



Method 2.2 – Prepared cane: Displacement Rate Index (DRI)

1. Rationale

This method is applicable to prepared cane and expresses prepared cane as a function of how easily the Brix can be extracted from the open cells in the sample. The method uses a DRI instrument (developed by the SMRI) that was specifically designed to determine the time constant associated with the process of washing the Brix out of a particular preparation.

2. Principle

A weighed amount of prepared cane is placed in a basket. Water is circulated through the cane in the basket so that the Brix in the cane is slowly transferred to the water. A measure of the Brix concentration in the water as a function of time is obtained using conductivity techniques. The concentration of the Brix in the water is modelled with a mass transfer equation. The time constant obtained through the equation is referred to as the displacement rate index (DRI) and indicates how easily the Brix could be removed from a sample of that particular cane preparation.

3. Apparatus

3.1 DRI instrument

The following are also required:

- A level surface of at least 450 mm wide × 550 mm deep
- A water connection: $\frac{3}{4}$ " B.S.P. connector to connect to a standard washing machine pipe
- A drain, such as a sink, that is lower than the surface
- A power supply: 220V AC 50 Hz

3.2 Plastic sheet: 2 × 2 m

4. Reagents

4.1 Disinfectant: household bleach

5. Procedure

5.1 Sample preparation

Take a sample of prepared cane from the DAC station following the normal procedure. Empty the sample onto a large sheet of plastic. Separate the sample into individual strands by taking a handful at a time and rolling it between two hands in a circular motion allowing the separated fibres to fall back onto the plastic. All the cane in the sample must be separated using this technique. The sample should be at least 1 000 g.

Mix the sample to give a uniform distribution of components (pith, fines and fibre) over the sheet of plastic by lifting each corner of the plastic in turn and rolling the sample towards to the opposite corner.

Level the sample by hand to a layer of approximately 50 - 100 mm thick. During leveling the fines tend to settle to the bottom of the pile. It is therefore essential that cane from the entire thickness of this layer be taken when the DRI basket is filled.

5.2 DRI determination

The instrument works on the principle that the water is washing the sample as it circulates. It is therefore critical that the sample be distributed evenly in the basket and that the sample be representative. If balls of cane are placed in the basket instead of a homogeneous layer, errors will result.

Install the instrument on a level surface with access to power, water and a drain. Switch the instrument on and wait for the rinse prompt. Ensure the cane pot is empty and press the indicated button on the instrument. When the rinse is complete, remove the cane basket and fill with the sample from 5.1. Take manageable handfuls from the layer of prepared cane ensuring that the entire thickness of the layer is taken each time. Spread each handful of cane evenly in the basket without compressing it. Repeat this until the basket is full (approximately 500 g sample).

Press the button to start the measuring cycle. The result will be displayed after about two minutes. Empty the basket immediately once the cycle is complete. Rinse the sample basket and the top and bottom sieves with water to remove pieces of cane. Reinstall the sample pot in the instrument and press the button to rinse.

5.3 Instrument maintenance

Never leave the spent cane in the basket for extended periods of time as this will lead to bacterial growth and fowling of the detector. If the instrument stands for more than twenty minutes without being rinsed, it will automatically fill and circulate with water to limit bacterial growth (this is referred to as a forced rinse). When the forced rinse has been completed the basket may be emptied and rinsed as normal.

Once the normal rinse is complete, the machine can stand until the next sample is scheduled. The instrument must be washed out with 30 cm³ household bleach once a shift. To do this, press the button while the machine is filling for the rinse cycle. Add the bleach when prompted and wait for the wash to complete. After the bleach rinse, continue as normal.

Wipe out the main water tank with a dry cloth and clean the sieve on the white cap at the front of the machine once a week.

6. Expression of results

The DRI value has no units. Express results to the nearest integer.

7. References

Loubser RC and Gooch MA (2004). DRI - what is it? *Proc S Afr Sug Technol Ass*, **78**: 403 - 411.

SMRI (2004). *Displacement Rate Index (DRI) Instrument User Notes*, 2 pp.