

The Effect of Using Fermented Sago Dregs with *Pleurotus ostreatus* as Rabbit Feed

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Abstract- This study aims to determine the effect of using sago dregs fermented with *Pleurotus ostreatus* as a complete feed mixture for rabbits. This research uses experimental methods and analysis using variance with a Randomized Group Design (RAK). The ration treatment consisted of 5 levels which were repeated in 3 body weight groups, each experimental unit was filled with 2 male rabbits so that the number of rabbits used was 30. The treatment given is the level of use of fermented sago dregs in complete feed. The ration is made in pellet form with the following arrangement: R0 = Ration without using fermented sago dregs; R1 = Ration using 5% *Pleurotus ostreatus* fermented sago dregs; R2 = Ration using 10% *Pleurotus ostreatus* fermented sago dregs; R3 = Ration using 15% *Pleurotus ostreatus* fermented sago dregs and R4 = Ration using 20% *Pleurotus ostreatus* fermented sago dregs. The variables observed were feed consumption, body weight gain and feed conversion. The research results showed that the highest feed consumption was in the R2 treatment, namely 59.70 g ind⁻¹ d⁻¹. The R2 treatment was statistically significantly higher ($P < 0.05$) than the R3 and R4 treatments with values of 56.22 g ind⁻¹ d⁻¹ and 53.10 g ind⁻¹ d⁻¹ respectively but not significantly different ($P > 0.05$) compared to treatments R0 and R1 with values of 56.11 g ind⁻¹ d⁻¹ and 57.15 g ind⁻¹ d⁻¹. The results of the analysis of variance for the treatments showed that there were significant differences ($P < 0.05$) in the increase in body weight of rabbits. The highest increase in body weight was in treatment R2, namely 15.91 g ind⁻¹ d⁻¹. The R2 treatment produced higher PBB ($P > 0.05$) than the R0 and R3 treatments with values of 13.00 g ind⁻¹ d⁻¹ and 13.10 g ind⁻¹ d⁻¹ respectively and were much higher ($P < 0.05$) compared to treatments R1 and R4 with values of 14.49 g ind⁻¹ d⁻¹ and 11.20 g ind⁻¹ d⁻¹. average feed conversion of 4.32; 3.97; 3.75; 4.29 and 4.74. Treatment R2 showed the lowest conversion value compared to other treatments in this study. This shows that R2 treatment is more efficient than other treatments. The conclusion of this research is that the administration of 10% fermented *Pleurotus ostreatus* sago dregs in a complete feed mixture showed the best results in terms of consumption parameters with a value of 59.70 g ind⁻¹ d⁻¹, body weight gain with a value of 15.91 g ind⁻¹ d⁻¹ and produced feed conversion of 3.75.

Keywords: Sago dregs, fermentation, *Pleurotus ostreatus*, complete feed, rabbits.

I. INTRODUCTION

The livestock sector has strategic significance as a source of animal protein for human consumption, so that the development of the livestock sector is an embodiment of efforts to provide animal protein to improve nutrition. Rabbit

farming for meat production is increasingly popular in developing countries due to its desirable protein quality, fatty acid profile (high in polyunsaturated fatty acids) and low cholesterol content⁽¹⁾. Rabbit farming has production potential, including; small body size so it doesn't require a lot of space; does not require large costs in investment; short adult life of around 4-5 months; high breeding ability and short fattening period.

Bioconversion through the fermentation process of sago dregs using white oyster mushrooms (*Pleurotus ostreatus*) is an innovative technological approach that enables the availability of feed which is ultimately expected to increase rabbit livestock productivity. Sago pulp is a potential ingredient as feed because it is widely available as a waste product from the sago making process.

The use of sago dregs as animal feed is limited by its relatively high fiber content. Sago dregs have a dry matter content of 54.03%; GE 3,912 kcal/kg; BO 48.75%; PK 3.02%; NDF 67.78% and ADF 43.47%. Utilizing sago pulp waste as an alternative feed is promising but needs to be technologically advanced before being given to livestock. Bioconversion of sago dregs with white oyster mushrooms (*Pleurotus ostreatus*) is a biological processing carried out with the aim of reducing the crude fiber content and increasing the protein content while also increasing the palatability of livestock.

Rabbits have enormous potential to meet the animal protein needs of Indonesian people. The benefits of rabbits, apart from being taken for meat, can also be taken as experimental animals and rearing animals⁽²⁾. Rabbits are a potential livestock commodity as a meat provider, because of their fast growth and reproduction. There are many types of rabbit species. Meat type rabbits are usually large, have a heavy body weight, and grow quickly, such as the Flemish Giant (Vlaamse Reus), Chinchilla Giant, New Zealand White, English Spot and others⁽³⁾. Rabbit protein requirements range between 12-18%, highest in the lactation phase (18%) and lowest in adults (12%), crude fiber requirements of lactating, pregnant and young mothers (10-12%), crude fiber requirements of adult rabbits (14%) while fat requirements in each maintenance period do not differ (2%)⁽⁴⁾.

Sago pulp is a potential ingredient as feed because it is widely available as a waste product from the process of making sago which comes from the sago tree plant. Making sago flour is traditionally done by cutting down sago palm trees, cutting the sago tree trunk into two parts lengthwise, then crushing the pith, making a slurry by squeezing to separate the sago dregs from the flour, then filtering and settling. The chemical composition of sago dregs is; Dry Matter 54.03%; GE 3.912 kcal/kg; Organic Material (BO) 48.75%; Crude Protein (PK) 3.02%; NDF 67.78% and ADF

43.47%. There are differences in the composition of several research results, which may be caused by differences in species, age, place of residence and processing⁽⁵⁾.

The use of fermented sago dregs in the diet of male Alabio ducks up to around 10.6% was able to increase cellulolytic activity without causing damage to the duck's digestive organs⁽⁶⁾. The use of sago dregs fermented with *Aspergillus niger* can increase the body weight gain of pigs⁽⁷⁾, while according to⁽⁶⁾ fermentation of sago dregs with *Aspergillus niger* can improve the nutritional value of sago dregs, especially increasing pure protein from 2.16 to 9.55%. The fermentation process has also been proven to increase the nutritional value of the original ingredients because apart from the transformation of complex ingredients into simpler ones.

The white oyster mushroom (*Pleurotus ostreatus*) is classified as a white rot fungus which is capable of degrading

lignin because it produces extracellular ligninolytic enzymes such as laccase, lignin peroxidase, and manganese peroxidase⁽⁷⁾, this fungus requires relatively low costs and is able to improve low quality feed into high quality feed. The growth of white oyster mushrooms requires a suitable environment and nutrition. The desired temperature ranges from 20-30°C, but the optimum temperature for mycelium growth is 22°C. The fungus *Pleurotus ostreatus* secretes extracellular and intracellular enzymes that play a role in the degradation of lignin, cellulose and hemicellulose^(8,9).

The amount of feed given must meet the amount needed by the rabbit according to the rabbit's age or body weight. Feeding is determined based on dry matter requirements. The amount of feeding varies depending on the rearing period and the rabbit's body weight. Feeding management that is oriented towards the needs of rabbits and the availability of feed ingredients is the right effort to increase rabbit livestock productivity⁽¹⁰⁾.

II. METHOD

Research Sites

Field research was carried out in the research pen of the Faculty of Animal Husbandry, Sam Ratulangi University, Manado, while chemical tests for nutrient content as a follow-up to field research were carried out in the Animal Nutrition and Forage Laboratory, Faculty of Animal Husbandry, Brawijaya University.

Research Materials

This research used 30 weaned local rabbits and other mixed feed ingredients including corn, soybean meal, rice bran, minerals and forage. Cages and cage equipment for feeding and drinking, sitting scales, room thermometer, sample drying oven for analysis of nutrient content.

Research methods

This research used an experimental method with a Randomized Block Design based on the initial body weight of the rabbits. The rabbits used were obtained from rabbit farms owned by breeders in Manado City and surrounding areas. The treatment diet consisted of 5 levels which were repeated in 3 body weight groups, each experimental unit was filled with 2 male rabbits so that the number of rabbits used was 30. The treatment given is the level of use of *Pleurotus ostreatus* fermented sago dregs in a complete feed ration with the following structure:

- R0 = Ration without using sago dregs
- R1 = Ration using 5% fermented sago dregs *Pleurotus ostreatus*
- R2 = Ration using 10% fermented sago dregs *Pleurotus ostreatus*
- R3 = Ration using 15% fermented sago dregs *Pleurotus ostreatus*
- R4 = Ration using 20% fermented sago dregs *Pleurotus ostreatus*

Observed variables

1. Feed consumption (g/head).
2. Increase in body weight (g/head).
3. Feed conversion

III. DATA ANALYSIS

Data were tabulated using Excel program and analysed with ANOVA. If ANOVA shows significant difference, the Least Significant Difference was applied following⁽¹¹⁾

$$Y_{ij} = \mu + T_i + \beta_j + \epsilon_{ij}$$

where :

Y_{ij} = observed value in treatment i, group j

- μ = Common mean
 T_i = observation of treatment i
 β_j = effect of group j
 ϵ_{ij} = experimental error at treatment i, group j

IV. RESULTS AND DISCUSSION

The effect of using Sago dregs fermented using *Pleurotus ostreatus* in complete feed on feed consumption

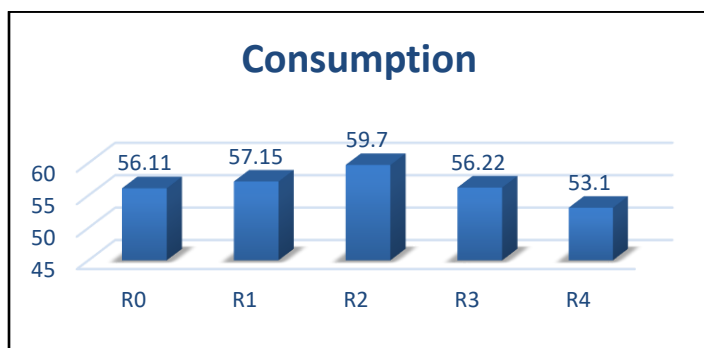
The food content consumed by rabbits will be used for basic living, production and partly as energy reserves⁽¹²⁾. Feed consumption is the amount of feed consumed by livestock in a period of time certain. Feed consumption is calculated by finding the difference in feed given and then converting it into dry matter and expressed in g ind⁻¹ d⁻¹. Feed consumption is also a very important factor in determining rabbit livestock productivity⁽¹⁰⁾. Feed consumption or the amount of feed consumed by an animal can be used as an indication to determine the appearance of an animal.

Table 1. Effect of using fermented *Pleurotus ostreatus* sago dregs in complete feed on feed consumption

| Variable | Treatment | | | | |
|---|---------------------|---------------------|--------------------|--------------------|-------------------|
| | R0 | R1 | R2 | R3 | R4 |
| Feed consumption (g ind ⁻¹ d ⁻¹) | 56.11 ^{ab} | 57.15 ^{ab} | 59.70 ^c | 56.22 ^b | 53.1 ^a |

Notes: different alphabets indicate significant difference (P<0.05)

The research results in Table 1 show that the highest feed consumption was in the R2 treatment, namely 59.70 g ind⁻¹ d⁻¹. Treatment R2 was statistically significantly higher (P<0.05) than treatments R3 and R4 with values of 56.22 g ind⁻¹ d⁻¹ and 53.10 g ind⁻¹ d⁻¹ but not significantly different (P>0.05) compared to treatments R0 and R1 respectively with values of 56.11 g ind⁻¹ d⁻¹ and 57.15 g ind⁻¹ d⁻¹.



Providing rations that use *Pleurotus ostreatus* fermented sago dregs can increase consumption up to 10% and then reduce ration consumption at 15%. This means that the use of *Pleurotus ostreatus* fermented sago dregs in complete feed can stimulate rabbits' appetite up to 10% because the fermented product contains the results of the synthesis of vitamin B complex which can increase appetite. The palatability of a feed is related to the texture, color, taste and smell of the feed⁽¹³⁾. There are several factors that influence the level of livestock consumption, both internal and external factors, namely environmental temperature, palatability, taste, physiological status, nutrient concentration, form of feed and body weight of livestock. One strategy in developing rabbit farming is to provide feed that is consistent in quality and quantity, easily available, cheap in price and has high palatability for rabbits. The balance of nutrients in the ration greatly determines the productivity of rabbits⁽¹⁴⁾.

Effect of using *Pleurotus ostreatus* fermented sago dregs in complete feed on body weight gain

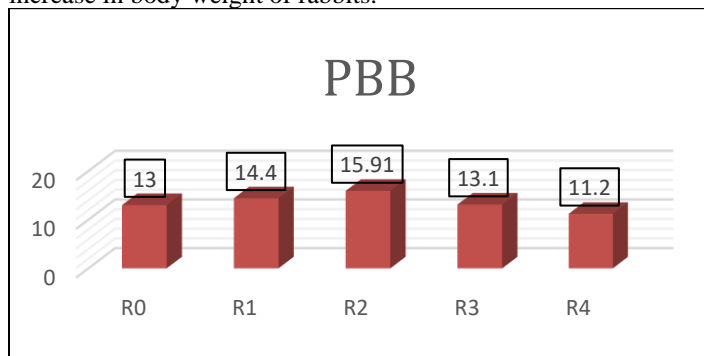
Body weight gain is one factor that can be used to measure livestock productivity. The increase in body weight of livestock is influenced by level feed consumption and environmental temperature factors⁽¹⁴⁾.

Table 2. Effect of using *Pleurotus ostreatus* fermented sago dregs in complete feed on body weight gain

| Variable | Treatment | | | | |
|--|---------------------|--------------------|--------------------|---------------------|--------------------|
| | R0 | R1 | R2 | R3 | R4 |
| PBB (g ind ⁻¹ d ⁻¹) | 13.00 ^{ab} | 14.40 ^b | 15.91 ^c | 13.10 ^{ab} | 11.20 ^a |

Notes: different alphabets indicate significant difference ($P < 0.05$)

Based on Table 2, the results of the analysis of variance for the treatments show significant differences ($P < 0.05$) in the increase in body weight of rabbits.



The highest increase in body weight was in treatment R2, namely 15.91 g ind⁻¹ d⁻¹. Treatment R2 produced higher PBB ($P > 0.05$) than treatments R0 and R3 with values of 13.00 g ind⁻¹ d⁻¹ and 13.10 g ind⁻¹ d⁻¹ respectively and significantly higher ($P < 0.05$) than treatment R1 and R4 with values of 14.49 g ind⁻¹ d⁻¹ and 11.20 g ind⁻¹ d⁻¹. Treatment R2 is the best treatment which produces the highest increase in body weight compared to treatments R0, R1, R3 and R4. One factor that influences body weight gain is feed consumption. High feed consumption and feed digestibility will result in higher body weight gain. This is caused by more nutrients being absorbed by the livestock's body. Rabbits are an alternative livestock that produces meat as a source of protein and rabbits also have a relatively fast growth and breeding rate, one of which is determined by consumption factors⁽¹⁵⁾.

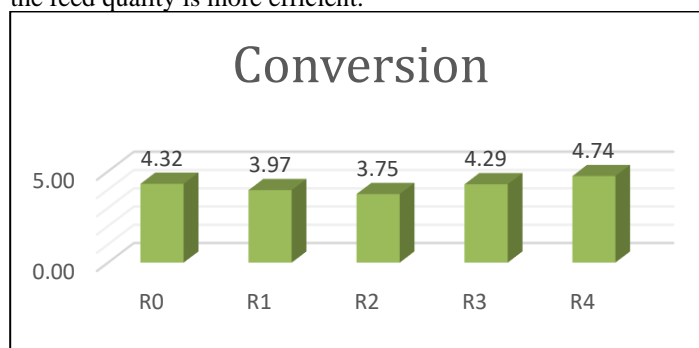
Effect of using *Pleurotus ostreatus* fermented sago dregs in complete feed on feed conversion.

Animal feed conversion is influenced by the quality of the feed, the amount of body weight gain and the digestibility value⁽¹⁶⁾. The feed conversion value is inversely proportional to the feed efficiency value. The lower the feed conversion value, the higher the feed efficiency value, so it will affect livestock production costs.

Table 3. Effect of using *Pleurotus ostreatus* fermented sago dregs in complete feed on feed conversion

| Variable | Treatment | | | | |
|------------|-----------|------|------|------|------|
| | R0 | R1 | R2 | R3 | R4 |
| Conversion | 4.32 | 3.97 | 3.75 | 4.29 | 4.74 |

Based on Table 3, the average feed conversion average is 4.32; 3.97; 3.75; 4.29 and 4.74. Treatment R2 showed the lowest conversion value compared to other treatments in this study. This shows that R2 treatment is more efficient than other treatments. The lower the feed conversion rate for a treatment indicates that the feed quality is more efficient.



The average feed conversion value for rabbits during the research was around 3.75, which means that to gain 1 kg of body weight you need 3.75 kg of feed. Research⁽¹⁷⁾ showed that ration conversion between treatments ranged from 2.62 to 3.46 with an average of 3.00 with a PK nutritional content of 16%, DE 2500 kcal/kg and 0.1% biovet. The lower the feed conversion value, the higher the feed efficiency value and the effect on efficient livestock production costs⁽¹⁸⁾. Feed conversion is the amount of feed consumed based on the dry matter used for the research unit divided by the increase in body weight for the research unit used

⁽¹⁹⁾. Animal feed conversion is influenced by the quality of the feed, the amount of increase in body weight and the digestibility value.

V. CONCLUSION

Giving 10% of *Pleurotus ostreatus* fermented sago dregs in a complete feed mixture showed the best results in terms of consumption parameters with a value of 59.70 g ind⁻¹ d⁻¹, body weight gain with a value of 15.91 g ind⁻¹ d⁻¹ and resulting in a feed conversion of 3.75.

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