Changes in Ash, Crude Fiber and Crude Fat Content by Bioconversion of Raja Banana (Musa paradisiaca) Peel with Rhizopus Oligosporus

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Abstract

This study aims to determine the effect of inoculum dose treatment with the fermentation time of plantain peel (Musa paradisiaca) on changes in ash, crude fiber and crude fat. This research was carried out using waste plantain peel (Musa paradisiaca) with tempeh yeast as the inoculum. The design used was a Completely Randomized Design (CRD) with 9 treatments and 3 replications. The treatments given were: P1: 0.2% inoculum dose and 48 hour fermentation time, P2: 0.4% inoculum dose and 48 hour fermentation time, P3: 0.6% inoculum dose and 48 hour fermentation time, P4: dose 0.2% inoculum and 96 hour fermentation time, P5: 0.4% inoculum dose and 96 hour fermentation time, P6: 0.6% inoculum dose and 96 hour fermentation time, P7: 0.2% inoculum dose and fermentation time 144 hours, P8: 0.4% inoculum dose and 144 hour fermentation time, P9: 0.6% inoculum dose and 144 hour fermentation time. The results of the diversity analysis showed that the treatments had significantly different effects ($P<0.05$) on the ash, crude fiber and crude fat content. The Honestly Significant Difference Test (BNJ) showed that the percentage of ash content in treatment P8 was not significantly different ($P>0.05$) from treatments P9 and P5, but was significantly different ($P<0.05$) compared to treatments P6, P7, P4, P2, P3 and P1. The percentage of crude fiber content in treatment P9 was not significantly different ($P>0.05$) from treatment P5, but was significantly different ($P<0.05$) compared to treatments P6, P8, P3, P2, P7, P4 and P1. The percentage of crude fat content in treatment P9 was not significantly different ($P>0.05$) from treatments P8 and P6, but was significantly different ($P<0.05$) compared to P5, P4, P2, P7 and P1. It can be concluded that bioconversion of plantain peel (Musa paradisiaca) with Rhizopus Oligosporus can increase ash content, reduce crude fiber and crude fat content, where an inoculum of 0.4% and fermentation time of 96 hours is the best combination by producing an increase in ash content of 18.38 % and a decrease in crude fiber content of 18.38% and a decrease in crude fat content of 17.33%.

Keywords: plantain peel, bioconversion, Rhizopus Oligosporus.

I. INTRODUCTION

Feed is a very important factor in livestock business. The biggest expense in a livestock business is feed. The biggest cost in a livestock business is the cost of feed, because generally the ingredients that make up chicken feed are corn, fish meal and soybeans, where the amount needed for these ingredients is higher than their availability, resulting in the ingredients being imported at relatively higher prices. expensive.

One way that can be taken is by utilizing local resources which are abundant, cheap, do not compete with human needs, are available continuously and contain the food substances needed by livestock. To overcome this, it is necessary to use unconventional ration ingredients such as agricultural waste. One of the agricultural wastes that has not been utilized optimally is plantain peel, which has not been widely used as a constituent of poultry rations because its nutritional value is low.

Plantain peel (Musa paradisiaca) is waste from food products that are not used and can only have a negative impact on the environment. Plantain peel (Musa paradisiaca) has great potential to be developed as a feed ingredient because it is quite available, but the problem is its low nutrient content. An alternative to improving the quality of nutrients is by fermentation, because the fermentation process can improve the quality of the original material. Udjianto [1] stated that banana peels fermented with prebiotics can increase the crude protein content by up to 14.88% and decrease crude fiber by up to 11.43%. %. The results of research by [2] stated that the crude fiber content in fermented Kepok banana peel flour decreased from 18.71%

before fermentation to 15.75% after fermentation. Fermentation can increase the crude protein content and reduce the crude fiber content [3].
Based on this background, research has been carried out to determine changes in the ash, crude fiber and crude fat content of plantain peel flour fermented with Rhizopus Oligosporus.

II. MATERIALS AND METHODS

Place and time of research
This research was carried out at the Nutrition and Feed Technology Laboratory, Faculty of Animal Husbandry, Unsrat Manado, for 3 weeks.

Tools and materials
The equipment used in this research was a gas stove, steamer, plastic bags, scales, blender and drying oven.The materials used in this research were plantain peel and tempeh yeast

Research design
This fermentation research was carried out experimentally using a completely randomized design consisting of 9 treatments and each treatment consisted of 3 replications. Treatment consists of a combination of inoculum dose and fermentation time, namely:
P1: inoculum dose 0.2% and fermentation time 48 hours,
P2: inoculum dose 0.4% and fermentation time 48 hours,
P3: inoculum dose 0.6% and fermentation time 48 hours,
P4: inoculum dose 0.2% and fermentation time 96 hours,
P5: inoculum dose 0.4% and fermentation time 96 hours,
P6: inoculum dose 0.6% and fermentation time 96 hours,
P7: inoculum dose 0.2% and fermentation time 144 hours,
P8: inoculum dose 0.4% and fermentation time 144 hours,
P9: inoculum dose 0.6% and fermentation time 144 hours..

Research procedure
1. Making tempeh yeast inoculum
A total of 320 grams of tempeh yeast was inoculated with 80 grams of plantain peel which had been made into flour, stored in a sterilized jar so that it was not contaminated with other microorganisms.
2.Plantain peel fermentation process
- The selected banana peel is washed with clean water, then cut into 2 cm pieces
- Steam the cut banana peels for 15 minutes, counting after the water boils.
- Steamed banana peels, spread on a tray and aired. Once cool, put it in a plastic bag.
- inoculate with tempeh yeast inoculum according to the treatment (0.2%, 0.4% and 0.6%) with 400 grams of plantain peel. Mix until homogeneous, and put it in a bag that has been perforated on both sides to obtain aerobic conditions.
- incubate at room temperature (25^0C - 28^0C) for 48 hours, 96 hours and 144 hours. Each treatment was repeated 3 times.
- after the fermentation time has been reached, the fermented product is dried using an oven at 60^0C for 72 hours (until a constant weight is obtained)
- test the nutritional content of fermented products through proximate analysis [4]

Variables Measured
The variables measured are changes in ash content, changes in crude fiber content and changes in crude fat content, which are calculated according to the equation:

$$\text{Change in nutrient composition (\%)} = \frac{K_2 - K_1}{K_1} \text{ x } 100\%$$

Information:
K1 = Nutrient components (ash, crude fiber, crude fat) before fermentation
K2 = Nutrient components (ash, crude fiber, crude fat) after fermentation

III. RESULTS AND DISCUSSION

Table 1 displays the typical changes in nutrient content (ash content, crude fiber content, and crude fat content) that occur during the bioconversion of plantain peel (Musa paradisiaca) by the mold Rhizopus oligosporus. Ash Content as a Function of Treatment Table 1 depicts the typical variation in the amount of ash present in plantain peel (Musa paradisiaca) when the mold Rhizopus oligosporus was present. From 8.20% to 42.74%, the ash content changed in percentage. The least typical rate change in debris content was gotten in treatment P1, in particular an inoculum portion of 0.2% and a maturation season of 48 hours, while the most elevated rate change in debris content was in treatment P8, specifically an inoculum portion of 0.4% and an aging season of 144 hours. The consequences of the variety examination showed that maturation treatment of plantain strip (Musa paradisiaca) with the form Rhizopus oligosporus made an essentially unique difference ($P<0.05$) on changes in debris content. According to the Honestly Significant Difference Test (BNJ), the change in ash content in treatment P8 was significantly different ($P<0.05$) from treatment P1, treatment P1 was significantly different ($P<0.05$) from treatment P5, treatment P6, treatment P8, and treatment P9, but it was not significantly different ($P>0.05$) from treatment P2, treatment P3, treatment P4 and treatment P7.

Tabel 1. Perubahan Komponen Nutrien Hasil Fermentasi

Perlakuan	Perubahan Komponen Nutrien (%)		
	Abu	Serat Kasar	Lemak Kasar
P1	8.20^{d}	12.75^{c}	13.58^{d}
P2	12.61^{d}	15.55^{c}	14.02^{d}
P3	12.12^{d}	16.01^{c}	16.01^{bc}
P4	16.18^{cd}	14.31^{d}	14.68^{cd}
P5	37.36^{ab}	18.33^{a}	17.33^{bc}
P6	28.26^{bc}	17.69^{b}	18.21^{ab}
P7	18.51^{cd}	15.53^{c}	13.68^{d}
P8	42.74^{a}	17.20^{b}	20.20^{a}
P9	40.17^{a}	18.63^{a}	21.08^{a}

Information: P1: 0.2% inoculum dose and 48 hour fermentation time, P2: 0.4% inoculum dose and 48 hour fermentation time, P3: 0.6% inoculum dose and 48 hour fermentation time, P4: 0 inoculum dose, 2% and fermentation time 96 hours, P5: inoculum dose 0.4% and fermentation time 96 hours, P6: inoculum dose 0.6% and fermentation time 96 hours, P7: inoculum dose 0.2% and fermentation time 144 hours, P8: 0.4% inoculum dose and 144 hour fermentation time, P9: 0.6% inoculum dose and 144 hour fermentation time. Superscripts on the same row are significantly different ($P<0.01$)

According to [5] research, the increase in ash content was caused by dry material being lost during the fermentation process and the formation of new components, so that the percentage of initial media formation is different from the media after fermentation. The percentage change in the ash content of plantain peel (Musa paradisiaca) fermented with Rhyzopus oligosporus was caused by different treatments of inoculum dose and fermentation time. According to [6], the fermentation process's incubation time will increase the amount of ash in the substrate it produces. According to [7], the development of mold biomass during the fermentation process, when the cell walls contain a lot of silica, was the reason for the increase in ash content. Effect of Treatment on the Content of Crude Fiber Table 1 shows the average change in plantain peel (Musa paradisiaca) crude fiber content when the mold Rhizopus oligosporus was present. From 12.75 percent to 18.63 percent, the crude fiber content changed. The most minimal typical rate change in rough fiber content was gotten in treatment P1, in particular an inoculum portion of 0.2% and a maturation season of 48 hours, while the most noteworthy rate change in unrefined fiber content was in treatment P9, to be specific an inoculum portion of 0.6% and an aging season of 144 hours. The diversity analysis revealed that using the mold Rhizopus oligosporus to ferment plantain peel (Musa paradisiaca) had a significant ($P<0.05$) different effect on changes in crude fiber content. According to the Honestly Significant Difference Test (BNJ), the change in crude fiber content in treatment P9

was significantly different (P<0.05) from treatment P1, treatment P1 was significantly different (P<0.05) from treatment P4, treatment P5, treatment P6, treatment P8, and treatment P9, but it was not significantly different (P>0.05) from treatment P2, treatment P3, and treatment P7. According to [10], the inoculum dose and fermentation time had an effect on the decrease in crude fiber. Styawati [8] detailed that rough fiber content will diminish as the aging time increments. According to [9], the longer the fermentation time, the more likely it is for microbes to degrade the material. This means that the longer the fermentation time, the more likely it is for microbes to grow and ferment. Effect of Treatment on the Content of Crude Fat Table 1 shows the average change in crude fat content when the mold Rhizopus oligosporus was added to plantain peel (Musa paradisiaca). From 13.58 percent to 21.08 percent, the crude fat content changed in percentage. Treatment P1 had the lowest average percentage change in crude fat content, with an inoculum dose of 0.2 percent and a fermentation time of 48 hours. On the other hand, treatment P9 had the highest average percentage change in crude fat content, with an inoculum dose of 0.6 percent and a fermentation time of 144 hours. The diversity analysis revealed that using the mold Rhizopus oligosporus to ferment plantain peel (Musa paradisiaca) had a significant (P<0.05) different effect on changes in crude fat content. According to the Honestly Significant Difference Test (BNJ), changes in crude fat content in treatment P9 were significantly different (P<0.05) from those in treatment P1, treatment P1 was significantly different (P<0.05) from those in treatment P3, treatment P5, treatment P6, treatment P8, and treatment P9, but it was not significantly different (P>0.05) from those in treatment P2, P4, and P7. Wolayan [10] detailed that the higher the inoculum portion and the more drawn out the maturation time will cause a reduction in rough fat substance. According to [11], microbial activity became more active in degrading simple compounds, facilitating the degradation of fat from the fermented material, leading to a decrease in crude fat content along with the length of fermentation and high inoculum doses. According to [12], because microbial growth is too rapid and is not balanced by the availability of sufficient nutrients, the crude fat content will decrease over time.

IV. CONCLUSION

The bioconversion of plantain peel with Rhizopus oligosporus can raise the ash content, decrease the crude fiber content, and decrease the crude fat content, according to the findings and discussion. The best outcome was obtained with treatment P5, which included a 0.4% inoculum dose and a 96-hour fermentation period. This treatment increased the amount of ash by 37.36%, decreased the amount of crude fiber by 18.38%, and decreased the amount of crude fiber by 17.33%.

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