Nutritional Content of Fermented Cassava (*Manihot esculenta crantz*) Peel Using Cattle Rumen Waste

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Abstract

This research aims to determine the effect of cow rumen waste on the nutritional value of cassava skin by increasing the values of dry matter content, crude fibre content and soluble protein content. This study used a unidirectional, completely randomized design (CRD) with four treatments and four replications. Then, the analysis was repeated two times. Fermentation was carried out for seven days. The treatment is P0 = 50 gram cassava peel + 14% bran + 2% molasses + 0% rumen waste, P1 = 50 gram cassava peel + 14% bran + 2% molasses + 2% rumen waste, P2 = 50 gram cassava peel + 14% rice bran + 2% molasses + 4% rumen waste, P3 = 50 gram cassava peel + 14% bran + 2% molasses + 6% rumen waste. The parameters observed in this study were the Dry Matter content (DW), Crude Fiber content (SK), and Soluble Protein content (PT). The results of measuring the dry matter content of P0, P1, P2 and P3 were achieved respectively, 33.92%, 38.88%, 43.20% and 51.20%. The crude fiber content results P0, P1, P2, P3 were achieved respectively at 0.41%, 0.72%, 1.16% and 1.49%. The results of dissolved protein levels P0, P1, P2 and P3 were achieved respectively at 5.11%, 5.17%, 5.73% and 7.20%. The research concluded that fermentation for seven days using cow rumen waste significantly affected the dry matter content, crude fibre content and soluble protein content of cassava peel.

Keywords :Fermentation, Cassava Skin, Cow rumen waste

Introduction

The livestock industry must be distinct from a series of maintenance management, and its success is influenced by various aspects, one of which is feed. Feed contributes to determining livestock performance, such as increasing body weight and health due to its nutrient content. Feeding is adjusted to the abilities and needs of the livestock being developed. For example, ruminants require several types of feed, including forage, concentrate and additional feed if necessary. Breeders have widely used additional or additive feed because most of it comes from waste products, including cassava peel.

Indonesia can produce woody cassava of 22,906,118 tons/ha/year (BPS, 2015) to increase the cassava peel population. Giving cassava skin to ruminant livestock can help reduce feed costs due to the relatively cheap price of cassava skin because it is a waste, but it is important to pay attention that when providing feed, you must also take into account sufficient nutrient content in cassava skin the nutrient content contained is not optimal enough. Such as low crude protein and high fibre do not have an optimal effect on livestock growth; technology is needed to increase the nutrient content of cassava skin, one of which is fermentation.

Fermentation is the process of curing a substrate that is low in nutritional value with the help of microorganisms such as bacteria that produce enzymes that degrade complex

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nutrients to produce simple nutrients easily absorbed by livestock. Commercial products containing degrading bacteria are quite common and easy to obtain. Still, most of them have quite high selling prices, so there is a need for alternative fermentation microorganisms based on production waste with the ability to degrade complex nutrients, one of which is by utilizing cow rumen waste from slaughterhouse waste.

Cow rumen waste is a solution resulting from the feed digestion process. This waste contains many degrading microorganisms with the ability to produce decomposing enzymes, so it has the potential to be used for a fermentation process that is cheap and easy to obtain because it is a by-product of the slaughterhouse (RPH) industry. The enzymes such as cellulase, amylase and protease produced by several bacteria will break down complex chains of cassava peel waste nutrients such as fibre and starch, which are converted into glucose and proteins into amino acids.

Based on the above background, the researcher intends to use slaughterhouse waste, such as cow rumen waste, as decomposing microorganisms in the fermentation of cassava skin to increase its nutritional value.

Materials and methods

Research materials

The equipment used in this research is a knife for peeling cassava skin, 500 ml thin wall plastic as a fermentation container, a Camry brand electric scale with a sensitivity of 0.001 for weighing the sample, an Ohaus for weighing the sample, a Rack for placing the measuring flask, Oven as a heating device, Micropipette is a tool for moving small amounts of waste, Bluetip as a tool for taking micro quantities of the solution, Ice flask as a container for rumen waste, Cotton cloth for filtering rumen waste, Petri dish as a place for weighing samples, Desiccator for cooling after leaving the Oven, Glass measuring to measure the volume of the solution, measuring flask as a container for diluting the solution, funnel as a tool to move the solution to another place, 5 ml scale pipette, suction pump, 50 ml, 100 ml measuring cup, 50 ml Erlemeyer and 100 ml test tube.

The materials used are 800 grams of cassava peel to ferment microorganisms, 24 grams of cow rumen waste as microbes, 14% rice bran, and 2% molasses as additional substrates.

Experimental design

This study used a unidirectional, completely randomized design (CRD) with four treatments and four replications. Then, the analysis was repeated two times. Fermentation was carried out for seven days. The treatment is as follows:

P0 = Cassava peel 50 grams + 14% bran + 2% molasses + 0% rumen waste P1 = Cassava peel 50 grams + 14% bran + 2% molasses + 2% rumen waste

P2= Cassava peel 50 grams + 14% rice bran + 2% molasses + 4% rumen waste

P3= Cassava peel 50 grams + 14% rice bran + 2% molasses + 6% rumen waste

Observed parameters

The parameters observed in this study were the Dry Matter content (DM), Crude Fiber content (CF), and Soluble Protein content (SP).

Data analysis

The data obtained were processed statistically using analysis of variance (ANOVA) based on a completely randomized design (CRD) with a unidirectional pattern. If the results of the variation test are different or have an effect, then a further test is carried out using Duncan's multiple area test (Mulyono, 2010).

Results and Discussion

The ANOVA test showed that fermentation results using cow rumen waste significantly affected the dry matter of cassava peel (P<0.05). The average content of dry matter, crude fibre, and soluble protein produced shows differences between treatments in Table 1.

Tabel 1. Average dry matter, crude fiber and soluble protein of Cassava Skin (Manihot esculenta crantz) Fermented Cow Rumen Waste

Parameter	Average data (%)			
	P0	P1	P2	P3
Dry ingredients (%)^{abc}	33.92^{a}	38.88^{ab}	43.20^{b}	51.20^{c}
Crude Fiber (%)^{abc}	0.41^{a}	0.72^{ab}	1.16^{bc}	1.49^{c}
Soluble protein (%)^{ab}	5.11^{a}	5.17^{a}	5.73^{a}	7.20^{b}

Note : ^{a,b,c} Different superscripts indicate significant differences (P<0.05)

Dry material

The average dry matter P0 was 33.92%, P1 was 38.88%, P2 was 43.20% and P3 was 51.20%. The statistical analysis shows that fermented cassava peepeelsing 0-6% of cow rumen waste significantly affects dry matter content. The dry matter content of cassava peel without fermentation is only 17.45% (Nurlaili et al., 2013; Simbolon et al., 2016). The increase in fermentation dry matter is due to the spontaneous fermentation process from the decay of cassava skin in the cassava skin which changes chemical conditions; carbohydrates become alcohol and organic acids; these conditions are to the statement from Wilkinson (1988), Muni et al. (2021) that fermentation can occur without the role of additional microorganisms because microorganisms in the decaying substrate will change their chemical value, such as carbohydrates which turn into alcohol, organic acids, water and CO2.

The results of previous research conducted by Prasetya (2020) produced dry rice husk material fermented for seven days, which was not significantly different from the results of P0 treatments of 93.03%. P1 was 93.96%, and P2 was 93.59%, while the results of the average dry matter content of cassava peel fermented for seven days using cow rumen waste were able to increase the dry matter due to the type of substrate in the form of cassava peel which is higher in nutrients than rice husks. And rumen waste has numerous kinds of bacteria, so dry matter increases due to the more numerous and complex microorganisms in the cow's rumen waste.

Temperature is an indicator of the success of the fermentation process. The results of measuring the fermentation temperature P0 showed an increase from before fermentation of 28^{O}C to 30^{O}C; changes in temperature P1, P2 and P3 tended to be stable or even decreased, as in P0 before fermentation, the temperature obtained was 29^{O}C which was stable after fermentation took place to 29^{O}C, P2 before fermentation reaches a temperature of 30^{O}C to 29^{O}C and P3 changes the temperature which decreases from 31^{O}C to 30^{O}C. The ability of cow rumen to influence this condition of waste microorganisms to touch cassava skin so that the activities carried out during the fermentation process are less than optimal because the resulting temperature does not increase. This condition is by the statement of this condition, supported by the statement from Ratnakomala (2009) in Widodo (2014) that the fermentation process tends to increase the temperature of the feed due to the living activity of microorganisms on an occupied substrate.

PH is also an indicator of the success of the fermentation process, which is characterized by a decrease in the fermentation pH; the lower the pH number indicates, the higher the acidic conditions, the acidic conditions are produced by acidic bacteria, which are formed through the fermentation process of substrates with high water content resulting in the formation of acid which is characterized by The decrease in pH also occurs along with the high water content of the substrate. The pH results of research for P0, P1, P2, and P3 before fermentation had the same pH, namely 4, but after fermentation, the pH increased simultaneously to 5.

Crude Fiber (CF)

The average crude fibre content of P0 was 0.41%, P1 was 0.72%, P2 was 1.16 and P3 was 1.49%. %. The statistical analysis shows that fermented cassava skin using 0-6% cow rumen waste significantly affects crude fibre content.

Unfermented cassava skin has a crude fiber content of 15.20% (Sari and Astili, 2018). This condition is caused by the decomposition of bacteria originating from cassava skin, which can change the fibre structure for the better because the living conditions of bacteria originating from the original substrate will be better than the addition of bacteria from outside; this is supported by the statement from Yunilas et al., (2013) that Microbes originating from the substrate itself have a high ability to degrade the substrate because they are accustomed to their natural living environment.

The results of increasing crude fibre content are the same as the results of research from Haq et al. (2018) on palm fronds using a cow rumen bioactivator, which resulted in an increase in crude fibre due to the addition of fermentation components such as rice bran and molasses which supply the silage liquid with increased crude fibre levels. These results are similar to those obtained from crude cassava peel fibre, which adds bran and molasses components to fermentation.

Soluble Protein

The mean dissolved protein content of P0 was 5.11%, P1 was 5.17%, P2 was 5.73%, and P3 was 7.20%. %. The statistical analysis results show that cassava peel fermented using 0-6% cow rumen waste significantly affects soluble protein levels. This condition is caused by the number of proteolytic bacteria in cow rumen waste being able to produce sufficient protease enzymes to break down proteins into amino acids so that the number of cell components is greater, as shown in the dissolved protein test; this is confirmed by the statement from Onweluzo and Nwabugwu, (2009) in Martono et al., (2016) that the increase in dissolved protein during the fermentation process is caused by microbes hydrolyzing complex proteins into amino acids as a result of the performance of proteolytic enzymes.

The protein results are different from those carried out by Haq et al. (2018), who fermented palm fronds using a cow rumen bioactivator, which produced decreased protein resulting from the low number of bacteria in the cow rumen bioactivator, resulting in the protein not being degraded into amino acids and the temperature being low. High from the fermentation process.

Conclusion

The conclusion obtained from this research is that fermentation for seven days using cow rumen waste significantly affects the dry matter content, crude fibre content and soluble protein content of cassava peel.

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