

## ABSTRACT.

### THE PRODUCTION OF SORGHUM SYRUP

#### **The Development of Process Parameters for the Full-Scale Production of Sorghum Syrup and Preliminary studies on the Evaluation of Sorghum Juice as a Substrate for Ethanol Fermentation.**

#### **Section 1**

Experiments were carried out to identify and establish technically and economically feasible processes for commercial production of sweet sorghum syrup, suitable for the local and export food market, using conventional cane sugar production facilities.

The need for chemical clarification was emphasised by comparison with the physical clarification techniques, centrifugation and filtration. The effect of temperature and pH on juice quality was also studied. Clarification by heating to 95°C and lime addition to pH  $\geq$  7.0 was essential for complete precipitation and coagulation of juice impurities.

Acid and enzyme hydrolysis of sucrose were investigated and optimum conditions established for the use of invertase. Elimination of juice starch was achieved with Teramyl, a liquid  $\alpha$ -amylase operable at 95°C and neutral pH.

A process was established for syrup production which was compatible with the facilities for processing sugar cane. The major unit operations involved were enzyme inversion at pH 5.0-5.5 and 55-60°C, hot clarification and starch elimination at 95°C and pH 7.2, and vacuum evaporation to 75-80° Brix.

## Section 2

Sweet sorghum juice was also evaluated as a potential substrate for ethanol fermentation. The influence of process parameters such as temperature, sugar concentration and yeast cell concentration on the rate and extent of ethanol fermentation were investigated.

The rate of ethanol formation was a maximum at 34°C, 15.0% total sugars and a yeast cell concentration of  $1.1 \times 10^{11}$  cell/100 ml juice (15% v/v). Ethanol concentration and sugar conversion efficiencies however, were highest at a cell concentration of  $7.4 \times 10^{10}$  cell/ 100 ml juice. (10% v/v) and 40°C.