ACIDITY AND TOTAL BACTERIA OF DAIRY WASTEWATER SOLID AND CASSAVA WASTE FLOUR MIXTURE FERMENTED BY *Aspergillus niger* AS BROILER FEED

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ABSTRACT

This research aim to know the effect of Dairy Waste Water Solid-Cassaca Waste Mixed fermented by Aspergillus niger on pH and Total Plate Count. This experimental research was arranged based on Completly Randomized Design, with 4 treatment of inoculant doses : 0%, 0,4%, 0,5% and 0,6% and each of them was replicated 6 times, with fermentation time 3 days. The data was statistically analized by using Analize of Variance, then the different of treatment analized by Duncan Multiple Range. The result of research showed that, 1) Fermentation by Aspergillus niger highly significant (P<0,01) decrease pH and Total Bacteria, 2) Inoculant doses 0,6% lowest decrease of pH and total bacteria with pH 3,8 and decreasing of total bacteria 84,4%. At low pH condition spoilage and patogen bacteria stunted.

Keywords : ***Dairy Wastewater Solid, Cassave Waste Flour, A. niger, pH, Total bacteria***

INTRODUCTION

Utilization of waste as animal feed have been widely commercialized. This aims to avoid competition with food. Waste that has not been widely used is dairy processing industry.

Before being discharged into rivers, dairy waste must be processed first. Dissolved organic matter in the effluent is filtered through several stages of filtering, then channeled into a storage pond. This will result dairy sludge to settle to the pool shelter, called dairy wastewater solids (DWS). So far, the use of DWS is still limited as fertilizer, or disposing of DWS to land around the plant. Use of DWS as feed material are still rare, whereas its content of potential nutrition. Every 2000 grams of slurry can be obtained 250 grams of DWS, and content of crude protein

34.98%, lactose 4.42%, crude fiber 9.77%, crude fat 11.04 %, calcium 2.33%, and phosfor 1.05%, Mg 0.4% based on dry matter (Marlina, 2007).

Production of dairy processing waste is expected to reach 1000-2000 kg each processing 450,000 kg of milk / day (Belyea et al, 1990). DWS content of 97.89 % water content, high fat levels, and very susceptible to microbial attack, so easy to degraded or fast decay. Things need to be aware of the dairy sludge is primarily a bacterial pathogen that can degrade the quality of the feed material.

Use the potential of the dairy sludge as a nutritional source of protein and reduce the vulnerability of low dry matter can be pursued with the addition of a combination cassava waste flour through bioprocess microbial of the fungus *Aspergillus niger*. Cassava waste flour potential as a feed material for high energy content by 3000 kcal metabolic energy / kg and high crude fiber 14.54 % but low protein content, ie 1.60 to 3.92 percent.

Aspergillus niger can grow quickly and are not dangerous because it does not produce mycotoxins. Besides its use easy and can produce several enzymes such as amylase, pektinase, amilo-glucosidase and cellulase, as well as extracellular enzymes fitase (Conneely, 1992), and in the metabolism of *Aspergillus niger* producing citric acid which can lower the pH of the substrate (Abun, 2003). Under conditions of acidic pH spoilage bacteria can not attack the fermentation products (Murphy and Silbert, 1992; Dobbins, 1990; Pancorbo et al, 1990). Total bacterial in dairy sludge (DWS) reached 8.7×10^9 CFU / g and the number of coliform bacteria is 16 MPN / g (Marlina, 2007). Without processing first, dairy sludge is very susceptible to decay, thus decreasing the nutritional quality.

MATERIALS AND METHODS

Materials

About 17 kg sample of DWS (water content 92%) was collected randomly from the Indomilk dairy processing plant and 7 kg of cassava waste flour (water content 15%).

Sample Preparation

The DWS and cassava waste flour (CWF) mixed in the ratio 70:30. About 1 kg portion from each treatment (Each group consist of about 700 g of DWS and 300 g of CWF) was inoculated with strain of *Aspergilus niger* respectively 0% (control/T_0); 0,4% (T_1); 0,5% (T_2); 0,6% (T_3). They were allowed to ferment for 3 days, in temperature 37^{o}C (Marlina, 2008). The fermented product (DCF= Dairy wastewater solid-Cassava waste flour Fermented) were sun-dried and milled. The natural/unfermented product served as control. The samples were kept at room temperature for subsequent analysis.

Sample Analysis

The pH was determined using pH meter. The number of total bacteria determined using Surface or Spread Plate method (Morton, 2001). Media used to calculate the total number of bacteria is NA (Nutrient Agar).

Analysis of Data

The data were analyses by analyses multi variance and Duncan Test.

RESULT AND DISCUSSION

Acidity (pH)

Inoculum dose has been generally recognized to be of great importance in the process of Dairy wastewater solid-Cassava waste flour Fermented. Acidity (pH) on the dairy wastewater solid-cassava waste flour fermented by *Aspergillus niger* decreased compared with unfermented product. The influence of inoculum dose on the pH of Dairy wastewater solid-Cassava waste flour Fermented (DWF) was investigated by varying the inoculum dose at the range of 0%-0.6% (v/v). The Profiles of pH during the cultivation with the different inoculum size were observed in Table 1.

Table 1. pH and Total Bacteria on Dairy wastewater solid-Cassava waste flour Fermented (DCF)

Inoculum dose (%,v/v)	Unfermented				*A. niger*-fermented			
	0 (control)	0.4	0.5	0.6	0 (control)	0.4	0.5	0.6
pH	6.7±0.2	6.6± 0.2	6.6± 0.1	6.8± 0.2	6.8± 0.2	4.0± 0.3	3.8 ± 0.3	3.4± 0.2
Total counts (Log_{10}) CFU[1]	1.93± 0.15	1.91± 0.12	1.99± 0.1	1.77± 0.38	1.41± 0.32	1.21± 0.29	1.19± 0.30	1.00± 0.25

[1]CFU=Colony Forming Unit

Fermentation process by *Aspergillus niger* is very significant (P <0.01) lowers the pH of the substrate. In *Aspergillus niger* metabolism produces organic acids in the form of citric acid. Citric acid is capable of lowering the pH of the fermented substrate. In sustrat that no inoculum was added (control), the acidity of a neutral substrate. Decrease in pH occurred in line with increasing dose. Dose reduction achieved at the lowest dose of 0.6% ($P_{3)}$. The amount of mycelium mass in line with the number of doses given. The amount of mycelium formed will determine the production of citric acid which will affect the decrease in substrate pH. Citric acid fermentation process consists of two stages. The first phase of mycelium growth and the second phase of fermentation product formation. In the first phase of absorption is used for the formation of mycelium and in the second stage of carbohydrates is converted into citric acid (Kiel, H. et al., 1981). At the time of 32 hours incubation the mycelium growth was beginning to

look and the formation of citric acid occurs in the second phase after which the mycelium grows can be achieved at the 72.

Total bacterial

A decline in the total number of bacteria in the fermentation substrate. In each treatment decreased the total number of bacteria by 62.8% ($P_{0)}$; 76.8% ($P_{1)}$; 81.4% ($P_{2)}$ and 84.4% ($P_{3)}$ (Table 1). Decrease in the total number of bacteria on the substrate fermented in line with the decrease in pH. Decrease of pH is a manifestation of the formation of citric acid from *Aspergillus niger* metabolic processes.

Citric acid, a weak organic acid, has bacteriostatic effect. Each unit decrease in pH will increase the bacteriostatic effect until approximately 10 times (Robert et al, 1996; Soeparno, 1998). In general, bacterial pathogens require a neutral pH for growth. Thus the decrease in pH to acidic pH causes the inhibition of bacterial growth.

Based on Duncan's test, the treatment that is not added inoculum (control) were significantly different by treatment with a dose of 0.6%. Differences doses produce a different rate of decrease in pH. This illustrates that the factor of acidity (pH) is very influential on the development of bacteria on the substrate. Thus, low pH can be expected as a preservative on the fermentation substrate.

CONCLUSION

Dairy wastewater solid-Cassava waste flour Fermented (DWF) by *Aspergillus niger* can lower the substrate pH until 3.4 and decrease the number of total bacteria until 84.4%. The lower of pH, the higher reduction in total bacteria. Thus, dairy wastewater solid and cassava waste flour fermented to be used as feed material is expected to be safe from the attack of pathogenic bacteria.

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