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UTILIZATION OF SOLID WASTE FOR SEAWEED PROCESSING

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ABSTRACT

This article aims to examine the utilization of solid waste from the seaweed processing industry into products that have a selling value. Based on the results of the literature study, information on the utilization of solid waste from the seaweed processing industry can be used as particle board and liquid organic fertilizer. Making panel boards and liquid fertilizer from solid waste from the seaweed industry is very easy and simple. The manufacture of panel boards consists of seven stages, namely drying, size reduction, filtering, mixing, printing and drying followed by pressing. The manufacture of liquid fertilizer consists of 3 stages, namely size reduction, boiling/pulverization and fermentation.

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Keywords: panel board, liquid fertilizer, stages, cellulose

INTRODUCTION

Indonesia is one of the largest seaweed producing countries in the world, but the use of seaweed in Indonesia is still lagging behind compared to the use of seaweed in other countries such as Japan, Korea and China. Seaweed is not only used as daily food, but can also be used for various other needs such as medicines, food additives, cosmetics, organic fertilizers, and animal feed. However, in Indonesia, seaweed is still not optimally utilized in the industrial world. Seaweed is still more often used directly as food, especially for residents who live in coastal areas. In several countries in the world, applications for the use of seaweed for agricultural crops

have long been carried out, such as liquid seaweed fertilizer (LSF), seaweed liquid fertilizer (SLF), liquid fertilizer (LF), and chopped powdered algal manure which are commonly circulated in the market (Sedayu). et al., 2013).

The seaweed processing industry produces a very large amount of waste, both in the form of liquid waste and solid waste. One of the wastes produced by the seaweed processing industry is solid waste from the processing of agar products. Based on research data by the Center for Research on Product Processing and Socio-Economic Maritime Affairs and Fisheries in 2002-2003, the amount of solid waste produced in agar processing ranges from 70–85% (Basmal et al., 2003).

Since the development of the agar processing industry up to now, there has been no solid waste processing activity which at the same time utilizes it into other products, thus the solid waste generated becomes a problem for the seaweed processing industry. Several seaweed processing companies in Indonesia use large areas of land to dispose of the solid waste they produce. This article aims to examine the utilization of solid waste from the seaweed processing industry into products that have a selling value.

Seaweed Solid Waste

Based on the characterization of the waste, it is known that the seaweed processing waste consists of two phases, namely the liquid phase and the solid phase. The liquid phase comes from washing and precipitation of seaweed extraction, while the solid phase comes from the separation of seaweed extract from the solid. The main composition of the solid phase is cellulose, while the other components are minerals. The water content of the solid phase can reach 68.4%, the ash content is 31%, and the fiber content is 20.1% (Basmal et al., 2003).

The high cellulose content in this seaweed processing solid waste can be used to produce high-value products such as particle board and liquid fertilizer. Particleboard is a type of wood panel made of wood particles or other lignocellulosic materials mixed with synthetic adhesives or other binders and then hot-pressed.

Besides being used as particle board, seaweed solid waste can also be used as liquid organic fertilizer for plants. According to Sedayu et.al (2014), Basmal (2009) and Mooney & Van Staden (1985) that Eucheuma sp seaweed contains growth-promoting hormones (HPT) including auxins, gibberellins, and cytokinins consisting of kinetin and zeatin. Jensen, A. (1993); Jimenez-Escrig and Goni (1999) said that Eucheuma sp type seaweed is thought to

contain macro nutrients, namely calcium, manganese and potassium and contain micro nutrients consisting of zinc, iron, cobalt, molybdate, boron, and others. Meanwhile, according to Basmal (2010), seaweed contains micro nutrients consisting of; N 1%, Phosphorus 0.05%, Potassium 10%, Magnesium 0.80%, Sulfur 3.70%, Copper 5 ppm, Iron 1200 ppm, Manganese 12 ppm, Zinc 0 ppm, Boron, 80 ppm, organic compounds 50 –55% and Ash, 45–50%.

Procedure for Utilization of Seaweed Solid Waste The

a. Process of Utilizing Seaweed Solid Waste into Particle Board (Bakti et al. 2008) The

technique of making particle board used is hot pressing with high pressure. Solid waste from the processing industry must be dried in the sun to a moisture content of ± 5%, then the waste is ground and sieved with a size of 26 mesh. The sifted waste was mixed with a polyethylene binder in a ratio of 1:1 (w/w), then homogenized using a cone-homogenizer developed by the Research Center for Product Processing and Biotechnology of Marine and Fisheries (Basmal et al., 2006). After that the mixture was put into a copper plate mold with a size of 30 x 30 x 2.5 cm^3 . The bottom and top layers of the raw material mixture are covered with aluminum foil, then after being heated to a temperature of 150°C, they are pressed with a pressure of 10 kg/cm2 at a constant temperature of 150°C with variations in forging time of 3, 5, and 7 minutes. The press used is a manual hydraulic system press, with a pressing plate equipped with an electric heater which is connected to a thermostat to regulate the temperature of the pressing plate.

After pressing, the particleboard is still very hot and soft. The particleboard was left for 3 hours to cool (room temperature) and hardened after that it was removed from the mold. The resulting particleboard was conditioned for one week at room temperature. The particleboard was tested for its physical and mechanical properties as well as a termite resistance test.

Particleboard Manufacturing Process Flow

b. The Process of Utilizing Seaweed Solid Waste into Liquid Fertilizer (Yumas et al. 2019)

Pieces of seaweed thallus (*Eucheuma* sp) remaining sorting and washing, were washed to remove the stickiness of shells, sand, grains of salt, mud, rafiah ropes, and other dirt attached. After being washed, the seaweed is reduced in size using a knife. Seaweed that has been reduced in size is boiled until it forms a seaweed porridge. After the seaweed slurry is formed, it is cooled at room temperature. The cooled seaweed slurry is put into the fermenter tank, fermented or composted with the addition of EM4 solution and shrimp paste solution. EM4 solution containing several types of bacteria (*Lactobacillus,* fermented fungi, and *Actinomycetes*) was diluted in water with a concentration of 1.75%. While the shrimp paste solution is made from shrimp paste which is added with water with a concentration of 0.1%.

The cooled seaweed slurry is put into the fermenter tank, then sprayed with EM4 solution and shrimp paste solution while stirring until evenly distributed. The fermenter tank is tightly closed, then allowed to stand for 30 days to produce leachate or liquid organic fertilizer. The liquid organic fertilizer produced is discharged through the outlet valve, then it is collected and packaged into packaging bottles to be analyzed and tested on chili (Capsicum sp) and tomato (Solanum lycopersicum) plants.

Process Flow of Liquid Organic Fertilizers

CONCLUSION

Based on the results of the literature study, information on the utilization of solid waste from the seaweed processing industry can be used as particle board and liquid organic fertilizer. Making panel boards and liquid fertilizer from solid waste from the seaweed industry is very easy and simple. The manufacture of panel boards consists of seven stages, namely drying, size reduction, filtering, mixing, printing and drying followed by pressing. The manufacture of liquid fertilizer consists of 3 stages, namely size reduction, boiling/pulverization and fermentation.

REFERENCES

Bakti BS, Tri NW, Jamal B., and Bagus SBU 2008. Utilization of Solid Waste Processing Seaweed *Gracilaria* sp. For Making Particle Board. Journal of Postharvest and Marine and Fisheries Biotechnology. 3(1) : 1-9.

Basmal, J., Yeni, Y., Murdinah, Suherman, M., and Gunawan, B. 2003. Technical Report of Research Center for Product Processing and Socio-Economic Economy of Marine and Fisheries. Marine and Fisheries Research Agency, Ministry of Marine Affairs and Fisheries, Jakarta. 61 pp.

Basmal, J., Utomo, BSB, Fithriani, D., and Sedayu, BB 2006. Research on the engineering of solid and liquid waste recycling equipment for seaweed processing. Technical Report. Research Center for Marine and Fisheries Product Processing and Biotechnology, Jakarta. p. 1–30.

Basmal, J., 2010. The technology of making liquid organic fertilizer in combination with the hydrolyzate of Sargassum sp. and fish waste. Squalene. 5(2): 59–66

Jensen, A., 1993. Present and future needs for algae and algal products. Hydrobiology. 261: 15 21.

Jimenez-Escrig, A. and Goni, CI 1999. Nutritional evaluation and physio logical effects of edible seaweeds. Archivos Latinoamericanos de Nutrition 49: 114–120.

Maloney, TM 1977. Modern Particleboard and Dry Process Fiberboard Manufacturing. Miller Fremann, Inc., San Francisco.

Mooney, PA and Van Staden, J. 1985. Effect of Seaweed Concentrate on Growth of Wheat under Condition of Water Fern. S. Afr. Sci 8: 632 – 633.

Prasetya B., Sudijono, and Kasinoputro, P. 2006. Utilization of oil sludge for the manufacture of lignocellulosic fibrous composites. J. Tropical Wood Science and Technology. 4(1): 9–14.

Sedayu, BB, Erawan, SMI, and Assadad, L. 2014. Liquid Fertilizer From Seaweed Eucheuma cottonii, Sargassum sp and Gracilaria sp Using Composting Process. Journal of Postharvest and Marine and Fisheries Biotechnology. Vol 9 No. 1: 61–68.

Sedayu, BB, Basmal, J. and Utomo, BSB 2013. Identification of growth-promoting hormone extract (sap) of Eucheuma cottonii. Journal of Postharvest and Marine and Fisheries Biotechnology. 8(1): 1–8.

Sulastinigsih, IM, Jasni, and Iskandar, MI 1999. Effect of permethrin on physical, mechanical, and durability properties of particleboard. Forest Products Research Bulletin. 16(4): 219–229.

Yumas, M., Justus EL, Eky YR, and Dyah WA 2019. Utilization of Semi-Refined Carrageenan Processing Industry Waste from Eucheuma Sp as Liquid Fertilizer for Horticultural Crops. Journal of Plantation Products Industry. 14(2) : 67-82.

Xu, X., Zhu D., Wu Q., and Vlosky, RP 2004. Agro-based composites in China: opportunities and challenges. Forest Products Journal. 54(5): 8–15