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Nutrition content of cocoa pod fermented white rot fungi isolate from wood and rice straw

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Abstract. This study aims to determine the content of crude protein, crude fiber, crude fat, and NFE cocoa pods of fermented using white rot fungi isolates from wood and rice straw. This study used white rot fungi isolates from wood and rice straw. The design used is a Completely Randomized Design consisting of 3 treatments repeated 5 times, namely A (Cocoa pod without fermentation), B (Cocoa pod fermented fungus isolates from wood), and C (Cocoa pod fermented fungus isolates from rice straw). Analysis of variance showed that the treatment had a very significant effect ($P < 0.01$) on crude protein and crude fiber and had no significant effect ($P > 0.05$) on crude fat and NFE of cocoa pod. Fermentation of cocoa pods using white rot fungi isolates from wood can increase crude protein content by 5.30% and reduce crude fiber by 12.54% to 19.35%. Fermentation treatment using white rot fungi isolates from wood is better than isolates from rice straw. The isolates can improved the nutritional quality of the pod cocoa compared to fermentation using isolates from rice straw.

1. Introduction

The main problem of livestock business in Indonesia is the lack of available land to grow animal feed and in the dry season, farmers have difficulty in providing inexpensive and high-quality forage feed. Therefore an alternative feed is needed by utilizing Agroindustrial waste as feed. Indonesia as an agrarian country has abundant agricultural potential including plantation products, when the production of abundant plantations also produces a lot of waste. One of the plantation wastes that can be utilized is cocoa pod. Based on the field survey, the cocoa pods were only thrown away, without anyone making use of them. The availability of cocoa pods is around 75% of one whole cocoa fruit, 23% cocoa beans and 2% placenta [1]. In terms of the nutritional content of cocoa pods can be used as feed because they contain 6.00-10.00% crude protein, 19.00-28.00% crude fiber, 0.50-1.50% crude fat and 50.00-55.60% NFE [2]. The use of cocoa pods as feed needs to be processed, because the cocoa pods have low nutrients, lignin and theobromine which can cause poisoning in livestock. One way to increase the nutritional content of feed by fermentation using fungi isolates [3], the process of fermentation of feed ingredients by microorganisms causes beneficial changes such as improving the quality of feed ingredients from aspects of nutrition, digestibility and increasing storage capacity. Therefore a study was carried out using wood rot isolates from wood and rice straw to improve the quality of cocoa pods.

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2. Materials and methods

The materials used in this study were fungi isolates from wood and rice straw (Figure 2), cocoa pods, bran, lime, and chemicals for proximate analysis. The tools used in this study are autoclaves, cutting boards, analytical balance and tools used for proximate analysis.



Figure 1. Rot Fungi used, a) Isolate from wood; b) Isolate from rice straw

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This study uses a completely randomized design [4], consisting of 3 treatments and each treatment was repeated 5 times. The treatments in this study are:

A = Non-fermented Cocoa pod (control)

B = Cocoa pod fermented rot fungi Isolate from Wood

C = Cocoa pod Fermented rot fungi Isolate from Rice Straw

This research was conducted in two stages, the first stage was fermentation. Before fermentation, mushroom isolation is carried out from wood and rice straw. The isolation method used refers to [5], scissors cleaned with 70% alcohol, then a portion of the fungus heenium (where basidiospores are formed), cut into small pieces. The piece is dipped in a sterile distillation aqua, then dipped in 70% alcohol, then dipped again in a sterile distillation aqua, then placed on sterile filter paper in a petri dish that has been roasted, then the piece is incubated at 300C, for 2 -3 days. The growing fungus colony was taken with tweezers and transferred to a petri dish containing the medium Potato Dextro Agar (PDA). Purification: isolates were taken from petri dishes containing a single colony of fungi that had grown. The treatment is repeated several times until a completely pure mycelium is obtained. Making media (F0), which is a place for fungal growth with 92% cocoa skin substrate, 6% bran, and 2% lime, then added water to 70% levels until mixed homogeneous [6]. Then put in an observation bottle, each observation bottle (height 9 cm and diameter 5 cm) filled 50 grams, then tightly closed and sterilized in an autoclave at a temperature of 1210C with a pressure of 1 atmosphere for 1 hour, as much as 2 times until all spores and microbial disruptors really dead. Inoculated the next day when the media had cooled. After chilling, 5 cuteborer isolates from petri dishes were put into bottles and mixed with substart. The bottle is then closed so that the entire substrate reaches the bottom of the bottle until it is covered by mycelium (spawn). Observed regularly so as not to be contaminated by the growth of other microorganisms. After that the organic media (F1) was made mixed with 92% cocoa pods, 6% bran, and 2% lime, then added water until 70% levels were mixed evenly. The growing media is packed in 50 gram glass bottles, then compacted and put into an autoclave at 1210C at a pressure of 1 atmosphere for 1 hour, 2 times. Let stand for 12 hours before inoculation is done. Fungal isolates that have been grown in organic media (F0) are inoculated into the plating medium at a level of 10% by weight of the substrate (B / B). Furthermore, the proximate test is crude protein, crude fiber, crude fat and NFE [7].

3. Result and discussion

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The average content of crude protein, crude fiber, crude fat and NFE of fermented cocoa pods using rot isolates from wood and rice straw in Table 1.

Table 1. Nutrition Content of Cocoa pod Fermentation Fungi Isolates from Wood and Rice StrawWood and Rice Straw

Parameter (%)	Treatment		
	A	B	C
Crude Protein	5,62 ^a ±0,82	10,46 ^b ±2,52	8,96 ^b ±2,84
Crude Fiber	36,74 ^a ±1,14	17,22 ^b ±8,83	24,03 ^b ±3,79
Crude Fat	4,59±1,00	2,39±1,87	2,54±2,21
NFE	26,70±1,79	34,92±12,08	35,41±7,00

Different superscripts in the same row show a real difference ($P < 0.05$); A = Cocoa pod without fermentation; B = Cocoa pod fermented rot fungi Isolate from Wood; C = Cocoa pod fermented rot fungi Isolate from rice straw.

The results of the analysis of variance showed that the fermentation treatment using fungal isolates had a very significant effect ($P < 0.01$) on crude protein content and crude fiber but had no significant effect ($P > 0.05$) on the crude fat content and NFE of cocoa pod husk. Duncan test results showed that the treatment without fermentation (control) was significantly different ($P < 0.05$) with the treatment fermented with fungal isolates from wood (B), and fungal isolates from rice straw (C), but the B and C treatments were no different. crude protein content and crude fiber of cocoa pod.

Table 1. shows that cocoa pods fermented with fungal isolates from wood were able to increase crude protein content by 5.30%, reduce crude fiber 19.35%. The increase in crude protein is thought to be caused by the fermentation process by fungi isolates from wood and rice straw producing enzymes that are able to increase the crude protein from the cocoa pods. According to [3] the fermentation process of feed ingredients by microorganisms causes beneficial changes such as improving the quality of feed ingredients from aspects of nutrition, digestibility and increasing storage time. Fermented products usually have a higher nutritional value than the original ingredients because of the enzymes produced from the microbes themselves. The decrease in crude fiber content, probably caused by the ability of rot fungi isolated from wood to produce enzymes that degrade fiber more than fungi isolated from rice straw. [7] state that fungi produce ligninase an enzyme that can decompose lignin compounds, whereas cellulase is an enzyme that can decompose cellulose. [8] large amounts of fungus can be found in wood and cause damage in the form of weathering. The fungus has very strong cellulotic activation. Life can be on wood and trees that are still alive, or wood that has died.

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