

THE QUALITY OF FERMENTED CASSAVA TUBER SKIN AS HERBIVOROUS FISH FEED

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Abstract

This research aims was to determine the quality improvement in the nutritional value of cassava (*Manihot esculenta* Crantz) tuber skin waste through the fermentation process by cellulolytic microbial consortium of *Aspergillus tamari*, *Bacillus megaterium* and *Bacillus mycoides*. The usefulness of this research is to improve the quality of the nutritional value of cassava tuber skin waste that can be used as herbivorous fish feed material. The research was conducted in the Laboratory of Microbiology, Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Padjadjaran. The experiment was conducted with experimental methods, while the data were analyzed using the T test. Fermentation was carried out for 7 days by the method of solid substrate. The parameters measured included 1) content of crude protein, crude fat, water, ash and energy using proximate analysis, 2) levels of cyanide acid (HCN) using AOAC method, 3) content of lignin, cellulose and hemicelluloses using van Soest analysis, and 4) content of glucose and starch using Luff Schoorls methods. The results showed that the enzymatic activity of microbial consortia of *A. tamari*, *B. megaterium* and *B. mycoides* in the fermentation process improved the quality of the nutritional value of cassava tuber skin. There was an increase in crude protein content, energy and glucose content from 4.63%, 3510 kkal and 7.36 ppm to 10.91%, 4015 kkal and 10.59 ppm at fermentation with 5% of microbial consortium. Meanwhile, the enzymatic process of the microbes decreased the content of crude fat, water, ash, HCN, starch, lignin, cellulose, and hemicelluloses. The HCN content of cassava tuber skin waste significantly declined from 265.142 mg/kg to 5.49 mg/kg. This fermentation product in turn has a better biological value to be used as feed materials for herbivorous fishes.

Key words: cassava tuber skin, fermentation, cellulolytic fungi and bacteria, nutrition value quality, herbivorous fishes

INTRODUCTION

Cassava cultivation area in West Java reached 113,663 ha with total production reached up to 2,044,673 tons per year, while the skin to lose about 20% by weight of the wet bulb (Indonesian Central Bureau of Statistics, 2010). Potential cassava skin waste can be used as a source of carbohydrate-based feed materials in fish feed. The use of cassava tuber skins as a feed material faced with obstacles that are found in agricultural waste in general, i.e., low protein values (3.08 to 4.63%), carbohydrate that is in the form of crude fibre and its components such as lignin, cellulose and hemicelluloses which are form a complex bonds that is difficult to

digest by fish, and the amount of cyanide acid as a toxic material. Limitations in the use of crude fibre carbohydrates by fish are associated with the limited cellulolytic enzyme availability in the digestive tract of fish. Some studies reported that in the digestive tract of fish were found small amounts of cellulose activity [13, 3, 8,10].

Simplification process of complex carbohydrate bonds as well as toxic compound degradation process in the same time can be done either by using solid substrate fermentation (SSF). Cellulolytic or amillulolytic microorganisms isolated from natural sources can be used as biodegradation agents. The potential of cellulolytic bacteria of *Bacillus mycoides*, *Bacillus megaterium* and fungi of *Aspergillus tamarii* and *Penicillium nalgiovense* has been tested [2]. Based on the cellulolytic index, those microbial isolates

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The manuscript was received: 12.05.2012
Accepted for publication: 29.05.2012