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PHYSICOCHEMICAL AND PHYTOTOXICITYANALYSIS OF SAGOBARK WASTE COMPOST

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Abstract - Sago bark (SB) waste is available abundantly as sago processing by-products in Sarawak. The release of SB waste into waterways could harm aquatic life and burning of SB will cause air pollution. In this work, SB waste is utilized via composting process to produce compost foragricultural use.The physicochemical characteristics and phytotoxicityof the prepared compost was evaluated monthly. SB compost was prepared by mixing SBwaste with chicken manure and empty fruit brunch (EFB) in ratio 6:6:1. The maturity and stability of compost in three months composting process was evaluated via physicochemical characterization of the composts in terms of pH, total ash content, total organic content and elemental analysis. The effect of the composts usage as growth medium and the phytotoxicitywas assessed towards aromatic lettuce via seed germination. Results showed that after three months, the composts colour were dark brown with earthy smell. The volume and weight of the compost was decreased.The total ash content and total organic matter of the SB compost were increased and decreased respectively during 3 months composting. Total C/N ratio was 21.63, 13.38 and 4.91 during first, second and third month respectively. The pH of the compost is alkaline after three months of composting. The germination index (GI) for studied vegetables was >100% after five days after germination.

Keywords - Sago bark waste, agriculture waste, compost, physicochemical, maturity

I. INTRODUCTION

Sarawak is currently one of the world's largest exporter of sago products, with annual export of approximately 43,000 tonnes [1]. It is estimated that 0.75 tonnes SB waste is generated for every tonne of sago flour produced [2], which accounts for 32,250 tonnes of annual SB waste generation. SB waste is normally incinerated for power generation in sago mills, dumped directly into nearby rivers or left for netural degradation outside sago mills [3]. More than 85% ofSB is left unutilized in sago processing mill, giving opportunity for utilization of the waste as useful products.

Previous research has shown that composting can help in reducing the problems of agricultural waste, as well as providing products that can be used for agricultural purpose [4]. Composting is a controlled decomposition of organic material to produce highly stable and pathogenic free compost, which can be used to improve soil structure or nutrient quantity [5]. Previous studies on composting revealed that the composting conditions must be carefully maintained in order to ensure the efficiency of the process, and a matured compost is obtained at the end of the process [6]. As the use of immature compost could lead to unwanted alteration in soil physical properties and plant growth [7], it is crucial to monitor the physicochemical properties of the compost throughout the composting process. In this work, investigated was the physicochemical characteristics of SB compost prepared in a three-month period. The seed germination study was also conducted to study the applicability of the prepared composts as plant growth medium.

II. MATERIALS AND METHOD

A. Composting Process

SB waste was collected from Ubom Sago Mill SdnBhd in Mukah, Sarawak, Malaysia. Samples were washed, dried, ground and sieved into particle size range 0.1 to 0.5 cm prior to use. The composting process was conducted inside rectangular containers (20.0 cm length, 20.0 cm width, and 20.0 cm height). The composts were prepared by mixing the SB with chicken manure, and empty fruit brunch (EFB) as bulking agent, in the ratio 6:6:1 (SB waste:chickenmanure:EFB). The compost turning was done once daily to ensure the moisture content were kept between 50-70% [8]. Compost temperature was taken daily before turning the compost.Compost samples were taken monthly for analysis.

B. Physicochemical Analysis

The temperature of the compost was measured daily before compost turning,using soil thermometer.The changes in compost mass was measured by comparing with the initial mass of the compost with the mass at the end of each composting stage. The odour of compost was analysed by the presence of lack sour or ammonia odour, before and after the composting process based on physical observation directly in the compost pile [9]. The pH ofthe compost was measured using pH meter in distilled water at a sample/water ratio of 1:5 [10].Moistureand ashcontent was determined following previous studies [11], [12].Total organic carbon (TOC) and organic matter content were determined by wet oxidation using the Walkley–Black dichromate digestion method [10]. Total N was determined using an elemental analyzer using CHN Analyser Flash EA 112 Series. The C/N