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Yield efficiency and structural characteristics of cellulose fibers extracted from industrial *Ananas comosus* (pineapple) peel waste

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Sri Lanka is blessed with various kinds of agrarian resources such as cereals, yams, spices, fruits, and vegetables. Amongst the postharvest losses of fruits, mango, orange, and pineapple contain a higher percentage of inedible portion. However, fruit and vegetable waste is rarely used for value addition in Sri Lanka. Underutilized waste is useful in the production of value added constituents such as cellulose. The aims of this study were to explore the utilization of industrial *Ananas comosus* (pineapple) peel waste as a source for isolation of cellulose and to evaluate the characteristics of isolated cellulose. Wet milled pineapple peel pulp was washed with distilled water at 85 °C. The pulp was treated with an alkali (2% NaOH) at 80 °C for 2 h, then bleached with equal parts of commercial bleaching powder (1.7%), acetic buffer (pH 4.5), and distilled water at 80 °C for 2 h. The product was washed several times with distilled water until the pH is neutral. After bleaching, extracted cellulose fibers were dried at 45 ± 5°C and characterized using Fourier transform infrared (FTIR) spectroscopy, powder X-ray diffraction (PXRD), and scanning electron microscopy (SEM). The yield of isolated cellulose was calculated as 27.9% on a dry basis. In the SEM image of the extracted cellulose (at 100 µm scale), cellulose is present as micro fiber bundles (Figure 1). In the FTIR spectrum, peaks present at 3335 cm⁻¹ and 1030 cm⁻¹ can be assigned as O-H stretching and C-O stretching at C-6 respectively. The presence of a glycosidic linkage is evidence of a cellulose structure as these linkages bond anomeric carbon atom of saccharides to form polysaccharides. In the PXRD pattern, the highest peak intensity was exhibited at a 2θ value of 22° due to the crystalline phase of cellulose. The presence of a broad peak at a 2θ value of 18°, is related to the amorphous arrangements. The crystallinity index was calculated as 56.40%, which is a relatively lower value due to the amorphous regions. In conclusion cellulose was successfully extracted from pineapple peel waste indicating a pronounced production potential of cellulose from pineapple peel waste to be used in various industries, promoting sustainability and biodegradability.

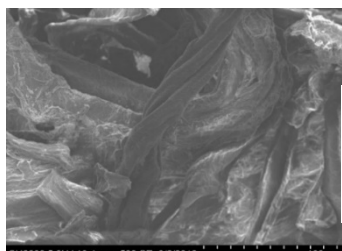


Figure 1: SEM image of extracted natural cellulose fibers from pineapple peel waste

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