PROTOTYPE OF BIODEGRADABLE PACKAGING MATERIAL FROM MUSM

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Highlights: The intend of MUSM packaging materials is to produce alternative packaging which can replace or reduce the vast amount of using polystyrene or synthetic plastic. MUSM is from biobased materials such as plant and mushroom mycelia. The mycelia play a natural binder to make the shape of the fabric according to the mold. The biodegradation processed showed by 18 days, MUSM materials started for degradation in the soil.

Key words: *Waste management, polystyrene, environment, pollution, Carboard,*

Introduction

Packaging materials are inseparably involved in our daily life. Therefore, for vast production of synthetic packing material especially polystyrene making problem as waste management (Chamas, 2020). Composition of Polystyrene is from petroleum based thus waste of this product released toxic element in the environment affect to human and other biolife (Chamas, 2020). This research was carried out to prepare a prototype of biodegradable packaging tools that can replace the vast amount for polystyrene. As for product development this study used biomass of fungal mycelia and paddy as refer here MUSM to prepare packaging materials. The packaging material design based on mould shape.

It showed fungal mycelia work as natural binder on paddy straw in the mold without using any chemical addition as compare to polystyrene. The mycelia cover the mould within 15-30 days based on mold shape (Table 1). There are three design mold were selected in this experiment which are can holder, bowl, and carboard/flat board. Each of the design has different application in the packaging industry.

- Can Holder: used to store and hold can drink.
- Bowl: used to put and store things like accessory.
- Carboard/Flat board: used to make a more compact structure to create more sturdy materials such as tables and chairs.

In this study, the degradation process was also observed as ensuring the biodegradability. The degradation process was carried out in soil incorporated tray and compare with polystyrene material. The degradation process of the MUSM packaging started to occur on 18 days as material become more brittle, moist, and some decomposer microbial growth can be found on top of the board; therefore, approximately by one 45 days it can completely decompose on soil. On the other hand, there is no change in polystyrene material. In literature showed that plastic, polystyrene packaging products took around 300- 500 years for biological degradation (Chamas, 2020). Besides that during the degradation process of synthetic packaging material of polystyrene released toxic or carcinogenic chemicals in soil, water; hence it has urged to banded polystyrene (Chamas, 2020).

The MUSM packaging material product advantages notice as it is simple to produce, completely biobased, less equipment is needed, cost effective and faster to degrade without leaving any toxic material in the environment.

MUSM production can create entrepreneur because nowadays biodegradable packaging materials demand are increasing in line (Mordor Intelligence, 2020). The awareness of biodegradable packaging materials are increasing in worldwide which showed it has great chance for commercial production in market entry, market share and market size (Mordor Intelligence, 2020).

Figure 1: MUSM Bowel prototype

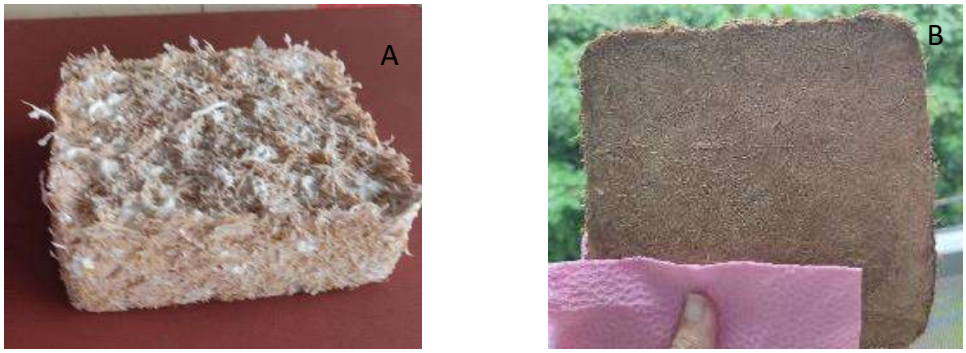

Figure 1: MUSM cardboard/flat board prototype. Figure 1A shows the mycelium has covered the mold shape; 1B shows that carboard/flat board from MUSM.

Table 1: Shows the total process information on for the development of different mold shape mushroom packaging materials

No	Sample Design	Initial weight (g)	Time taken to cover mold shape	Expected final weight (g)	Time taken to dry in oven dry	Final weight (g)
1	Can Holder	220.10	25 days	77.04	6 hours	76.89
2	Bowl	260.47	30 days	91.16	7 hours	90.70
3	Desk Corner Protection	76.14	20 days	26.65	5 hours	19.65
4	Flat board (height: 5cm)	207.30	24 days	77.04	12 minutes	67.89

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