ARTICLE REVIEW; UTILIZATION OF CLAM SHELLS FOR NON-FOOD

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ABSTRACT

Clam shells are waste from the use of clam meat. This article aims to review the use of clam shells into organic fertilizer, craft materials and additional bahanin animal feed. Based on hasl review, information was obtained that cant gkang shellfish can be used as organic fertilizer, crafts and additives in animal feed. Clam shells contain calcium and phosphorus which are macronutrients that are used by plants. Clam shells can be used as the basic material for craftsmanship because they have a very good texture to be shaped into various handicrafts. The content present in clam shell flour is not only calcium, but also protein and phosphorus needed by farm animals to grow, develop and reproduce.

Keywords: Feed, Organic Fertilizer, crafts, waste, Calcium.

INTRODUCTION

Shellfish is one of the fishery commodities that is widely consumed by the Indonesian people as a source of cheap and highly nutritious animal protein. Mussels are also known as filter feeder organisms (Darmono 2001). The types of shellfish that are most often found in Indonesian waters are Blood Mussels, Green Mussels, Batik Mussels and Simping Clams.

Shellfish is also a prospective fishery resource with high nutritional and commercial value. According to Tari et al (2018), clam meat is a perfect source of protei, due to its high content of essential amino acids (85% – 95%). The highest amount of amino acids per 100 grams is glutamate 3,474 mg, aspartic 2,464 mg, lysine 1,909 mg, arginine 1,864 mg and leucine 1,798 mg. Meat also contains vitamin B12 which is high at around 98.9 mg / 100 mg, vitamin B12 which is very useful for maintaining heart health, stabilizing body temperature, stabilizing pH in the body, helping the digestion of food, maintaining a healthy nervous system and the formation of bone cells. Shellfish meat is rich in omega-3 and omega-6 fatty acids, and contains 59 kilocalories of energy.

Indonesia's shellfish production volume continues to increase in the last decade reaching an average of 94,247.1 tons / year with a value of Rp 565.48 billion / year (Santoso 2022). Theuse of clam meat as a source of nutrition is toproduce waste, including clam shells. Along with the increase in production, the case waste produced also increased. Therefore, the handling of this clam shell needs serious attention to reduce its negative impact on humans and the surrounding environment.

The chemical compounds contained in the clam shell are chitin, calcium carbonate, calcium hydrosiapatite and calcium phosphate (No *et al.* 2003). Kitin is a natural polysaccharide that has many uses, such as chelates, emulsifiers and adsorbents. One of the chitin compounds that is widely used is chitosan. Chitosan is a polysaccharide amine resulting from chitin distillation. In addition to chitin, the clam shell also has calcium carbonate (CaCO3) which physically has pores that allow it to have the ability to adsorb or absorb other substances into its surface pores.

Clam shells have a mineral composition consisting of a combination of calcium carbonate with Mg, N, P, K, Fe, Cu, Ni, B, Zn, and Si) (Maslim 2013). This article aims to review the utilization of clam shells into organic fertilizers, craft materials and additives to animal feed.

Utilization of Clam Shells into Organic Fertilizer

Figure 1. Clam Shells
(Source : Kurniasih *et al.* 2017)

The shell or clamshell contains calcium and phosphorus which are macronutrients needed by plants. Based on the literature and research results, clam shells can be used as organic fertilizer. Organic fertilizers are fertilizers that consist mostly or entirely of organic matter derived from plant residues, and or animals. Organic fertilizers have a very influential role in the growth, development and fertility of plants (Umami and Suprijanto 2013).

Proper selection of fertilizers is very important for plant growth. Fertilizers that are used wisely can have a good impact on plants, one of the environmentally friendly fertilizers is the use of organic fertilizers.

Both solid and liquid organic fertilizers can improve the chemical and biological physical properties of the soil. Organic matter has an important role as a source of carbon, as a source of feed and a source of energy to support life and its breeding of various types of soil microbes (Sisworo 2006). The use of organic fertilizers on plants gives a sense of insecurity to consumers who consume the plant or part of the plant.

The following are the stages of making organic fertilizer for clam shells (Muntamah 2011):

1. Prepare the tools and materials used.

2. Collected clam shells to taste.

3. Clean the waste of clam shells by washing with water until clean.

4. The clam shells are dried in the sun for 4 days to remove the water.

5. As many clam shells are burned to make them easy to crush.

6. The shells that have been burned are then mashed and sifted into flour.

7. Then put water with a ratio of shell flour and water 1: 5 (w/v).

8. Then put EM4 with the ratio of shell flour and EM4 1: 0.1 (w/v).

9. Put granulated sugar with the ratio of shell flour and granulated sugar 1: 0.3 (w/w) and stirred well.

10. Covered with plastic plastic containers.

11. Fermented for 15 days.

Figure 2. Organic Fertilizer Made from Baku Clam Shells

(Source: ITSNU Pasuruan KKN Students 2022)

The presence of clam shell flour is able to enrich the Ca content in fertilizer, which is 2.8%. The element Ca for plants functions in strengthening cell walls, nutrient absorption, cell elongation and division as well as cation balance for anion transport (Hardjowigeno 1997).

Microbial activity in EM4 converts complex compounds into simple compounds available to plants. EM4 is a mixed culture of several microorganisms that are beneficial for plant growth, namely photosynthetic bacteria (Rhodopseudomonas sp.), fermented fungi (*Saccharomyces* sp.), acid bacteria lactate (*Lactobacillus* sp.), and Actinomycetes. EM4 is able to accelerate the decomposition of organic matter, increase the availability of plant nutrients, and suppress the activity of pathogenic microorganisms (Indriyani 1999).

Utilization of Clam Shells into Crafts

The use of clam shells as the main basic material for making various crafts, in addition to being of economic value, also has the potential to reduce environmental pollution. Clam shells can be used as the basic material for craftsmanship because they have a very good texture to be shaped into various handicrafts. This handicraft will be a typical souvenir especially for coastal tourism areas (Yahya and Latjompoh 2020). The use of clam shells for this craft, in addition to adding economic value to the product as well as to maintain environmental sustainability (Ridho *et al*. 2016). The use of clam shells can also reduce the risk of environmental pollution (Hardjanto 2020).

Solid waste of shells in the form of shells has been more widely used as craft materials such as wall decoration materials or interior design materials. Shell waste has enormous potential and opportunity to improve the economy of coastal communities.

The shellfish craft business, in addition to providing benefits for business actors, also provides other benefits, including opening up jobs and increasing people's creativity. Enthusiasts of shell crafts are not only in the domestic market, but also all the way to Europe and America. Shellfish handicraft products have high economic value in international trade. Product marketing is also carried out through exhibitions (expo) from local, national to international levels (Dewi 2010).

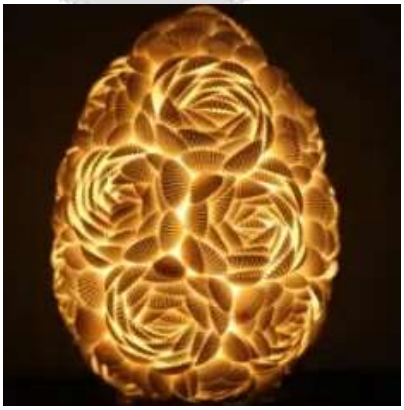

Figure 3. One of the handicraft products made from clam shells

(Source : Salsabila 2018)

One example of the manufacture of kerajinan from clam shell material is as follows:

1. Shells are washed with clean water and then dry the clams with a cloth or dry until dry.
2. After the cangkang the shells are placed on the outer platic glass.
3. Pasting starts from the bottom of the plastic cup.
4. Line the inner edges of each shell with firing glue and then attach them to plastic cups.
5. Hold until the glue hardens slightly.
6. After completing one line, continue on the next line.
7. Begin to attach the clam shell to the second row with a parallel formation and can hide plastic cups in it.
8. Repeat, one row at a time, until the whole pot is covered.
9. If all the surfaces of the plastic cup are already covered, then the multipurpose clam shell container is finished.

Utilization of Clam Shells into Animal Feed

Figure 4. Animal Feed mixed with Clam Shell flour

(Source : Kurniasih *et al.* 2017)

Tepung clam shells are useful to be one of the mixtures of animal feed to strengthen bone growth in farm animals. The content present in clam shell flour is not only calcium, but also protein and phosphorus needed by farm animals to grow, develop and reproduce. Therefore clam shell flour is very well used for animal feed mixtures.

The procedure for making animal feed mixed with clam shell flour (Kurniasih 2017) is as follows:

1. The clam shell is washed under running water until clean.
2. Already clean shell, dried for 6-8 hours.
3. The clam shells are then crushed to a smaller size with a hammer mill for easy processing by subsequent processes.
4. The clam shell with a small measure is heated in a 0.1 N NaOH solution at a temperature of 50 ^{o}C for 3 hours. Boiling with this 0.1 N NaOH Solution is to remove organic matter present in the shell.
5. After boiling then neutralization with water is carried out.
6. After washing the next is carried out drying in the oven at a temperature of 121^{o}C for 15 minutes.
7. The next process is re-grinding with a grinding machine and filtered into flour.
8. Furthermore, it is mixed (mixing process) with ingredients between clam shell flour and animal feed nutritional complementary ingredients. Such as, bran, corn and feed concentrates.
9. Ready animal feed is given to a laying yam or laying duck.

CONCLUSION

Based on hasl review, information was obtained that clam shells can be used as organic fertilizer, crafts and additives to animal feed**.** Clam shells contain calcium and phosphorus which are nutrients needed by plants. Clam shells can be used as the basic material for craftsmanship because they have a very good texture to be shaped into

various tangan crafts. The content present in clam shell flour is not only calcium, but also protein and phosphorus needed by farm animals to grow, develop and reproduce.

BIBLIOGRAPHY

Darmono. 2001. *The Environment and Its Pollution: Its Relationship to the Toxicology of Metal Compounds*. UI Press. New York.

Hardjowigeno, S. 1997. *Soil Science*. Akapres. Jakarta.

Indriani, Y. H . 1999. *Making Compost Quickly*. Self-Help Spreader. Jakarta.

Kurniasih, D., Rahmat, M. B., Handoko, C.R., and Zuhri, A. A. 2017. *Making Animal Feed from Clam Shell waste in Bulak Kenjeran Village, Surabaya*. Surabaya State Shipping Polytechnic. Surabaya.

Maslim, 2013. *Effect of Blood Mussel Shell Extract with Berberda Concentration on the Growth of Leatherback Turtle Hatchling Carcasses in Lampu'uk Lhoknga Breeding, Aceh Besar Regency.* Syiah Kuala University. Banda Aceh.

Muntamah, 2011. Synthesis and Characterization of Hydroxyapatite from Blood Mussel Shell Waste *(Anadara granosa). Thesis*. Bogor Agricultural Institute. Bogor.

No, H.K., Lee, S.H. , Park, N.Y and Meyers, S.P.2003. Comparison Of Phsycochemical Binding And Antibacterial Properties Of Chitosans prepared Without And With Deprotei Ization process. *Journal of Agriculture and Food Chemistry*. 51: 7659-7663.

Salsabila, S. 2018. *Handcrafted Papers From Shells*. Sma Negeri 1 Kotabaru. South Kalimantan.

Santoso, P. 2022. Study on Blood Mussel Capture *(Anadara granosa)* Towards The Development of Its Cultivation in Kupang Tengah District, Kupang Regency. *JVIP*, 2(2) : 24 - 31

Sisworo, W. H. 2006. *Food Self-Sufficiency and Sustainable Agriculture*. Jakarta.

Dance, A. A, D uan FK and Amalo D. 2018. Analysis of the Nutritional Content of Types of Shellfish Commonly Consumed by the Nembe Community of Oeseli Village, Southwest Rote District , Rote Ndao Regency, East Nusa Tenggara. *Journal of Biotropical Science* Vol. 15, No. 2 : 1 – 9.

Umami, A. and Suprijanto, J. 2013. *Utilization of Seaweed Waste and Clam Shells as Liquid Organic Fertilizer*. Semnaskam Gajah Mada University. Yogyakarta.