

REPORT OF COMMITTEE ON STANDARDIZATION OF CHEMICAL CONTROL

Three meetings of this Committee were held during the year, on 22nd September, 1944, 30th November, 1944, and 13th March, 1945.

REVISION OF RECOMMENDED METHODS OF CHEMICAL CONTROL.

At our first meeting the need of a thorough revision of our "Recommended Methods of Chemical Control"⁵ was discussed. It was felt that the publication of these methods in a separate book was a great step forward, many improvements in the methods were incorporated and it served an exceedingly useful purpose. Nevertheless, it was decided that with the experience gained in the intervening years the time was now opportune to start the revision of this publication and to bring it up to date. This decision was subsequently approved of by the Council of the S. A. Sugar Technologists' Association.

The Committee is fortunate in having available "System of Cane Sugar Factory Control of the International Society of Sugarcane Technologists," edited by F. W. Zerban, Chairman of the Special Committee on Uniformity in Reporting Factory Data, and will be largely guided by this publication, as the Committee will endeavour to conform as far as possible with international practice.

It is deemed advisable to publish proposed changes in our existing methods or contemplated departures from recommended international practice fairly fully so as to offer ample opportunity for comments thereon.

ERRORS IN PRESENT EDITION OF RECOMMENDED METHODS.

Although a large part of the year's work was directly or indirectly concerned with the proposed revision, this task will probably prove time consuming and it is necessary to point out the following additional errors in the "Recommended Methods":—

- Page 23 line 9 from top : for 98 ml. read 10 ml.
- Page 23 line 18 from top : for 0.01 mg. read 0.01 gm.
- Page 26 line 12 from top : for 9.5 gm. read 0.95 or 1 gm.
- Page 28 line 22 from top : for 25 gm. read 25.5 gm.

TEMPERATURE CORRECTIONS IN JUICE POLARIZATION.

A paper by G. S. Moberly³ dealing with this subject was discussed and the Committee agreed with the author that the brix calculation as given on Page 27, "Recommended Methods," was not strictly correct, and it was recommended that the following method be used:—

Calculation.—The weighted average of the four corrected brix determinations is adjusted to the temperature of the solution at the time of polarization. This figure is used for finding the sucrose from the Schmitz Table.

In this connection it must be pointed out that the change in procedure will only slightly affect the sucrose content of mixed juice under normal conditions and that this operation has of course nothing whatever to do with the correctness or otherwise of the Jackson and Gillis Method No. 4 for sucrose determination. It is unfortunately necessary to draw attention to this as the term Jackson and Gillis Method is often used rather loosely in this country—a practice which is to be deplored and which has led to some misunderstanding in the past.

As far as our application of the Jackson and Gillis method is concerned, we use a table of temperature corrections (Table V, Recommended Methods), based on a temperature coefficient of -0.53 . In many countries, however, a temperature coefficient of -0.5 is used and Zerban⁴ states that until a more exact figure becomes available the more generally used and rounded-off figure of -0.5 is preferred for routine factory control.

We, however, intend adhering to our present practice and to use the Jackson and Gillis temperature correction table based on a temperature coefficient of -0.53 until the position has been further clarified. In the meantime it is as well to stress the fact

once more that temperatures differing a great deal from the standard 20°C . should be avoided as far as possible so as to minimise errors arising from temperature corrections. Laboratories should not be situated where they are exposed to excessive heat. The ideal is, of course, a constant temperature room kept at 20°C ., thereby eliminating uncertainty as regards the correction and the complex effect of a varying temperature on solution and instrument. We now have one such laboratory in the industry, and it is hoped that this initiative will receive serious and sympathetic consideration of all concerned, especially where a large part of our routine control is based on pol determinations only.

SUCROSE TABLES USED WITH THE JACKSON AND GILLIS METHOD No. 4.

Zerban⁴ maintains that tables based on partial sucrose concentration or the difference between direct and invert polarizations are wrong and that dry substance concentration is the only correct basis. At the same time the concentration coefficient 0.0676 for methods using hydrochloric acid as the hydrolysing agent is strongly suspected as being too low. However, Zerban proposes keeping it, but suggests that it will have to be changed when a new value is agreed upon.

A change from our present procedure in which we use tables for finding the divisor based on the difference between the direct and invert polarizations (Table IV Recommended Methods) to dry substance concentration, will tend to increase the divisor whereas an increase in concentration coefficient will have the opposite effect. Therefore, much as we would like to follow the proposed international practice we do not feel justified in recommending any change at present, as a further alteration may become necessary in the near future, and it would appear better to wait until such time to review the whole situation. This being the case, the Committee can see no objection to the use of Moberly's² "New Table for Use of Jackson and Gillis Method of Sucrose Determination" if preferred to Tables IV and V in "Recommended Methods."

LEAD ACETATE IN BAGASSE POLARIZATION.

Brown and Zerban¹ state that neutral lead acetate should be employed for clarification wherever possible in preference to the basic salt, but these authors recommend dry lead subacetate for clarifying bagasse extract. Zerban⁴ too uses dry lead and this is done in many sugar countries. We, however, have been using neutral lead acetate for bagasse polarizations and it was decided to get a number of comparative tests done using neutral lead acetate and basic lead subacetate as clarifying agents on bagasse extracts. The following is a summary of the results obtained:—

Observer.	No. of Comparisons	Polarization higher using			Average	
		Dry lead.	Neutral lead.	No diff.	Dry lead.	Neutral lead.
1	46	18	12	16	3.52	3.50
2	30	0	15	15	3.15	3.20
3	28	0	13	15	3.32	3.37
4	48	18	18	12	10.22	10.22
5	101	22	42	37	3.05	3.09

Observer No. 5 noted that on several occasions when the extract was dark the filtrate, using Horne's dry lead acetate, was exceptionally clear and a definite end point on the saccharimeter could be read, whereas the filtrate from the neutral lead acetate was clear but dark and the end point not so good.

It was felt that the differences in pol between the two methods although in some cases statistically significant, were so small that considering the drastic treatment to which bagasse is subjected in a pol determination and consequent errors, these differences may not necessarily be consistent, and it was decided to do some more tests at different times of the year, and to pay particular attention to the clearness and colour of the filtrate, and the quantities of clarifying agents necessary.

MOISTURE IN BAGASSE.

Our Recommended Methods⁵ stipulates a drying temperature of not more than 105°C and a quantity of bagasse not less than 100 grams. The bagasse is to be dried to constant weight.

The Special Committee on Uniformity in Reporting Factory Data² recommends that a much larger sample than the usual 100 grams be taken. At least 500 grams should be used and the temperature of the oven can safely be raised to 130°C. A current of hot air is a great help to efficient and rapid drying.

Mr. Buchanan has done some valuable preliminary investigations on the drying of bagasse and his findings so far are in accordance with the above recommendation, and would indicate that bagasse can be dried at a much higher temperature than 105°C without danger of charring. Although the weight may become fairly constant after some hours drying at 105°C a further reduction in weight will take place if left longer, and also a higher temperature will indicate a higher moisture content. He also finds that with an increased sample the length of drying has to be increased considerably. The position of the bagasse tray in an ordinary oven has a great effect on the rate and efficiency of drying and there were large temperature variations in the oven. Another point noticed was that with our present perforated bagasse trays there was a small but fairly constant loss of bagasse dust.

It is clear that the subject should be investigated further, as at present moisture per cent. bagasse figures are probably often not comparable.

It is realised that with a substance such as bagasse a bigger sample has many advantages, but it is doubtful whether most of the existing ovens in the industry will be large enough for very bulky samples, and at any rate a large number of the smaller samples done at frequent intervals ought to give a satisfactory control. The necessity for standardizing not only the technique, but also as far as possible the ovens, trays, etc., is obvious.

NEW POLARIMETERS AND SACCHARIMETERS.

At least one factory intends buying a polarimeter with an electric sodium discharge lamp. The Committee recommended that future importations of either saccharimeters or polarimeters should have the International Sugar Scale

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References.

- ¹ Brown, C. A. and Zerban, F. W. (1941): Physical and Chemical Methods of Sugar Analysis. 3rd Edition. John Wiley and Sons. 311.
- ² Moberly, G. S. (1943): New Table for the Use with Jackson and Gillis' Method of Sucrose Determination. Proc. S.A. Tech. Assoc., **17**, 48.
- ³ Moberly, G. S. (1944): Temperature Corrections in Juice Polarization. Proc. S.A. Tech. Assoc., **18**, 24.
- ⁴ Zerban, F. W. (1942): System of Cane Sugar Factory Control of the International Society of Sugar Cane Technologists. Published by "Sugar."
- ⁵ ——— Recommended Methods of Chemical Control. S.A. Sugar Tech. Assoc.