

Polarimetry & Polarimeters

Determining Pol by Saccharimeter



a xylem brand

FAQ-GRP-028

Background

This method is applicable to cane juice and all factory products

Field of Application

The use of lead acetate clarifiers for Pol measurement is dangerous to health and the environment. This new Pol method uses pressure filtration with a non-toxic filter aid followed by a pol reading on a near infrared (NIR) polarimeter. NIR polarimetry is used because the alternative Diatomaceous Earth filter aid does not clarify perfectly so transmission of visible light may be restricted. The method is used in sugar mills and is used for cane payment.

In addition, Brix measurement can be carried out on the same filtrate.

Definitions

Pol: (polarisation of a solution) is the apparent sucrose content of any substance expressed as a percentage by mass in grams of solute per 100g of solution.

Brix: the unit, °Brix, which has been in common use in the sugar industry for decades, is intended to represent the dry substance content (in grams of solute per 100g of a solution)

Principle

The aim of this method is to determine Pol and Brix in sugarcane factory products. A physical filtration is carried out using a filter aid and with a pressure filtration device. The polarimetric measurement is obtained with a polarimeter with a near infrared wavelength (825 – 882.6nm).

All sugarcane products may be analysed: sugarcane juice, mixed juice, filter cake, molasses, massecuite and bagasse.

Reagents and Materials

Filter paper: 140mm diameter
Filter aid: Diatomaceous Earth

Apparatus

Filtration unit: A high-pressure filtration device should be used for a fast and correct filtration. Pressure is obtained with a compressor.

Balance: capable of weighing up to 1kg, readable to 0.01g

Polarimeter: Polarimeter – ADS400 Series (850nm; accuracy ± 0.06 °Z or better) or ADP620P (880nm; accuracy ± 0.02 °Z) at 20.00°C.

Refractometer – RFM340+ refractometer (accuracy ± 0.03 °Brix or better)

Procedure

Preparation of extract: Dilute the sugar product if necessary (Table 1). Prepare 2 x 200mL of dilute solution. Weigh filter aid (Table 1) and mix in the solution. The first 200mL sample is used to clean the filtration apparatus, the other sample is used for analysis. Cool the filtrate at 20°C in a waterbath and use for Pol and Brix measurements

Table 1

Procedure for sugarcane juice and factory products

Product	Dilution (w/w)	Filter aid quantity (g)	Tube length (mm)
Cane analysis	No dilution	8g / 200mL	100
Mixed juice	No dilution	15g / 200mL	100
Syrup, A	1/6	15g / 200mL	100
Massecuite, B	1/6	15g / 200mL	100
Massecuite, A	1/6	15g / 200mL	100
Molasses	1/6	15g / 200mL	100
C Massecuite, B	1/20	20g / 200mL	100
Molasses and final molasses	1/20	20g / 200mL	100
Bagasse	250g + 2500g	5g / 200mL	100
Filter cake	72g + 500mL	5g / 200mL	100

Brix and Pol Determination

Prepare the filtration equipment and adjust the filter paper. Rinse the apparatus with the first 200mL. The second 200mL filtrate is used for the readings of Pol and Brix. Let the filtrate stabilise at 20°C for 30 minutes before reading.

Expression of Results

- Brix:

For refractometric dry substance, express results to the nearest 0.1 °Brix.

- Pol:

For Bagasse, the Pol is calculated as described in method ICUMSA GS5/7-1 (2011) “*The Determination of Pol (Polarisation), Brix and Fibre in Cane and Bagasse by the Wet Disintegrator Method with Lead Subacetate*”

- For filter cake:

Pol% Filter cake = $P \times 2$ (for a 100mm tube)

Where:

P = Pol reading on the polarimeter (°Z)

- For other products, polarisation is expressed as:

$$\text{Pol\% product} = \frac{P * D * 2 * 0.26}{\rho}$$

Where:

P = Pol reading on the polarimeter (°Z)

D = dilution factor following the sugar product

ρ = density correction according to Brix as given by SPS4 (2000)

Precision

The absolute difference between two results under repeatability conditions should be no greater than 0.04 for mixed juice and molasses.