

Extraction of Pulp from Waste Grasses and Tree Leaves for Paper Industry

By Kamoga Omar Lwako

Abstract

Fibre consumption for the production of paper and paperboard worldwide is increasing despite of diminishing supply of wood due to deforestation. Earlier, paper was being made from non-wood materials but with the development of technologies in pulping, their use was almost abandoned. However there is a growing revival of the use of non-wood raw materials in paper production since they are more available, readily regenerate and are not beneficially utilised in many communities. In this study four grasses and leaves from four tree species were selected and their potential use as raw materials for pulp and paper industry was evaluated. The sample materials were collected from both rural and urban areas of Eastern and Central Uganda. The study involved the proximate analyses of the raw materials, identification of appropriate pulping techniques, optimisation of pulping conditions and characterisation of the extracted pulp and paper made.

Standard Norman and Jenkins; as well as Tappi methods were used in the proximate analyses and characterisation of both pulp and paper. Soda Anthraquinone (AQ) and Kraft pulping techniques were evaluated and their optimum conditions identified for the different species. A combination of the Taguchi optimization and Space-Filling Maximum Entropy Designs were used in the optimisation study of the pulping conditions; and in the development of multivariable regression model equations for kappa number and yield.

Findings showed that grasses contained appreciably higher amount of the desirable constituents (hollocellulose and α -Cellulose) and less of undesirable constituents (lignin, extractives and ash content) in the production of paper than tree leaves. The grass constituents were very close to those of other nonwood materials and some wood. The optimum soda AQ pulping conditions of grasses were 25% NaOH, 0.1% AQ, at 160oC in 1 hour and 30% sulphidity for *Cymbopogon nardus* and *Paspalum notatum* and 10% sulphidity for *Saccharum officinarum* and *Digitaria scalarum*, at 20% active alkalis at the same temperature and time duration for Kraft pulping. There were slight differences in properties among pulps of the same species extracted by the two pulping methods . The pulps from grasses had reasonable yield (31.08% - 45.13%), medium viscosity (915.00-603.59 cm³/g), high bleachability (brightness of 71.27- 48.60%), short (1.143- 0.661mm) and narrow fibres (11.6 -18.5 mm) as well as moderate paper strength. The four grasses are recommended for pulp and paper production. If the research findings are adopted, the study is expected to contribute to the reduction in environmental degradation, and the burden of collection and disposal of waste grasses and tree leaves.

Keywords: Pulping, Non-wood, optimisation, kappa number and deforestation