

Chittawan Kruakam 2012: Characterization and Physico-Chemical Properties of Brewers' Spent Grains for Application of Degradable Plant Pot. Master of Science (Packaging Technology), Major Field: Packaging Technology, Department of Packaging and Materials Technology. Thesis Advisor: Assistant Professor Lerpong Jarupan, Ph.D. 98 pages.

Brewers' spent grains (BSG) is an agro-industrial by-product from brewery production. This research aimed to utilize BSG as a raw material in the development of degradable plant pots. The experimental procedures spanned characterization of BSG including chemical composition, essential nutrients to plant growth, heavy metals, and physico-chemical properties. Optimum condition between BSG, clay, glycerol, and polyvinyl acetate (PVAc) for preparation of the plant pots in formable shape was analyzed. Chemical and mechanical properties, and biodegradability of the plant pots were investigated. Nutrient release to soil was compared at the initial and final stage of the biodegradation process. The results showed that BSG had a high nitrogen content (5.629 %) and was enriched with essential nutrients for the plant growth. Heavy metals which can cause toxicity to plants were found under maximum standard levels. After sixteen formulae for manufacturing of the plant pots by compression method, the optimum proportions between BSG, clay, glycerol and PVAc were found of having the BSG as the core content of 75 g and 100 g. Nonetheless, there were four compositions yielded a formable shape: T<sub>14</sub> (BSG<sub>75</sub>: CLAY<sub>100</sub>: GLY<sub>25</sub>: PVAc<sub>50</sub>); T<sub>16</sub> (BSG<sub>75</sub>: CLAY<sub>100</sub>: GLY<sub>50</sub>: PVAc<sub>50</sub>); T<sub>10</sub> (BSG<sub>100</sub>: CLAY<sub>100</sub>: GLY<sub>25</sub>: PVAc<sub>50</sub>); and T<sub>12</sub> (BSG<sub>100</sub>: CLAY<sub>100</sub>: GLY<sub>50</sub>: PVAc<sub>50</sub>). Analysis of mechanical properties elucidated that the BSG plant pots under T<sub>14</sub> and T<sub>10</sub> withstood the maximum compressive strength at 3,235.548 and 2,722.374 N and resisted to the drop heights at 192 and 142 cm, respectively. The biodegradability test employing cumulative carbon dioxide that was released from the organic content of the BSG plant pots showed the average biodegradation of 0.0093% after a 45-day period. In spite of such a small percentage of the biodegradation, chemical properties of soil affected by the decomposed plant pots indicated an increase of total nitrogen (0.092-0.105%), organic matters (2.155-2.276%), and electrical conductivity (EC) (0.419-0.422 ds/m). To this end, it was concluded that BSG was capable of utilizing as raw material for manufacturing the plant pots, in order to represent an alternative solution to the environmental problems generated by agro-industrial wastes.

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