

REPORT OF THE CLARIFICATION AND FILTRATION COMMITTEE

The last report of this Committee hinted at the lines on which our future research should be based; indicated the very wide field of such investigations, and showed that such work could only be carried on by the co-operation of each factory working under the control of a central body.

A significant advance has been made in this direction by the preliminary work done on the factors influencing the filtration rate of our Raw Sugars, and this committee strongly recommends the continuance of this investigation this year. Further recommendations based on this co-operative plan are appended to this report.

Clarification.

While there have been no new departures from our standard methods of clarification, there is a renewed interest in this essential feature of sugar manufacture. This is probably due to the larger propagation of new cane varieties, and their inherent problems, which will soon be coming into our mills in ever increasing quantities, together with the ever present need for reduced costs accompanying greater efficiency. With regard to the methods of clarification, interest has centred round:—

- (a) The continuous Sulphitation process as practised in Egypt.
- (b) Superheating.
- (c) The possible production and use of liquid SO₂.
- (d) Clarification methods with the new cane varieties.

The first (a) refers to the paper prepared by P. Neuville, Bulletin 65, I. S.S.C.T., 1932.

No trial of this method has yet been made in this country, and it is difficult to see how any such investigations can be made on a practical scale without the co-operation and financial assistance of the Industry under the direction and control of a central body.

The same applies to the question of Superheating. In this connection the work of M. C. Muller * has been translated and is available to interested members.

The possible use of liquid SO₂ has been discussed, but any developments are dependent upon accurate data and costs, which are at present unprocurable.

Increased efficiency in Sulphur burning and the burning of Crude Sulphur have been recorded.

Plants for the absorption of waste SO₂ gases from Sulphur towers are being tried out, but no data on their efficiency are as yet available.

* "Causes and remedy of the difficult defecation of cane juice." Bull. Assoc. chim. suc. dist. France, No. 7. (1920).

Cane Wax.

Renewed interest in Cane Wax is due to several causes, chief of which are:—

- (a) The possibility of increased quantities of wax from the Coimbatore seedlings, Co. 290 and Co. 281.
- (b) Wax as a causative agent in the filtration rates of raw sugars.
- (c) Removal of Wax by straining devices, and the effect of burning and hand trashing cane on such removal during the milling process.
- (d) Effect of heat in emulsifying wax in juice suspension.

A few figures on the Wax content of dry Filter Cake (Benzene extraction), month by month during 1933, are as follows:—

	Darnall	Amatikulu	Felixton
May	9.82%	—	—
June.....	10.65%	14.05%	7.75%
July.....	9.09%	10.09%	7.49%
August.....	8.74%	9.38%	5.55%
Sept.....	7.96%	10.18%	9.70%
Simple average	9.25%	10.92%	7.62%

To what extent variety of cane, cultural practice, climatic conditions, burning or hand trashing, and methods of clarification may effect the amount of wax, its removal and after-effects in the Boiling House, and the filtration rates of sugars is a subject worthy of closer investigation. At Incomati, Portugese East Africa, the difficulties caused by the high wax content of the Co. varieties, more especially Co. 290, have been, it is said, largely overcome by burning the cane before cutting.

Efficiency of Juice Strainers.

The efficiency of juice strainers has been greatly increased by the method of preheating the juice devised by M. Viger, Natal. In this method the mixed juice is heated to 150°F. prior to screening and chemical treatment. The heat keeps the apparatus in better condition and prevents the choking up of the screen by the accumulative gumming products of fermentation, while the swollen baggacillo entrains an equal amount of wax without loss through emulsification.

Reducing Sugars in New Cane Varieties.

There has been a certain amount of conjecture on the effect of the new cane varieties on our future factory work, one being the reported low percentages of reducing sugars found in these canes.

The following figures from samples a few hours old, were recorded at the Experiment Station during 1933:—

Variety	Plant and Ratoon Canes 18 to 21 months		Reducing Sugar Ratio		
	Number of analyses		Average	Max.	Min.
Co. 290	53		1.17	3.06	0.65
P.O.J. 2725	52		0.38	0.88	0.30 approx.
P.O.J. 2714	11		0.94	1.26	0.70
Co. 281	8		0.88	1.21	0.30 approx.
P.O.J. 2878	2		0.55	0.60	0.51
P.O.J. 2727	3		0.82	1.16	0.30 approx.

Varieties under Irrigation.

		Red. Sug. Rat.
P.O.J. 2714	12 mos. plant (single tests)	1.60
P.O.J. 2727	"	1.06
P.O.J. 2725	"	0.56
P.O.J. 2878	"	1.51
Co. 290	"	1.95
CH 64/21	"	2.87
Uba	"	1.99

No comparison can be made with our actual Factory figures, as the Experiment Station figures were made on freshly cut cane, whereas the Factory represent canes which have been cut for approximately three days. Most of the Uba is burnt, and well burnt cane will maintain its purity longer than partially burnt or hand trashed cane.

The new varieties will presumably be hand trashed and allied to the observed rapid rates of deterioration of some varieties, the possibilities are that the Reducing Sugar Ratios at the Factories will be much higher than the figures recorded at the Experiment Station, as indicated by two Milling tests when the Reducing Sugar Ratios were 5.19 and 7.71 respectively.

Factory averages for five years (1927-1931), representing 10 Mills, shows the average Reducing Sugar Ratio to be 3.53 with a maximum and minimum for individual Mills over single crops of 6.10 and 2.20. (Report on the Puerto Rican Conference.)

It is probable that with the advent of new cane varieties in quantity, efforts will have to be made to decrease the time between cutting and milling in order to cut down the losses which are associated with deteriorated cane.

Comparative Ash Non-Sugar data.

A considerable amount of Ash data has been collected during the 1933 crop (Bulletin No.1, obtainable at the Experiment Station.) The results, so far, serve to show the variable nature of the Ash components due to:—

- (a) The variety of the cane.
- (b) Seasonal factors.
- (c) Regional variations due to soil, etc.

The Variety of the Cane.

The few figures available to date indicate a marked difference between the Ash content of the new varieties and Uba. These chief characteristics appear to be a lower total Ash content, a higher percentage of water insoluble Ash, low Chlorine, high Sulphate and lower Lime percentages.

Further work on individual varieties will be carried out this year.

Seasonal Factors and Regional Variations.

This investigation, full details of which are to be found in Bulletin No. 1, has illustrated the variable nature of the Ash due to cane variety, seasonal, climatic and soil conditions and also that ash abnormalities persist and are affected very little by our clarification treatment.

Although the variable natural factors indicated by these analyses are largely uncontrollable at present, they are valuable in that they illustrate the variable nature of the Raw product with regard to ash non sugars, a fact often lost sight of in attempting to explain fluctuations in Factory figures, weekly, monthly and from crop to crop.

Filtration Rate of Raw Sugars.

This subject has formed the basis of a separate investigation, but is nevertheless one closely associated with the work of this committee.

Outstanding points which need further study are:—

- (a) That the observed drop in filtration rates throughout the season, are independent of initially high or low filtration rates.
- (b) That certain factories have comparatively high filtration rates throughout the season, whilst others have exceptionally low ones.

The causative agencies in these conditions appear to be connected with:—

- 1.—Conditions and methods of clarification.
- 2.—Method of Treacle Sugar disposal.
- 3.—Quality of cane crushed, colloid content of the juice, with possible other influencing factors such as extent of deterioration Silica and Wax contents, etc.

Recommendations.

- (a) The Committee strongly recommends the continuance of the principle of co-operative research controlled by a central committee of this Association.

- (b) That during the 1934 crop, each Sugar Factory be asked to collect composite monthly samples of all Raw Sugars made, and have these sent to the Experiment Station for further work on the causes and factors operating in the filtration rates of our Raw Sugars.
- (c) That composite samples of Filter Cake, Mixed Juice and Clarified Juice (2 litres without preservatives), be collected at each Factory during the first half (August 15th), and latter half of the season, and sent to the Experiment Station for Ash Analysis.

Members of Committee:—

L. Blacklock.
 B. E. Beater.
 G. Booth.
 W. H. Foster.
 J. Rault.
 M. Viger.
 G. Wilson.
 G. C. Dymond (Convener).



The PRESIDENT: The paper is open for discussion.

Mr. BOOTH: Mr. Chairman, no one can but be impressed by the amount of work done over the year of which this report is but a synopsis. To my mind the information described on the ash content is of supreme importance, and much labour and patience has been expended on it, and we congratulate the workers in this sphere. But the practical issues have now to be faced, that is the necessity for co-operative work on a factory scale. Let me remind you, Mr. President, of Mr. Dymond's remarks last year in his Presidential Address, when he drew attention to enthusiasm displayed by the Mill owners and Planters for co-operative research in Puerto Rico. He pleads again in this report for co-operative work, this time showing something of the results already obtained.

Now, as a member of this Committee, I have come to the conclusion that it is futile to issue any further reports, unless we are able to quote something attempted, and perhaps something done for the year just past. This cannot be achieved unless this Congress passes a resolution to the Millers' Association, urging the necessity for the allocation of a factory, or portion of a factory for the exclusive purpose of investigating methods by which we may overcome those peculiarities belonging to the Uba cane.

Yesterday, you candidly admitted that washed sugar solution of 99.5 had you guessing at times at the filtration station, and as is well known, you and your staff have spent very much time and study on this subject. The report of yesterday of the General Committee, tells us the same story of filtration troubles. Last year's report said "No progress in methods of clarification;" this year likewise. Last year's report said that only by the

use of increased chemicals could we hope to increase the recovery 1% or 2%, and also by purchasing expensive machinery. The non-sugars beat us. How can we say that when we have nothing to prove it except the one process in the country?

At the risk of being called a pessimist, I take a definite stand and say that I do not put any faith in the idea that these new canes are to be a panacea for all our troubles. They will bring their own troubles. At first, probably, there will be relief, but who can say that they will not adopt the idiosyncrasies of Uba cane, and probably might be worse, even after ten years, when they get accustomed to the climate. We have no right to bury our heads in the sand with regard to this. Our chemical bills are already much too high. They may temporarily be lessened, but for how long? Now is the time to get busy on what, to me, is the most important deliberation of this Congress. A few lines have been suggested in this report, and there are many more well worth attention.

Whilst on this theme, Mr. President, may I suggest that a questionnaire should be sent out to all interested to find out how far individual investigations have gone, and if possible to elicit definite data and observations. In the course of conversation with many of my contemporaries I have found sometimes most useful information, containing much valuable matter, at the same time much that is contradictory. Why cannot we, as a body, collate all this valuable information? The standing Committee thereby would have an opportunity of avoiding those pitfalls which involve waste of time and money. We do not expect these researches and investigations to be actually money-making in the first instance, but we should certainly avoid useless expenditure. (Hear, hear.)

PRESIDENT: Mr. Booth, you have put a proposition forward more or less that something should go forward from this Association to the Millers, and that the Millers' Association should put one factory more or less at the disposal of the Clarification and Filtration Committee. Would you now definitely put up a proposition to that effect to the incoming General Committee, so that they may take it on to the Millers' Association?

Mr. BOOTH: I am unaware of the procedure of this General Committee, in fact, Mr. President, I asked the other day how many meetings the General Committee had in the year, because I wanted to learn what their job was. This is not criticism, but comment. I shall be delighted to move a motion to the effect that the General Committee approach the Millers with a view to asking them to consider allocating a factory for the specific purpose of investigating other processes than that which we have.

Mr. Bechard seconded.

Dr. HEDLEY: I should like to make a general motion. Two or three years ago we approached the Millers for the first time. A delegation was proposed. There are several matters which will come up in the course of this Congress which should go before the Millers. I would like to make this proposition: "That a delegation is elected from the General Committee to interview the Millers on those matters which have been brought before us—this and any other matter that comes up."

Mr. BOOTH: I understood that was actually what had happened. For formality, I would second that motion and withdraw mine.

Mr. MOBERLY: Two years ago, as far as I can remember, the original motion was that a deputation, representative of this Association, and of the Experiment Station, should approach the Millers. I think that is the best way to do it. It covers a wider scope. The Experiment Station could also bring forward things which come to their individual notice. This was done a couple of years ago, but last year, I think because there were no particularly outstanding matters at the time, the deputation never went. But I think it should be the practice to do that, as far as possible, every year, because we want to work with the Millers' Association. Without their co-operation, this Association would lose a very great deal of its value. We do not want it merely to be a talking-shop. We want to follow up by being a working body with actual results to show. We can only be that by continually keeping in touch with the Millers, and letting them know we are doing things, and seeing that the ideas recommended are carried to a useful conclusion.

Mr. DYMOND: I rather agree that this work could be divided among several factories. In suggesting that the Millers might be asked to set aside a factory for this work, I probably has not been considered that a staff would also be necessary, and probably a large expenditure would be needed for installing the necessary plant. With regard to the point, that there is a lot of information stacked away in the drawers, I know that is a fact. If you go round any sugar mill and talk to any chemist, you will find that he has notes and the results of a lot of investigation that he has carried on for many years, which have never seen the light of day. I do think that if we had a central committee with more power than we have at present, to collect a lot of this information and distribute the work among the different factories, possibly some at the Experiment Station and the larger laboratories, it would help us very much. We did meet the Millers once. I think they gave us everything we asked. There was no trouble at all. We have not met them since. I think if we bring forward some reasonable proposition this year, they will meet us in the same spirit.

Mr. BOOTH: Further to my seconding the amended proposal, it should be thoroughly understood that there is no use in splitting hairs as to whether a factory be devoted to the work or half a dozen factories be used. Let us get on with the business. The Millers will soon tell us whether we are going too far.

PRESIDENT: Would not it be better to ask the Millers to finance the experiments? It does not matter where they are done. I do not see how you are going to get one factory to take on all these experiments. They will interfere with the running of the plant. I think we might approach the Millers and ask them to allocate us so much money.

Mr. BOOTH: As I say, ways and means are for the Millers. There is one definite thing which must be insisted on. It is no use asking the Millers to do anything unless they have a staff to be relieved of their routine duties. They must study one particular thing. Provided that point is absolutely settled, to my mind it is immaterial whether there is one factory or half a dozen investigating the conditions. The staff conducting these experiments must be absolutely on the one job and nothing else.

Mr. MURRAY: I think you should get a chemist and an engineer specially detailed on this job—as a whole-time job. Ask the Millers for that. Ask them to get a chemist and an engineer too.

PRESIDENT: All these recommendations will go up. The General Committee will consider them and we will take them to the proper quarters.

Mr. BIJOUX: Referring to the paper about the glucose ratio. There is no mention of the extraction from which this ratio is obtained. Have you any data about it?

Mr. DYMOND: These were just figures I got from the Experiment Station. They gave each analysis and I extracted the figures from hem.

PRESIDENT: Three recommendations have been put up by this Committee at the end of their report. I think what we have spoken about just now covers the first, the second was covered yesterday. There remains the third viz.: "That composite samples of Filter Cake, Mixed Juice and Clarified Juice (2 litres with preservatives), be collected at each factory during the first half (August 15th), and the latter half of the season, and sent to the Experiment Station for Ash Analysis." I would like to ask Mr. Dodds what he thinks about it.

Mr. DODDS: It is one thing to send samples to an Experiment Station, it is another thing to do the large amount of analytical work which is involved. The present shortage of staff at the Experiment Station must be kept in mind.

I would like this opportunity to make some comment on one paragraph of page 2 of the Committee's report, dealing with the keeping qualities of varieties of cane other than Uba. We have done very little work on these lines up to the present, but the information from other countries is that the later P.O.J. canes that have been released in this country keep, on the whole, very well. The earlier P.O.J. canes did not always do so. In the case of P.O.J. 213 we made a report to this Congress two or three years ago, in which we compared the rate of falling off in sucrose and purity of P.O.J. 213 with Uba, both burnt and unburnt, and we found it fell off to an appreciably more rapid extent—about half as fast again as Uba. But as far as the information goes at present, we need not expect very much difficulty from the new canes on this account; although much experimental work under our conditions will have to be done before we can say so very positively.

Mr. DYMOND: The point raised by Mr. Booth was that these new varieties of cane would very rapidly take on the characteristics of Uba. Is that a scientific possibility?

Mr. DODDS: In my opinion it is not at all likely to occur. The character of any variety of cane will vary within certain limits, according to the conditions under which it is grown, but a plant which is propagated vegetatively will not change permanently except under very unusual conditions

known as bud variation which is very little understood. Apart from bud variation, a plant propagated vegetatively will not change its essential character, though it will show a certain temporary response to environment. That is to say all canes will show a higher fibre content under conditions of drought, but certain varieties will show a lower fibre content than others, and would naturally show a lower fibre content under all similar conditions. In other words, the essential character of cane varieties is fixed, and it is only under very exceptional circumstances that they will permanently change, though they will show certain temporary changes within certain limits according to circumstances.

Mr. BOOTH: With regard to Mr. Dodds' contribution, I read from page 30 of last year's proceedings: "The low glucose content commonly found in sugar cane in this country is, I think, a climatic factor rather than one associated with any particular variety of cane. We find this low glucose ratio not only in Uba but in other varieties of cane during our cold and dry weather, and we find the same thing in other extra-tropical countries, such as, for example, Louisiana, where also during the cold harvesting season the glucose ratio at certain times falls very low indeed, far lower than we ever find it in the tropics."

CHAIRMAN: Who said that?

Mr. BOOTH: Mr. Dodds.

Mr. DODDS: The point I made last year was the same that I state now, that varieties will vary temporarily under different conditions, but they will show the same relative differences between each other under similar conditions. Under our conditions, and in all semi-tropical countries, as we discussed last year, the glucose ratio is low at the time of harvesting, due to low temperature, but you will find the same differences between different varieties on a lower or higher scale, according to the environment. The same applies to the fibre and a number of other properties of cane which are affected by environment. They will vary within limits, but the same differences will always be found between different varieties under similar conditions.

PRESIDENT: I thank Mr. Dymond for his paper, and would ask you to signify your approval in the usual manner. (Applause.)

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PRESIDENT: I will now call on Mr. Dodds to read his paper.