingredients. This is caused by the enzymes that the bacteria make and the catabolic microorganisms that reduce complicated materials into simpler, easier-to-digest forms (Winarno, 2002). A variety of advantageous microorganisms make up Effective Microorganism 4 (EM4). In order to facilitate the easy absorption of the nutrients contained in organic matter, EM4 will speed up the fermentation process. In EM4, some microorganisms are fermented, consisting of four groups of photosynthetic bacterial microorganisms (*Rhodospseudomonas* sp.) and fermentation fungi (*Saccharomyces* sp.).

METHODOLOGY

The study was conducted in a cage for ten weeks at Jalan Sedap Malam, Banjar Kebon Kori Klod, Alley Melati No. 15, Kesiman Village, East Denpasar, Bali. The Faculty of Agriculture's Basic Sciences Laboratory, situated in Tanjung Bungkak, Sumerta Village, East Denpasar District, was used to study the properties of native chicken flesh.

This study used a completely randomised design with five treatments and three replications, each with five hens, to be conducted in the field and the lab. The five methods of treatment are: R0 = Ratios without the fermented papaya leaf flour addition, R1 = Ratio plus 6% of papaya leaf flour that has undergone fermentation, R2 = Ratio plus 12% fermented papaya leaf flour addition, R3 = Ratio plus 18% papaya leaf flour that has fermented, R4 = Ratio plus 24% papaya leaf flour that has undergone fermentation.

After harvest, chemical analysis will be conducted on the native chicken's meat at the Basic Laboratory of the Faculty of Agriculture, Warmadeawa University. The variables observed in this research are fat level, water content, ash content, protein content, and pH.

RESEARCH RESULT

The results of adding fermented Japanese papaya leaf flour to native chickens with various levels of treatment have no significant effect ($P > 0.05$) on

all variables: water content, ash content, protein content, fat content, and pH, as shown in Table 1.

Table 1 Results of Quality Analysis of Super Kampung Chicken Meat Given Various Levels of Addition of Fermented Japanese Papaya Leaf Flour

Observation Variable(%)	Treatment					SEM
	P0	P1	P2	P3	P4	
Water content	74.26 a	73.87 a	73.87 a	73.82 a	73.05 a	0.361
Ash Content	1.29 a	1.40 a	1.27 a	1.48 a	1.42 a	0.088
Protein Content	19.77 a	19.69 a	20.20 a	20.15 a	19.73 a	0.316
Fat level	2.34 a	2.08 a	2.18 a	1.97 a	1.92 a	0.059
pH	5.08 a	5.38 a	5.19 a	5.29 a	5.23 a	0.057

Information:

1. The average value followed by the same letter on the same line shows that the difference is not significant ($P>0.05$)
2. P0: Control ration
 P1: Ration with 6% fermented Japanese papaya leaf flour
 P2: Ration with 12% fermented Japanese papaya leaf flour
 P3: Ration with 18% fermented Japanese papaya leaf flour
 P4: Ration with 24% fermented Japanese papaya leaf flour
3. SEM: (Standard Error of the Treatment Means)

DISCUSSION

The water content obtained in this study averaged 73.05 – 74.26%. Determining water content is to provide a minimum limit or range for the water content in materials (Ministry of Health of the Republic of Indonesia, 2000). From the results of the variance test, the addition of fermented papaya leaf flour did not affect the water content of native chicken meat. Statistically, it was not significantly different ($P>0.05$) between treatments P1, P2, P3 and P4. According to Grubben et al. (2004), Japanese papaya leaves contain water, fat, carbohydrates, protein, calcium, phosphorus, β -carotene, iron, thiamine, riboflavin, niacin and acrobatic acid, as well as several types of flavonoids. According to Anggorodi (1995), the composition of chicken flesh is 73.7% water, 20.6% protein, 4.7% fat, and 1% ash. The range of water content in chicken meat due to this research aligns with his findings. Iron, sulfur phosphate, calcium, magnesium, sodium, potassium, chloride, and iodine comprise chicken meat's 4% mineral composition.

The ash obtained from this study was not statistically significantly different ($P>0.05$) in all treatments. The ash content of native chicken meat given fermented Japanese papaya leaf flour in rations ranges from 1.27 to 1.42%. The ash content analysis aims to determine the amount of ash contained in a material related to the minerals of the material being analysed (Table 5.1). The ash content of native chicken meat as a result of the research is higher than that found by Anggorodi (1995), namely 1%. Fauzi (2006) stated that ash content can be used to determine the nutritional value parameters of a material. Meat is a good source of the mineral Fe (iron). Fermentation can lead to advantageous changes in feed quality, including increased digestibility and nutritional content (Lunar, 2012).

One method that can be used to transform inexpensive, low-quality feed components into higher-quality feed ingredients is fermentation (Windari et al., 2014).

Protein content in the research results for all treatments was not statistically significantly different ($P>0.05$) across all treatments (Table 5.1). The protein content of native chicken meat in treatment P1 with 6% fermented Japanese papaya leaf flour was 19.69%. In treatment P2, with 12% fermented Japanese papaya leaf flour, the meat protein content was 20.20%. In treatment, P3, with 18% fermented Japanese papaya leaf flour, the meat protein content was 20.15%. In treatment P4, with the addition of 24% fermented Japanese papaya leaf flour, the meat protein content was 19.73%. This is based on the opinion of Soepano (1994) and Alberre et al. (2021) that the protein content of broiler chicken meat ranges from 16% - to 22%. Protein content has a negative relationship with fat content. The meat protein levels from the research were classified as usual due to Japanese papaya leaves in the Journal of Medicinal Plants Research. The contents of 100 grams of chicken meat are 85ml water, 5.7gr protein, 11.4mg iron, 39mg phosphorus, 199mg calcium, 217mg potassium, 165mg vitamin C, flavonoids (23.72%) alkaloids (17.45%), saponin (12.49%) and tannin (5.72%). The fermentation process carried out on Japanese papaya leaf flour can reduce crude fiber and improve the quality of feed ingredients; according to Lunar (2012), fermentation can cause beneficial changes such as improving feed quality, nutrients, and digestibility.

Native chicken meat in this study statistically showed results that were not significantly different ($P>0.05$) in all treatments, namely ranging from 1.92 - 2.34 (Table 5.1). Providing fermented Japanese papaya leaf flour did not affect the fat content of native chicken meat. It was still within the normal range, according to the opinion of Alberle et al. (2001), who said the fat content of chicken meat was 1.2% - 12%. The water content of meat also hurts the fat content of meat. The fat in meat is influenced by the ration consumed because the fat in meat is formed from the ration metabolism process. Metabolic processes and nutrient digestion affect meat quality (Gregory, 2010).

Native chicken meat given fermented Japanese papaya leaf flour in the ration was not statistically significantly different ($P>0.05$). The pH of the research results was between 5.19 - and 5.38, according to the opinion of Lawrie (1995), who stated that the final pH of meat indicates good meat quality. Meat that has a pH between 5.5 and 5.7 (normal pH) gives a bright colour. Fermentation can lead to advantageous changes in feed quality, including increased digestibility and nutritional content (Lunar, 2012). One method that can be used to transform inexpensive, low-quality feed components into higher-quality feed ingredients is fermentation (Windari et al., 2014).

CONCLUSIONS AND RECOMMENDATIONS

Adding fermented Japanese papaya leaf flour to native chicken feed does not affect the quality of native chicken meat, but the protein content tends to increase. Using the fermentation method, utilising agricultural waste can improve the quality of feed ingredients.

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