
Adaptation of the Jayme-Wise Procedure For Determination Of Principal Components of Fibre in Sugarcane

F.A Homer, D.I Fox and H.B Davis

Bagasse as Fuel

- Sugarcane fibre is being increasingly recognised for its economic value
 - Bagasse has been in traditional sugar milling operation been used for power generation for the plant and process
 - Common perception that sugarcane varieties differ in value or performance as fuel
 - Most measurements indicate very similar calorific values in bagasse from sugarcane varieties of contrasting combustion performance
-

Fibre in Sugarcane

- Fibre content of sugarcane is considered a distinct variety characteristic
 - New MPC varieties have potential to increase the range of fibre composition in commercial sugarcane
 - It would be desirable to know whether the composition of fibre in sugarcane has a genetic basis
 - Of whether the chemical composition of fibre contributes to observed variation in combustion properties of bagasse derived from different varieties
-

Bagasse Organic Composition

Bagasse like other ligno-cellulosic materials has the following main organic components:

- cellulose
 - α -cellulose
 - hemicellulose
 - lignin
-

Combustion Properties

- Combustion properties enhanced by exothermic reactions generated when flammable volatile compounds produced at $>200^{\circ}\text{C}$ mix with air
 - The continuous production of heat from these reactions propagates combustion
 - Cellulose has the highest and lignin the lowest concentration of flammable volatiles
 - The higher the cellulose content, the higher the presumed combustibility
-

Jayme-Wise Procedure

- Sequential extraction of components of woody materials
 - Step1 – soxhlet extraction of waxes, oils and resins with 2:1 v/v toluene /ethanol
 - Step2 – extraction of lignin with 1% sodium chlorite and acetic acid
 - Step3 – alkaline hydrolysis of holocellulose (H₂O insoluble carbohydrate residue following lignin extraction) to yield soluble hemicellulose and insoluble α -cellulose
 - The content of each component determined by weights after each extraction
-

-
- The method is lengthy, tedious with risk of error from sample loss at each stage
 - The method was developed for woody materials
 - There is potential for reducing the process time for each step in less woody materials such as bagasse
-

Study Objectives

- The project was undertaken to adapt the Jayme –Wise procedure to sugarcane fibre materials
 - During the study methods of sample preparation, and duration of the sequential steps of the analyses were varied
 - Samples were taken of knifed cane from factories and fibre samples of DB 7869 and WI81456 from a jeffco cutter grinder
-

Summary Result

- Sample preparation (grinding) improved the efficiency of the procedure
 - 12hr required for soxhlet extraction of soluble organics (down from 24hr)
 - De-lignification requires a reaction time of 24 hr
 - Lignin results (~ 30%) were higher than generally reported in the literature for bagasse (18 -24%)
 - Alkaline hydrolysis for 1.25hrs at 26°C equivalent to 24hr at 4°C for hemicellulose / α -cellulose separation
 - Fibre from DB 7869 and WI 81456 had similar relative distribution of the components
-

Conclusions

- These results though promising warrant closer examination of the procedures for separation of the holocellulose component
 - Use of certified reference material will be useful for validation of these procedures
 - These methods may have potential in the assessment of fibre in different varieties.
-