ISOLATION OF HEMICELLULOSE FROM RICE STRAW BY ALKALINE EXTRACTION

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ABSTRACT

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An alkaline extraction method was developed for the extraction of two types of hemicellulose; hemicellulose with lignin (HL) and hemicellulose without lignin (HWL) from rice straw. The extraction of hemicellulose was done using sodium hydroxide (NaOH). Hemicellulose is an alkaline soluble compound; therefore extraction using NaOH is the most suitable method to isolate hemicellulose especially from non-woody plants such as rice straw. Several factors such as NaOH concentration, temperature and pH were optimized for maximum production of these hemicelluloses. Rice straw was mixed with NaOH at concentration of 1 % - 5 %, temperature of 45 °C - 65 °C and at pH of 4.5 - 6.5. The determination of hemicellulose concentrations were done using UV - Visible Spectrophotometer and the hemicellulose concentrations were analyzed by determining the total sugar. The results showed that the optimum condition for the extraction of HL was at 1 % of NaOH, 65 °C and pH of 5.5 while for the extraction of HWL, the optimum conditions was at 3 % NaOH, 45 °C and pH of 5.5. The concentration for HL determined using UV - Visible Spectrophotometer at 1 % NaOH, temperature of 65 °C and pH 5.5 were 7.44 µg/mL, 18.01 µg/mL and 22.99 µg/mL, respectively. On the other hand, the HWL concentration at optimum NaOH concentration, temperature and pH were 32.06 µg/mL, 63.56 µg/mL and 33.77 µg/mL, respectively.

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1.1 Background of study and problem statement

The agricultural industry produces a significant amount of post-processing waste and residue. In Malaysia, the palm oil and sago starch industries, as well as industries concerning the fabrication of rubberwood products are responsible for the production of a significant amount of agricultural residues. In the past, such materials have been utilized as animal feed or organic fertilizers. At the same time, they are also allowed to decay naturally in fields, discarded or burnt. Current practices performed to discard these residues include on-farm burning, burial, stockpiling and landfilling. These procedures thus contribute adversely to water, soil and air quality as well as the survivability of living organisms in the surrounding ecosystems (Vikineswary, 2006).

Crop residues and other agricultural by-products are once categorized as wastes have become a major component of livestock feed in many Asian countries. The rapid increase in their use are believed due to several factors such as increasing demand for food, greater pressure for agricultural land use, rising cost of better-quality feed, pollution problems due to waste disposal, and the realization of the wasting of enormous quantities of potential sources of carbohydrates.