DIGESTIBILITY OF NUTRIENTS AND ANTI NUTRIENT OF GROWING PIGS FED WITH WHOLE FERMENTED TAMARIND SEEDS

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ABSTRACT

Tamarind seeds are nutritious but they have hard seed coats and contain anti-nutrient called tannin. Feed processing, by soaking the seeds in water and fermenting them with soluble carbohydrate, was believed to increase the nutrient content, which should enhance digestibility in pigs. As a continuation of Experiment I, the objective of Experiment II was to evaluate the digestibility of nutrient and anti-nutrient in growing boar pigs fed fermented whole tamarind seeds. Twenty-five of three to four-month-old of growing boar crossbred Landrace were fed with one of the five following dietary treatments in five replicates. The treatments were R0 = diet without fermented tamarind seeds or diet with fermented tamarind seeds, where the seeds were soaked in water for 2 d and fermented with 20% palm juice for 72 h (R1) or 108 h (R2); or the seeds were soaked in water for 4 d and fermented with 20% palm juice for 72 h (R3) or 108 h (R4). The variables measured were the digestibility of nutrient and anti-nutrients of the fermented tamarind seeds. Results showed that R1, R2, R3, and R4 increased nutrient and anti-nutrient digestibility. In short, before fed to pigs whole tamarind seeds should be soaked in water and fermented with palm juice to enhance feed digestibility. It was suggested to soak the seeds in water for 2 d before fermented them with 20% palm juice for 72 h.

Keywords: soaking, borassus palm juice, boar, grower

INTRODUCTION

Tamarind seeds are waste products from the tamarind fruit processing industry with nutrient content of 131.3 g / kg crude protein, 67.1 g / kg crude fiber, and 48.2 g / kg crude fat(1). However, tamarind seeds also have a hard shell structure that is not easily crushed and have anti-nutrients (tannins) that classified as polyphenol compounds with their characteristics that can form complex compounds with other macromolecules and which cause nutrients like protein and carbohydrates not to be digested properly and thus disrupt the absorption livestock growth process becomes less than optimal.

The solution offered is to ferment using a fermentor with preceding soaking. One of the local potentials of East Nusa Tenggara (NTT) that can be used is sap derived from palm

trees (Borassus flabellifer, Linn). According to Cahyaningsih(2), when tapped there was the formation of organic tamarinds and fermentation and amylolytic bacteria namely Leuconoctoc mesenteroides, Leuconoctoc pseudonesenteroides, Lactobacillus fermententum, and Lactobacillus frementum and lactic acid bacteria (LAB) were only found in sap which fell for 24 hours after fermentation spontaneously at room temperature with the highest total LAB at 24 hours is 7.1 x 103 CFU / g. The results of the study by Wea et al.,(3) showed that the processing of whole tamarind seeds by soaking for 2 and 4 days and fermented using 20% and 40% carbohydrates easily dissolved from palm juice for 36, 72, and 108 hours can increase the nutrient content and reduce anti nutrient tannin, but how digestibility, especially for pigs is unknown.

MATERIAL AND METHODS

1. Material

The material used is whole tamarind seeds that have been stored for ± 1 year, palm juice that has been fermented for ± 24 hours(2), grower male pig of Landrace crossbreed is ± 3 months with an average body weight of ± 20 kg, and treatment feed containing ±17% crude protein and ± 3200 kkal/ kg metabolic energy.

2. Methods

General.

The study was preceded by carrying out whole tamarind seeds fermentation using palm juice which was fermented for ± 24 hours(3). The diet is composed of isoprotein and energy according to the needs of grower pigs(4). Pigs fast for ± 24 hours and feed treatment is given for 2 weeks.

Statistic.

This study used a completely randomized design (CRD) with 5 treatments and 5 replications symbolized by R, namely: R0 = Basic ration without tamarind seed fermentation; R1 = Basic ration of 90% + 10% tamarind seeds soak 2 days, palm juice 20%, 72 hours fermentation; R2 = Basic ration of 90% + 10% tamarind seeds soak 2 days, palm juice 20%, fermentation 108 hours; R3 = Basic ration of 90% + 10% tamarind seeds soak 4 days, palm juice 20%, fermentation 72 hours; and R4 = Basic ration of 90% + 10% tamarind seeds soak 4 days, palm juice 20%, fermentation 108 hours. The use of tamarind seeds fermentation with palm juice is 10% of the total ration(5). The statistical model used according to Steel and Torrie(6) is $Yij = \mu + \tau i + \varepsilon ij$. The research variables are nutrient and anti nutrient digestibility (digestibility=(feed substance eaten-feed substance in feces)/feed sebstance eaten)); measured by the total collection method for 1 week, with a period of adaptation for 1 week(7). The results of the research data were analyzed using analysis of variance in RAL patterns and further tests using Duncan Test.

RESULT AND DISCUSSION

The nutrient digestion of Landrace breeds pigs which consume tamarind seeds fermented palm juice is shown in Table 1.

Table 1. Nutritional digestion of male grower of Landrace breeds

Treatments	Nutritional digestions (%)						
	Dry Matter	Organic Matter	Crude Protein	Crude fat	Crude Fiber	Ash	Tannin
R0	89,87±0,69[a]	92,58±5,02[a]	91,88±0,62[a]	97,05±0,26[a]	82,62±1,34[a]	87,42±1,11[a]	87,13±1,29[a]
R1	86,22±4,34[a]	89,40±2,94[a]	89,83±4,09[a]	95,26±2,07[b]	74,74±9,35[a]	82,05±8,23[a]	68,36±5,90[b]
R2	88,51±1,99[a]	90,74±2,47[a]	91,99±1,81[a]	96,50±0,82[ab]	80,19±4,28[a]	83,67±4,12[a]	82,97±3,48[a]
R3	88,11±0,94[a]	90,10±2,00[a]	92,03±0,81[a]	96,90±0,37[a]	80,03±1,97[a]	84,13±1,81[a]	80,75±1,52[ab]
R4	87,91±1,72[a]	90,49±1,00[a]	91,54± 1,61[a]	97,25±0,51[a]	82,12± 3,06[a]	83,36± 3,25[a]	84,89±0,93[a]

Description: Different superscripts on the same column show significant differences (P <0.01)

Based on Table 1 it is known that the results of statistical analysis show that the use of tamarind seeds fermentation in the ration had no significant effect (P> 0.05) on the digestibility of dry matter, organic matter, crude fiber, and ash digestibility, but significantly (P <0.05) on digestibility of crude fat, Ca, P, and digestibility of tannins. The digestibility of dry matter of palm juice fermented tamarind seeds in this study was higher ranging between 86.22 ± 4.34% -89.87 ± 0.69% compared to the results of the study on the local pig grower phase which consuming spontaneously fermented tamarind seeds which ranged from 69.798% (5). The high digestibility of dry matter in this study was caused by the tamarind seeds used had undergone soaking and fermentation using palm juice so that the seed husk and seed contents expand and nutrients become more available when consumed by pigs that have an impact on the high digestibility of organic and organic matter.

The organic matter digestibility of tamarind seeds processed by soaking and fermentation of palm juice in this study ranged from 89.40 ± 2.94-90.74 ± 2.47% indicating that the rations consumed could be properly digested to match the tamarind-free rations. This is because even though the rations consumed contain tamarind seeds, the tamarind seeds have been processed by fermentation using an easily soluble carbohydrate fermenter in the form of palm juice which is preceded by initial soaking so that nutrients become more available. The availability of nutrients is caused by the activity of microorganisms in the form of lactic acid bacteria contained in the tamarind seeds consumed. The presence of these bacteria in the digestive tract will provide a lower pH so as to limit the presence of pathogenic microorganisms in the digestive tract to develop and utilize existing nutrients so that available nutrients in the form of organic and organic matter are truly utilized by livestock.

The average crude protein digestibility ranged from 89.83 ± 4.09-91.99 ± 1.81% higher than the crude protein digestibility of local grower pigs (79.82%) consuming spontaneously fermented tamarind seeds in rations(5). This difference is due to differences in the ration, tamarind seed processing is given, livestock type, and the environment when the study was conducted.

Digestion of crude fiber also matches control pig. This ability is due to the tamarind seeds consumed have been immersed which results in the contents of the seeds expanding as well as the epidermis which contains a lot of tannins and coarse fibers to peel and dissolve. Furthermore, with the addition of palm juice as a source of easily soluble carbohydrates, the nutrient components bound in the form of complex bonds become separated into simple bonds and are easily utilized by fermenting microorganisms. This situation results in the crude fiber available in free form can be easily digested by enzymes in the digestive tract of pigs. Wea et al.,(5) found that the digestibility of crude fiber of local grower pig which consumed 10% spontaneous tamarind fermented seeds in rations was 46.551% lower than the results of this study. The fermenter will compete freely with other microorganisms, while this fermentation uses fermenters derived from carbohydrates which are easily dissolved from palm juice so that the developing microorganisms are microorganisms that are definitely LAB so that the results become more maximal.

Ash digestibility in this study was 53.40% higher than that of Wea et al. (5) in a local male pig Timor who consumed 10% spontaneous bioconversion tamarind seeds in the ration. Likewise in the results of the study of Wea et al.,(8), namely 45.74% -63.58% in pigs that consumed tamarind seeds which were spontaneously converted for 24-96 hours. This fact illustrates that in order to produce the good nutritional quality of feed ingredients it is necessary to use a fermenter in the fermentation process. The crude fat digestibility of this study ranged from 95.26 ± 2.07-97.25 ± 0.51% higher than the crude fat digestibility of male

grower local pig livestock results of research by Wea et al.,(8) who consumed spontaneous fermented tamarind seeds for 24 , 48, 72, and 96 hours and given 20% in rations (ranging from 49.19% to 71.65%). One of the basic things that cause a difference is the method of fermentation and the percentage of tamarind seeds used in the ration. Spontaneous fermentation does not use fermenters and microorganisms that develop are highly dependent on the substrate and the fermentation environmental conditions and the use of tamarind seeds with a high percentage (20%) in the ration results in the accumulation of tannins which are less digested by livestock.

Tamarind seed tannin digestibility was not significantly different (P> 0.05) between pigs consuming basic rations without the processing of tamarind seeds with tamarind seed preparations by 2-day soaking and 20% fermented palm juice for 108 hours and tamarind seeds processed by soaking 4 days and fermentation of 20% palm juice for 72 hours and soaking 4 days of fermented palm juice 20% for 108 hours. Likewise, there was no significant difference (P> 0.05) between processed tamarind seeds by soaking 2 days of fermentation of 20% palm juice for 72 hours with processed tamarind seeds by 4 days of fermentation soaking palm juice 20% for 72 hours. However, there were significant differences (P <0.05) between the digestibility of tamarind seeds processed by soaking 2 days of fermentation of palm juice 20% for 72 hours with 3 other processed methods. This shows that the processing of whole tamarind seeds by 2 and 4 days soaking, fermentation using 20% palm juice for 72 and 108 hours can increase the digestibility of tannins. Efficient processing is 2 days soaking and 72 hours fermentation, stated thus because the administration of fermented tamarind seeds in rations can be digested well by pigs because the whole tamarind seeds used are processed by soaking and fermentation so the tannin content decreases. The tannin digestibility in this study ranged from 68.36 ± 5.90-84.89 ± 0.93% higher than the results of the Wea et al.,(5) study i.e. 52.620% in local male grower pigs that consumed 10%

tamarind seeds spontaneous fermentation in rations. This is because the tamarind seeds processed in this study have undergone a process of soaking and fermentation using palm juice so that the amount of tannin has been dissolved. This situation causes the available tannins to be tannins which are already in free bonds so that they are easily digested by pigs.

Broadly speaking, it can be explained that whole tamarind seeds which have undergone processing by soaking and fermentation use soluble carbohydrates as long as the palm juice undergoes structural changes which result in complex bonds between tannin anti-nutrients and other nutrients such as carbohydrates and proteins and other nutrients released into bonds simple so that it is easily digested by livestock and involves the reaction of enzymes produced by microorganisms to change both physical and chemical complex organic materials such as proteins, carbohydrates, and fats into simpler molecules(9). Besides experiencing structural changes, the tamarind seeds fermented of palm juice consumed also contain LAB. This causes the digestibility of feed to increase in the digestive tract of livestock and increase absorption of nutrients.

CONCLUSION

Based on the discussion it was concluded that soaking and the use of soluble carbohydrates as long as the palm juice can improve the nutrition digestibility of pigs.

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