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The Effect of Duck Manure Fermentation with Yeast Tape

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Abstract

Manure ducks are farm waste that can pollute the environment if it is discharged into the environment without processing and in large quantities. Yeast tape is an Indonesian traditional microbial used for making food called tape. In yeast tape, there are BAL microorganisms, mold and yeast. These bacteria can degrade organic compounds to be simpler. This study was conducted to examine duck manure before and after fermentation using yeast tape. The nutrient content of duck manure before and after fermentation with yeast tape for 7 days were analyze by proximate analysis. The results of manure duck fermentation with yeast tape can degrade organic compounds to be simpler.

Keywords: duck manure, yeast tape, nutritional content

Introduction

The duck manure is the waste from the rest of the duck farm in the form of manure and feed. In large quantities manure can pollute the environment. Manure can naturally be degraded by microbes (animals, bacteria and mold). Yeast composed by Lactic Acid Bacteria (LAB) microorganisms, mold and yeast. Utilization of yeast to degrade manure can be done to accelerate the decomposition of organic matter found in the manure. Manure which decomposed by yeast tape can reduce air pollution of odor, reduce water pollution and soil pollution due to the presence of pathogenic bacteria in manure. Microorganisms in yeast tape can produce ethanol compounds. Ethanol compounds functioned as antiseptic which can inhibit the growth of other pathogenic bacteria. LAB on yeast tape can produce an acidic atmosphere in a medium which could suppress the growth of other pathogenic bacteria.

The most important result in this study was the nutritional quality of post-fermented duck manure with yeast tape. Nutrients in this study include moisture content, dry matter, ash content, crude protein content, crude fat content, crude fiber content and carbohydrate content. The post-fermentation nutrient content shows that the yeast bacteria degradation process works upon the duck manure. By analyzing and describing the results of this research, it can be used for the application of other technologies to prevent environmental pollution due to duck manure as animal feed and fish feed.

Materials and Methods

Proximate analysis consists of water content, crude protein content, crude fat content, ash content and crude fiber according to AOAC (1995), here is an analysis carried out:

Moisture. According to Sudarmaji et al., (1997) water content tests were carried out to determine the amount of water free of extracted samples in 96% ethanol. Tests carried out based on the Thermogravimetry were done by drying the ingredients in an oven at 105-110°C for 3 hours or obtaining a constant weight. The difference in weight after drying is the amount of water evaporated. Fermented duck manure that has been weighed in a bottle were put into an oven at 105°C for 3 hours. The final weight of the sample is weighed after drying and then the percentage of water content is calculated by the formula:

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$$\% \text{ Moisture} = \frac{(A+B)-(C)}{B} \times 100\%$$

Note:
A = weight of bottle
B = weight of fermented duck manure
C = final weight (bottle + fermented duck manure)

Crude Protein. Crude protein test is carried out by the Kjeldahl method which consists of destruction, distillation and titration. The destruction step is done by inserting 1 g of sample, 0.25 g of selenium and 25 ml of concentrated H_2SO_4 in a kjeldahl tube then heated until the solution is clear. The distillation stage was carried out by inserting the results of the destruction into a distillation flask which added 50 ml of distilled water and 40% NaOH as much as 20 ml. Then the liquid in the condenser tube is accommodated in 10 ml erlenmeyer containing H_3BO_3 solution and 2 drops of indicator (methyl red liquid and creosol green bromine). Distillation is carried out until 10 ml of distillate is obtained with bluish green colour.

Titration stage is carried out using 0.1N HCL until it is pink. The volume of the titrant is read and recorded to obtain the N level with the following formula:

$$N\ (\%) = \frac{(\text{ml HCL} - \text{ml HCL blanko})}{\text{mg sample}} \times 0{,}1\ \text{NHCL} \times 14{,}007 \times 100\%$$

Note:
Protein Level = %N x 6,25

Crude Fat. The crude fat content test was carried out by the Soxhlet method. The fat flask is dried using oven at 110°C, cooled in a desiccator and weighed. Samples of 5 g were wrapped in filter paper and extracted with hexane solvents. The reflux process is carried out until the solution is clear and the solvent in the fat flask is distilled. Furthermore, the fat-filled fat flask extracted was dried in an oven at a temperature of 105°C, cooled in a desiccator and weighed. According to Tillman et al., (1998) fat content was calculated by the formula:

$$\% \text{ fat level} = \frac{\text{weight fat}}{\text{weight sample}} \times 100\%$$

Ash. The porcelain cup is dried in an oven at 110°C, then cooled in a desiccator and weighed. A sample of 5 g is inserted into a porcelain cup and is burned above the bunsen burner flame until it is no longer smoky. Then it was carried out in an electric furnace at a temperature of 400-600°C for 4-6 hours or until white ash was formed. Then the sample is cooled in a desiccator and weighed. Calculation of ash content was calculated by the formula:

$$\text{Ash level} = \frac{\text{weight ash}}{\text{weight sample}} \times 100\%$$

Crude Fiber. The fat flask is dried in an oven, then put in a desiccator and weighed. A sample of 2.5-5 g is dried and wrapped in filter paper and extracted with diethyl ether for 6 hours in a sokhlet. The sample was transferred to 600 ml Erlenmeyer, 200 ml of boiling H_2SO_4 solution were added and boiled for 30 minutes, the suspension was then filtered with filter paper. The residue left in Erlenmeyer and filter paper is washed with boiling water. Then the residue was washed again with 200 ml of NaOH solution with the same treatment as adding H_2SO_4. The

residue is refiltered with filter paper that has been weighed by the time it was washing with $K_2SO_4$10% solution, boiled water, and then with 95% alcohol. The filter paper is then dried in an oven 110°C, then cooled in a desiccator and weighed. The weight of the residue obtained is the weight of the crude fiber, so the formula is:

$$\text{Fiber level} = \frac{\text{weight fiber}}{\text{weight sample}} \times 100\%$$

In this study, the results of the analysis of nutritional manure of ducks before fermentation and after fermentation were described. Description of the concentration ratio of manure nutrition fermented with yeast tape can be used for the application of advanced technology.

Results and Discussion

The first observation was compared between fermented duck manure yeast tape with unfermented duck manure. The comparison between duck manure before and after fermentation shown in the Table 1:

Table 1. Comparison proximate analyze between duck manure before and after fermentation

Sampel	Water content (%)	Dry matter (%)	Ash (%)	Crude protein (%)	Fat (%)	Fiber (%)	Carbohydrate (%)
Duck manure	44,78	55,22	59,71	7,73	0,06	31,23	31,62
Fermented Duck manure	46,20	53,80	59,17	5,86	0,26	32,54	33,64

Water content in the manure after fermentation has increased because the degradation process of an organic material produces water. The water content occured because of the yeast tape catabolism process that produced water. According to Sahratullah et al. (2017) fermentation using tape yeast can affect the moisture content of cassava substrate. The fermentation process that produces heat can also cause the increase of water content of the material because the water in the substrate forms high humidity. Dry matter has negative correlation to the moisture content of the material, the higher the water content, the lower the dry matter.

Nutrients compound of duck manure before and after fermentation (Table 1) have shown that the ash reached 59% for both manure taken from traditional duck farmers in Magelang Regency which may caused by mixed with sand during collection. Ash content recommendation for fish feed is below 12% (Zaenuri *et al.*, 2012).

Fat content in duck manure increased slightly. Yeast tape does not have the lipase enzyme so it is less likely to increase fat content in duck manure. Fat content as much as 0,26% in the fermented of duck manure is categorized low to be used as fish feed. So it needs another feed ingredients to meet the requirements of fat content. Darsudi et al., (2008) reported that the fat content in fish feed was 6.89%. The fat content out of the recommendation or up has a bad effect on fish.

Carbohydrate in duck manure after fermentation increased due to the capablility of the yeast to degrade cellulose in the duck manure. Fermentation of duck manure decreased protein compound and increased fiber compound. This could be explained by the use of protein manure duck as the substrate of yeast to build yeast tissue called mycelium, whereas mycelium composed by high fiber. The longer fermentation using yeast tape causes a decrease in protein content and an increase in fiber in the substrate because the mycelium contains a lot of crude fiber (Fransistika *et al*., 2012).

Carbohydrate after fermentation increased due to the ability of the yeast which contains microorganism of cellulolytic and amylolytic groups to degrade cellulose into simpler compounds. Narsun *et al.* (2015) reported that bacteria in yeast tape is a type of *Saccharomyces* sp. which can

degrade cellulose into sugar and alcohol, this is what causes an increase in carbohydrates after duck manure fermentation.

Conclusion

Fermentation of duck manure using yeast tape increased crude fiber, carbohydrates, fat, and water content. Meanwhile, it decreased dry matter and crude protein. This caused by the degradation process of yeast tape microbial upon manure and the formation of filament mold tape.

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