ABSTRACT OF A PAPER READ BEFORE THE CHEMICAL SECTION OF THE
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ON THE SPECIFIC ROTATORY POWER OF CANE AND INVERT SUGAR.

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THE angular rotation produced by a plate of 1 mm. in thickness is 24 degrees for the mean yellow ray or transition tint. In Soleil's polarizing saccharimeter the 24 angular degrees are graduated into 100 divisions, and in using the instrument a solution of cane sugar is employed of such concentration that a column of two decimetres in length shall cause a deviation of 24 degrees, or 100 divisions.

If S be the apparent specific rotatory power of an optically active substance in solution; A, the angular rotation observed; L, the thickness in decimetres of the solution traversed by the ray of polarized light; and C the number of grammes of solid in each 100 c.c. of solution; the value of S can be found by the following equation:—

$$S = \frac{L \times C}{100}$$

It is agreed by numerous observers that the apparent specific rotatory power of cane sugar in aqueous solutions containing at least 10 per cent. of the solid is + 73·88 for the transition tint.

Substituting this value for S in the above equation ; 24° for A ; and 2 for L ; we obtain—

$$73.8 = \frac{24}{2 \times \frac{C}{100}} ; \text{whence } C = 16.26$$

Hence the proper weight of sugar to be taken for use with Soleil's saccharimeter is 16.26 grammes, and not 16.19, 16.35 grammes, or any different weight. If it be contended that either of these alternative quantities is the right one to employ, it follows that $+73.8^\circ$ is not correct for apparent specific rotatory power of cane sugar.

According to Tuschmidt, Casamajor, and many other observers, a solution of cane sugar which, before inversion, shows a deviation of $+100$ Soleil divisions gives, after inversion, a negative rotation of -44 divisions at 0° C, decreasing by one division for each rise of 2° C, so that the inverted solution will show a deviation of -37 at 14° C, and -36.5 at 15° C.

Many writers on the rotatory power of invert sugar have overlooked the fact that inversion causes an increase in the weight of solid matter in the solution, 95 parts of cane sugar yielding 100 parts of inverted sugar. This increase of weight ought to be taken into account in calculating the specific rotatory power of invert sugar, which at 15° C is really 25.6° .

$$S_j = \frac{-36.5 + .24}{2 \times \frac{16.26}{95}} = -25.6$$

This number corresponds to a value of -25.94° for S_j at 14° C, instead of -25.0 , as generally stated. If 16.19 grammes be adhered to as the normal weight of sugar per 100 c.c., the value of S_j at 14° C becomes -26.05° , against -25.0° as usually taken.

If the value of S_j for invert sugar be taken at -26° (the mean of the above values) and O'Sullivan's figure $+57.6$ be adopted as the value of S_j for dextrose, then the specific rotatory power of lævulose at 14° C is -109.6° , instead of -106° , as usually taken.

$$(26 \times 2 + 57.6 = 109.6.)$$

To sum up, the corrected values of S_j are as follows :—

	S _j .
Cane Sugar	$+73.8$
Invert Sugar	-25.6 at 15°
Dextrose	$+57.6$
Lævulose	-108.8 at 15°

The deviation, according to the average results of various observers, produced by a plate 1 m.m. in thickness, is 24° for the mean yellow or transition tint, and 26.66° for the sodium ray. Hence the above values for S_j may be calculated to the corresponding values or S_D by multiplying them by the factor—

$$\frac{21.66}{24} = .9025$$