
EXPERIMENT 8 DETERMINATION OF TOTAL SOLUBLE SOLIDS (°BRIX)

Structure

8.1 Introduction

Objectives

8.2 Experiment

8.2.1 Principle

8.2.2 Requirements

8.2.3 Procedure

8.2.4 Result

8.3 Precautions

8.1 INTRODUCTION

Total soluble solids may be determined by means of Refractometer. Brix is a measure of total soluble solids (TSS) in the case of pure sucrose solutions. Generally fruit juices contain more sugar than other soluble constituents, and hence, Brix provides useful guide of TSS or sugar content.

The concentration of sugar solutions can be determined conveniently for routine purposes using a refractometer. There are two types of refractometers viz. hand refractometers and Abbe's refractometers, the latter being tabletop instrument, which can measure both °Brix (TSS) of sugar solutions and also there is provision for maintaining constant temperature.

It should be noted that the refractometers are calibrated for sugar solutions and hence if the medium contains other soluble solutes in substantial quantities, there will be slight error.

Objectives

After studying and performing this experiment, you should be able to:

- determine the °Brix of sugar solutions and TSS of food products.

8.2 EXPERIMENT

8.2.1 Principle

Refractometer measures total soluble solids (TSS) concentration based on the principle of refraction of light. When a ray of light travels obliquely from one medium to another, it is bent or refracted. The refraction occurs because light travels at slightly different velocities in different media, the extent being proportional to the density of the solution or the soluble solids concentration. The refractive index of a medium is defined as the ratio of the sine of the angle of incidence to the sine of the angle of refraction when a ray of monochromatic light is refracted from a vacuum (or, to a very close approximation, from air) into the medium. In a Brix refractometer, the refractive index is calibrated into °Brix readings. As refractive index is dependent on the density of the solution, the measurements have to be made at a specific temperature (20 °C) or suitable corrections have to be applied.

8.2.2 Requirements

Equipments

Hand Refractometer or Abbe's Refractometer

Thermostatically controlled water bath.

8.2.3 Procedure

Place few drops of the sample in between the prisms of hand refractometer and note the reading at the demarcation line. Apply temperature correction for readings taken at temperatures other than 20 °C using the following table.

In the case of Abbe's refractometer, circulate 20 °C water in the chamber enclosing the prism from a thermostatically controlled water bath. Place a few drops of the sample in between the prisms and allow the temperature to equilibrate and note the Brix reading, which gives per cent of sucrose sugar or TSS.

If sample is thick, squeeze it through cotton and place the drop in between the prisms.

8.2.4 Result

The readings are expressed as total soluble solids (TSS) = %.

Temperature corrections for readings of per cent sucrose in sugar solution by either Abbe or Immersion refractometer at temperatures other than 20 °C.

Table 8.1: International Temperature Correction Table, 1936

Percent Sucrose											
0	5	10	15	20	25	30	40	50	60	70	
Subtract from Per Cent Sucrose											
10	0.50	0.54	0.58	0.61	0.64	0.66	0.68	0.72	0.74	0.76	0.7
11	0.46	0.49	0.53	0.55	0.58	0.60	0.62	0.65	0.67	0.69	0.7
12	0.42	0.45	0.48	0.50	0.52	0.54	0.56	0.58	0.60	0.61	0.6
13	0.37	0.40	0.42	0.44	0.46	0.48	0.49	0.51	0.53	0.54	0.5
14	0.33	0.35	0.37	0.39	0.40	0.41	0.42	0.44	0.45	0.46	0.4
15	0.27	0.29	0.31	0.33	0.34	0.34	0.35	0.37	0.38	0.39	0.40
16	0.22	0.24	0.25	0.26	0.27	0.28	0.28	0.30	0.30	0.31	0.32
17	0.17	0.18	0.19	0.20	0.21	0.21	0.21	0.22	0.23	0.23	0.24
18	0.12	0.13	0.13	0.14	0.14	0.14	0.14	0.15	0.15	0.16	0.16
19	0.06	0.06	0.06	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08

Add to Per Cent Sucrose											
21	0.06	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08
22	0.13	0.13	0.14	0.14	0.15	0.15	0.15	0.15	0.16	0.16	0.16
23	0.19	0.20	0.21	0.22	0.22	0.23	0.23	0.23	0.24	0.24	0.24
24	0.26	0.27	0.28	0.29	0.30	0.30	0.31	0.31	0.31	0.32	0.32
25	0.33	0.35	0.36	0.37	0.38	0.38	0.39	0.40	0.40	0.40	0.40
26	0.40	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.48	0.48	0.48
27	0.48	0.50	0.52	0.53	0.54	0.55	0.55	0.56	0.56	0.56	0.56
28	0.56	0.57	0.60	0.61	0.62	0.63	0.63	0.64	0.64	0.64	0.64
29	0.64	0.66	0.68	0.69	0.71	0.72	0.72	0.73	0.73	0.73	0.73
30	0.72	0.74	0.77	0.78	0.79	0.80	0.80	0.81	0.81	0.81	0.81

8.3 PRECAUTIONS

The general precautions mentioned in the course 'Introduction' and those indicated in the experiments should be followed meticulously.