CHARACTERIZATION OF SUGARCANE BAGASSE, RICE STRAW AND RICE HUSK AND THEIR SUITABILITY FOR PAPER PRODUCTION.

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ABSTRACT
Various agricultural residues such as sugarcane bagasse, rice straw and rice husk have taken a significant place in supplementing the dwindling supply of conventional forest raw material for catering the ever-increasing demand on the pulp and paper industry. Production of pulp from non-wood resources has many advantages such as easy pulping capability. But the main reasons for the decreased use of these residues in the paper industry is due to the presence of large amount of pentosanes in the pulp and black liquors, which also contain silica. The silica content can limiting the use of the residues in paper mills. In this study, the agriculture residues were characterized by scanning electron microscope (SEM) with using energy dispersive spectrometer (EDS) technique. Results showed that sugarcane bagasse has lowest content of silica, 9.78 % and highest content of carbon, 90.22 % compare to rice straw and rice husk.

Keywords
Agriculture residue, silica and SEM-EDS.

1. INTRODUCTION
Various agricultural residues such as straw, stalk, bagasse and cereal have taken a significant place in supplementing the dwindling supply of conventional forest raw material for catering the ever-increasing demand on the pulp and paper industry [1]. In some countries, their researchers found that the agricultural residues like sugarcane bagasse, leaves and rice straws are suitable raw material for the production of pulp [2].

Sugarcane (*Saccarhum officinarum*) bagasse is a residue produced in large quantities by sugar industries. In general, 1 ton of sugarcane bagasse generates 280 kg of bagasse, the fibrous by-product remaining after sugar extraction from sugarcane [3]. However, the utilization of sugarcane bagasse is still limited and is mainly used as a fuel to power the sugar mill [4,5]. These polymers are important for the production of pulp.

Annual world rice (*Oryzae sativa*) production was about 577 million tons for 1997 – 98. More than 50 countries contributed to this sum with the production of at least 100, 000 tons of rice annually. One of the countries is Malaysia. Among these large quantities of agricultural residues (rice straws and rice husks), only a minor portion of the residues is reserved as animal feed. However a huge quantity of the remaining straws is not used and burnt in the fields. The air pollution, therefore is a serious problem by burning these residues in this area. Therefore, the use of these straws in pulping or papermaking has many advantages including reducing the need for disposal and environmental deterioration through pollution and fires [6]. The main reasons for the decreased use of rice straw and rice husk in the paper industry is due to the presence of large amount of pentosanes in the pulp and black liquors, which also contain silica. The need to add alkali to reduce or prevent silicate deposites to remove silica from the black liquors currently limiting the use of rice straws in paper mills [7].

Cellulose, the major constituent of all plant materials, forms about half to one third of plant tissues and is constantly replenished by photosynthesis. In particular, cellulose is the main constituent of higher plants, including sugarcane bagasse rice husk and rice straw. Chemically, cellulose is a linear natural polymer anhydroglucose units. Paper is composed of cellulose fibers. Finished papers may contain natural impurities, such as lignins that have not been removed during processing, unnatural impurities, such as residual chemicals, like sulfites, not washed out during final processing, or such chemicals as alum that have been added during final processing. Lignins, which are the combined glues that hold plant cells together, are undesirable in a finished paper product. They age poorly, turn brown, become acidic over time, are waterproof, and resist the natural bonding of cellulose fibers to each other. If lignins are not removed and are left in contact with the surrounding cellulose fibers in paper, their acidity will break down the cellulose and the paper will become brittle [8].

The objective of this study is to investigate the cellulose or cabon content and silica content of the sugarcane bagasse, rice husk and rice straw. The raw materials are characterized by Scanning Electron Microscope with Energy Dispersive Spectrometer technique (SEM-EDS).

2. MATERIALS AND METHODS

Sugarcane bagasse, rice straw and rice husk were obtained from a local factory and farmers in Perlis. The samples were first dried in sunlight and then cut into small pieces (1-3 cm). The cut sugarcane bagasse, rice straw and rice husk were ground to pass a 1.0 mm size screen. To reduce errors and confirm the results, each experiment was repeated in triplicate under the same conditions and the content of carbon and silica was given as the average of these three replicates. The fiber dimensions analysis were performed using Scanning Electron Microscope (SEM), MODEL JEOL (JSM/6460LA).

3. RESULT AND DISCUSSION

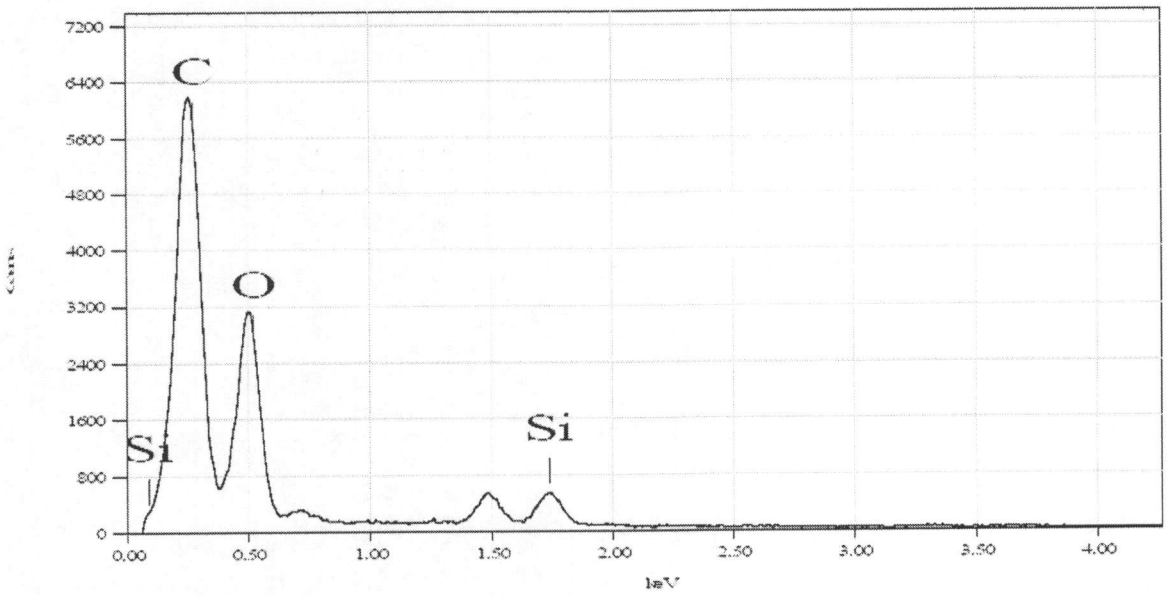

Figure 1 : SEM-EDS micrograph of sugarcane bagasse.

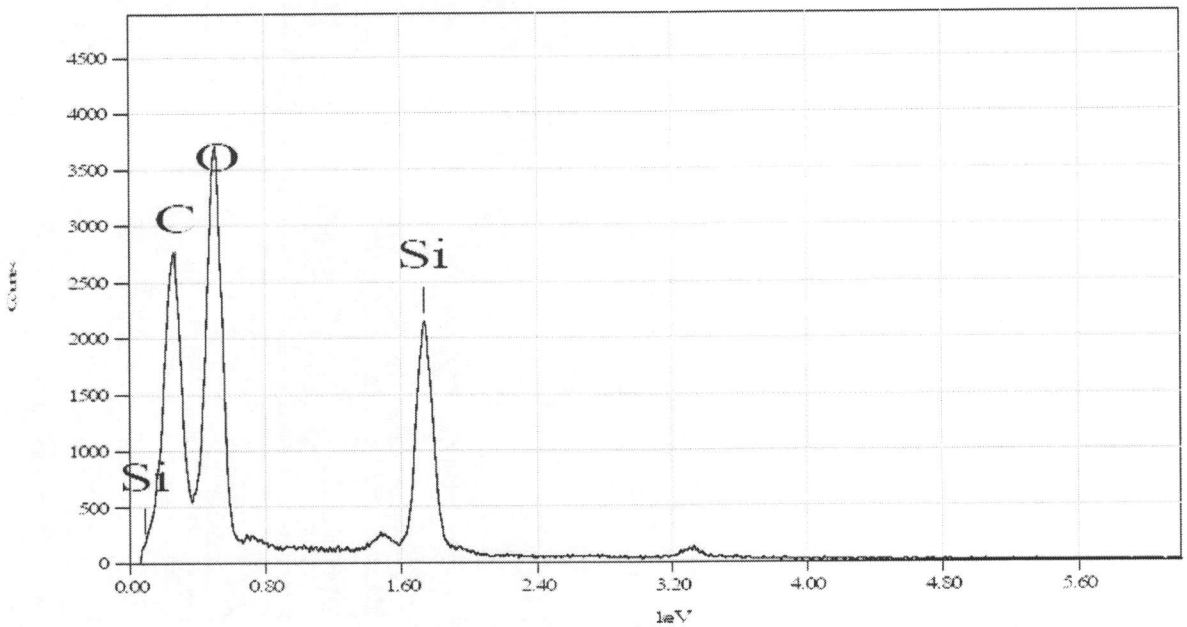

Figure 2 : SEM-EDS micrograph of rice straw.