

Committee on Standardisation of Chemical Control

Report for Year Ending March, 1928

The year under review has not seen any important new developments of the work of the committee such as the publication of our standard methods of sampling and analysis of last year. These methods, however, have been very generally adopted and given a thorough trial during the milling season under the diverse conditions prevailing at the various factories.

In general it may be said that they have stood the test of practical application very well, and the only criticisms received have been in comparatively minor matters, although each factory was asked individually to state any criticism or comment they had to offer.

There were 5 meetings of the committee during the year compared with 11 during the 1926/7 season when the standard methods were in preparation, but the meetings in general have been well attended and were usually considerably prolonged.

A sub-committee to study the sampling of cane for sucrose content, consisting of Messrs. G. S. Moberly (convenor), P. L. Draeger and G. Booth was appointed on January 24th and submits a separate report.

ANALYSIS OF MOLASSES.

The method of determining the specific gravity of molasses was criticised by one factory from the point of view of selling the molasses as distinct from the chemical control of the factory from which aspect the methods were formulated. As a result of these comments the matter is being discussed with the Durban Borough Analyst (Mr. A. Harding-Kloot) who usually represents the buyers of molasses, and there is no doubt that a mutually satisfactory scheme of general analysis of molasses will be evolved.

ERROR OF LEAD PRECIPITATE.

Another factory called attention to the possible error introduced by the precipitate in using basic lead acetate solution in the clarification of solutions for polarization and preferred the use of lead acetate powder.

The relative merits of Horne's v. Schmitz' method of clarification had been fully discussed by the committee last year and the conclusions were in favour of the latter.

It was shown at the Experiment Station that sugar cane juice as ordinarily obtained in Natal gave a negligible error due to the volume of the precipitate. Schmitz' method gave very slightly higher results than Horne's method, as has been found by observers, the discrepancy between the two methods being too small to be of any practical significance. The relatively large error (up to 3 per cent.) due to the volume of the precipitate recorded at Umfolozi was probably due to an abnormal juice containing a very large proportion of suspended matter.

ANALYSIS OF BAGASSE.

One or two factories reported somewhat higher or lower average results for sucrose in bagasse using the new apparatus compared with their former methods.

Experiments done at the Experiment Station with bagasse as received from the factory using the new apparatus both with the cover on and without gave no appreciable difference in results, showing that a method using an open boiler should give similar results to our method with a closed container. One half-hour's boiling was found to be ample in the ordinary way to ensure complete extraction of the sucrose; but where the bagasse was unusually coarse it might be necessary to prolong the time of boiling, and tests should be done in these cases to determine the extraction necessary.

In this connection, however, there should be kept in mind the possibility mentioned by Geerligs ("Cane Sugar and its Manufacture," 1924, page 52) that prolonged boiling may extract a dextro-rotatory non-sugar from the fibre and thereby give too high a value for sucrose in bagasse. According to G. L. Spencer, however (Handbook for Cane Sugar Manufacturers) de Haan showed that this extractable dextro-rotatory substance was precipitated from the solution by basic lead acetate, and that Norris did not find any evidence of it at all in Hawaiian conditions.

EFFECT OF TEMPERATURE ON POLARIZATION OF SUGARS.

The question of the variation in polarization of sugars with varying temperatures was brought before the committee.

Experiments done by L. Blacklock at the South African Sugar Refineries on raw sugars showed that the extremes of temperature found during a series of tests were 22° and 31° C. and that the polarization of a standard composite sample of raw sugar was 97.25° at the lower temperature and 97.10° at the higher. The small difference, 0.15°, between the readings over the extreme range of ordinary temperature variation in these experiments is considered to have no practical significance. Other experiments were in view, however, to determine over somewhat wider ranges the effect of change in temperature on polarization.

In dealing with sugar of higher polarization, however, 99° and over, it is considered necessary to apply a correction for temperature, which may be taken to be + 0.03° for every degree above 20° C. up to 30° C. as shown by Browne and other authorities.

DETERMINATION OF SULPHUR DIOXIDE IN SUGARS.

This matter was under consideration by the committee but no definite conclusions regarding the most suitable method have yet been reached.

OCCURRENCE AND DETERMINATION OF STARCH IN SUGAR CANE AND SUGAR HOUSE PRODUCTS.

Papers recently published by E. Haddon and L. Feuillerade in the South African Sugar Journal in this matter have been discussed by the committee.

No definite conclusions were arrived at, however, and the matter is held over until the return of Messrs. Haddon or Feuillerade to South Africa.

WEIGHING OF MOLASSES.

The few remaining factories having chemical control who appear to have no means of weighing or accurately measuring final molasses have been communicated with to remind them of the great importance of this matter.

STANDARDIZATION OF LABORATORY EQUIPMENT.

Advice had been received that the Experiment Station were prepared to undertake the checking of saccharimeters and hydrometers at the factory upon request, subject to a small fee to cover travelling expenses.

RESULTS WITH THE IMPROVED CLERGET METHOD.

G. C. Dymond reported that a comparison of the results with the modified Clerget test that we had adopted compared with the average of four-hourly tests of juice by direct polarization carried over a whole season at Empangeni showed the latter to be 0.09° higher than the Clerget results. This small systematic discrepancy might possibly be due to

the presence of other substances such as dextran or to a difference in the relative quantities of glucose and fructose present in the reducing sugars. It would be interesting to have the experience of other factories in this matter.

ANALYSIS OF RAW MATERIALS.

The committee have under consideration the possibility of extending the scope of their standard methods to include methods of analysis of the more important materials used in the sugar factory such as lime, phosphoric acid, sulphur, lubricating oils, etc., also the analysis of soils and fertilizers.

INTERNATIONAL SOCIETY OF SUGAR CANE TECHNOLOGISTS.

At the General Meeting of this Society in Cuba, in March, 1927, a Special Committee on uniformity in reporting factory data was formed with Dr. F. W. Zerban of New York as Chairman, and representatives appointed from most of the principal cane sugar producing countries; H. H. Dodds was appointed from Natal.

This committee is now collecting information from as many countries as possible and proposes to report to the next meeting of the Society to be held in Java in 1929.

ACKNOWLEDGMENTS.

In conclusion, the Committee wish to express their appreciation of the courteous and effective co-operation received in general from the factories and the Experiment Station of the Sugar Association which has much facilitated their labours.

Mr. Dodds added: I would like to add that in connection with the effect of temperature on polarization of sugars I have recently had a letter from Mr. Dymond which was too late for inclusion in this report, describing some of his experiments in this matter. With your permission I will read extracts from his letter.

"The following are the results of some experiments I have been carrying out on the effect of temperature on the polarization of raw sugars, which you may use for the next meeting if you so desire:—

1. Polarization of Raw Sugar at 20° C.
Atmospheric temperature, polariscope, etc., all constant at 20° C. Pol. 95.35.
2. Polarization of same Sugar at 30° C.
Atmospheric temperature, etc., all constant at 30° C. Pol. 95.35.

With a low polarization sugar such as the above it must be assumed that the combined influence of the temperature coefficients of the Sucrose, and Invert Sugar, etc., present have to a great extent neutralised each other.

Secondly, at 30° C. evaporation on filtering no doubt takes place thereby assisting the reverse action of the Invert Sugar.

Brown states that 26 gms. of Sucrose and 1.642 gms. of Invert Sugar or .813 gms. of Fructose will give a constant saccharimeter reading at all temperatures.

It is very important that a constant temperature be employed, for the effect of polarizing a sugar at a different temperature to that at which it was made up is quite appreciable.

Thus:—No. 1 Experiment carried out at 20° C. was left and the room temperature and solution, etc., were brought to 30° C. The sugar then polarized 95.15° (a drop of 0.2).

No. 2 Experiment carried out at 30° C. was brought down to 18° C., the sugar now polarized 96.10 (a rise of 0.75).

It will further be observed that whereas a sugar polarizing 95.35 showed no difference under different conditions of temperature. L. Blacklock observed a difference of .15 for a sugar polarizing 97.25.

It is apparent, therefore, as confirmed by Brown that the higher the polarization of the sugar the greater will be the effect of temperature on the polarization of that sugar, the extremes being a drop of .03 for every 1° C. rise in temperature for pure sucrose and no effect for sugars about 96 test.

If this is correct it would appear, therefore, that high polarization sugars with a high net titre are affected by an appreciable drop in the apparent polarization whereas a low quality sugar of 96 test is unaffected.

This effect would be somewhat as follows:—

Quality of Sugar.	Drop in Pol.
Drop in Polarization for 1° C. rise in temp. on Pure Sucrose	0.03
99 Pol. sugar	.025
98 Pol. sugar	.02
97 Pol. sugar	.01
96 Pol. sugar	Nil.

It is suggested, therefore, that further experiments be carried out on these lines, and if confirmed such corrections be applied to the polarizing of sugars over 96 test."

Mr. Bechard: There is one point that seems to have been overlooked, the definition of the value of a decimal. There seems to have been some difficulty last year on the value of a decimal, to which nearest point of a decimal the unit should be brought. I have had a little difficulty and I would like the committee to consider the question of the decimal value.

Chairman: It seems to me that the obvious thing where a decimal figure is stipulated that the nearest whole number be selected and not the lower one.

Mr. Bechard: Naturally that would be the view of practically everybody but I believe there are one or two people who are rather dubious about it.

Chairman: If you would like to have that laid down definitely by the committee I will ask them to do so.

Mr. Moberly: I believe that in last year's report that was gone into.

Chairman: Was anything laid down regarding any rule for disregarding the place of decimals not required?

Mr. Moberly: I think so.

Chairman: Where a decimal that has to be disregarded comes mid-way between the two, a difficulty may occur because if you have, say .25, and you want to express that to the first decimal place, are you going to call it point two (.2) or .3 because it is midway between the two figures? If you take the lower number, which is the natural tendency, you thereby introduce a slight systematic error by always reducing the value of your figure slightly; a practice which is adopted by statisticians in America and probably elsewhere in such a case is to make the last significant number an even number, that is to say if it is .25 you make the rounded figure .2 but if it is .35 you call it .4, and that eliminates any tendency to systematic error that might be caused otherwise.

Mr. Bechard: I would like to make a recommendation to the committee that some definite ruling should be given. I have had discussion about the value of .29 for instance, whether it should be written as .2 or .3.

Chairman: I would not have thought any difference of opinion could have arisen about that.

If you like we will postpone discussion on this report until later on; in the meantime we will get on with the next paper. Unfortunately, the reports were not received until the last minute, and it has been a rush to get them out even in time for the meeting, much less circulate them beforehand. Under the circumstances I think it is better to postpone further discussion on the report until this afternoon or tomorrow, when members will have had an opportunity of studying it.

Dr. Hedley: There is a point worth mentioning and that is that the practice to read the Brix to one decimal place and then correct it to two on the tables. That is the thing Mr. Bechard has got in mind but he has a great deal more in mind that he has not said anything about. That is one of the things that occurs in the working.

Mr. Bechard: My proposal is to have a definite ruling on the decimal and subdivisions of the Brix purities and sucrose.

Chairman: I can see that looking at it from a planter's point of view a slight difference in an analytical result might mean an appreciable gain or loss to him financially, but what we have to get him to understand is that the second place of decimals has no meaning in fact in many cases and

that the differences caused by rejecting it will neutralise each other in the long run, so that it is not any disadvantage to him at all. This is more a question of argument and explanation to the planters with whom you have to deal.

Committee on Standardization of Chemical Control.

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