

POJ 2878, ITS INCONVENIENCES AT THE SUBSIDER STATION,
AND THE SUCCESSFUL CLARIFICATION OF THIS JUICE USING
THE "FRACTIONAL LIMING AND DOUBLE HEATING PROCESS".

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I. INTRODUCTION.

The difficulty of clarification of the juice of POJ 2878 was investigated with a view to finding out, if possible, what was responsible for the slow rate of settling at the clarifiers, and secondly to find some means of obtaining an efficient clarification.

At this stage it would be just as well to give a short history of POJ 2878 showing the justification for investigating this problem of clarification. POJ 2878 was bred by Dr. Jacob Jesweit in Java between 1924 and 1925, (1) and the parents are POJ 2364 and EK 28, the female parent being placed first. (2) Today POJ 2878 is planted in nearly every sugar cane growing country in the world, its popularity being due to the very high yields obtained. Unfortunately, however, there is an almost universal complaint of the difficulty experienced in the clarification of juices from this variety due to slow settling. So the justification for the problem can be divided up into two main headings, the good yields obtained from POJ 2878 warranting its continued growth, and the difficulty experienced in clarifying the juice in the factory, which factor has very definitely tended to lessen the popularity of this cane.

(A). Agricultural Aspects.

Good reports of POJ 2878 have been recorded from many sugar-cane growing countries, and a few comments are here set down to show what can be expected from this variety. In the Philippines - POJ 2878 triumphed in a variety trial (compared with four of the chief varieties) and the comment

on the trial was, "It thus appears that POJ 2878 yields more sugar per unit area than any of the principal varieties now grown in the Philippines".(3) POJ 2878 is becoming very popular, and now (1933) occupies third place, it being introduced in 1927. It does well under normal and abnormal conditions and it is predicted that it will be the premier variety in a couple of years.(4) Again POJ 2878 is stated to be doing very well in the Philippines.(5) Finally the report of the Philippine Sugar Association Research Bureau for 1932-33 states that in five years the variety POJ 2878 has extended from an insignificant area to 41% of the total area planted. (6)

In Java it is reported that 93% of the cane lands of Java for the 1929 crop were under POJ 2878,(7) and also it is stated that this variety is considered to have reduced the cost of production in the field.(8)

From Queensland another of the outstanding agricultural advantages of POJ 2878 is recorded, that is, its resistance to gumming disease,(9) and this cane yielded 22.8 long tons of sugar per acre.(10) Other good yields were 65 long tons of cane per acre and 14.2% recoverable sugar at 21 months old grown without irrigation,(11) and 44.8 tons of cane per acre as leading variety in an experiment.(12)

In India it is stated that POJ 2878 is replacing J 247 at Samalkot.(13)

As a result of a variety trial run in Mauritius BH 10(12) and POJ 2878 together with three Mauritius varieties were recommended.(14)

From South Africa it is reported that POJ 2878 gives good results when grown on the good soils.(15)

In Puerto Rico P.R.Kuntz (16) and R.F.Garcia (17) showed in separate controlled experiments that POJ 2878 yielded more tons of cane per acre and more tons of sugar per acre than either BH 10(12) or SC 12(4), two of the standard varieties. J.O.Carero (18) reported that POJ 2878 compared favourably with BH 10(12), SC 12(4) and POJ 2725

in the 1930-31 season. Further (19) POJ 2878 gave nearly a ton of sugar per acre more than BH 10(12), POJ 2725, or POJ 2714. Finally from Puerto Rico it is stated that POJ 2878 is definitely becoming popular and is showing a tendency to replace BH 10(12) particularly in districts of serious mosaic infection. (20), (21), (22).

In Cuba after six years experience, POJ 2878 is now extensively grown, replacing with advantage the old Cristalina.(23) This Java variety (POJ 2878) has also been shown to be a good germinator growing under a wide variety of conditions, and also being very resistant to mosaic disease.(24)

In Jamaica BH 10(12) is still the most popular cane variety, but the area under POJ 2878 is reported to be increasing. (25)

In Trinidad at the Imperial College of Tropical Agriculture, Professor R.Cecil Wood has shown by experiment that POJ 2878 over two years gave a slightly greater yield than BH 10(12) though this was not significant,(26) and in another experiment grown with Co 213, POJ 36, M 36, POJ 213, Uba, Co 281, POJ 234 and POJ 826, POJ 2878 was far superior, and in average yields for four years led its nearest rival (Co 213) by over three tons of cane per acre.(27)

In British Guiana in variety trials POJ 2878 is stated to have done very well having taken a first and a second place as regards the yield of sugar.(28)

From Mexico an instance of a field of POJ 2878 cane which at the age of twelve months yielded 144.6 short tons of cane per acre.(10)

In Louisiana POJ 2878 canes do well in spite of drought.(29)

In Brazil certain sugar factories are abandoning the old cane varieties (Demerara and Manteiga) in favour of POJ 2878, which is found to give a shredder juice purity of 90, and a mixed juice purity of 88, brix 17 and sucrose per-

cent of 15; comparable figures for mixed juices of the old varieties are 79 purity, 15 brix and 12 percent sucrose.(30) The record yield of this variety at the Campos Experiment Station was 163 tons per hectare at the age of twelve months, obtained in 1932 under normal conditions of culture.(31)

From Hawaii the following extracts from various reports may be noted.- The percentage of POJ 2878 is gradually rising from zero in 1929-30 to 4 - 5 percent in 1932.(32) The average gain of POJ 2878 over all its competitors in various variety trials was a ton of sugar per acre.(33) POJ 2878 is becoming very popular in Hawaii.(34) With regard to the situation of cane varieties, H 109 leads in popularity with POJ 2878 second.(35) Variety POJ 2878 now occupies 41 percent of the area planted for the 1933-34 crop.(36) Finally obtained in Hawaii are the extraordinarily high yields of 185 short tons of cane and 18.5 tons of sugar per acre.(10)

The above extracts undoubtedly show that POJ 2878, "The Wonder Cane" from Java, has proved itself easily adaptable to varying conditions throughout nearly every Sugar-cane Growing country in the world. The popularity of this variety is also demonstrated, and this popularity may be attributed, not only to the extraordinarily high yields of cane obtained, but also to the disease resistant properties of POJ 2878 with special regard to its resistance to mosaic disease. It would indeed therefore be a great pity if the acreage planted under POJ 2878 were to be decreased due to the difficulty of obtaining good clarification of its juices. Every effort therefore has been directed in obtaining a satisfactory method of clarification which has enabled the juices of this variety to be easily handled at the Subsider station.

(B) Clarification Difficulties.

Complaints have been reported, from almost every factory that has^s had to handle POJ 2878 canes. Certain factories have complained that POJ 2878 does not mill well,

others that the juices from this variety froth in the evaporator and in the pans, and reports have been recorded which stated that the heat value of the bagasse obtained from this variety is definitely less than that obtained from the bagasse of the standard varieties grown. By far the most common complaint, however, has been the difficulty experienced in the clarification of the juices of POJ 2878 due to slow settling. So again extracts from these various reports are here set down to show the countries in which this difficulty of clarification has been experienced.

From the Philippines it is reported that "The general juice quality of sugar cane crops has dropped in the La Carlota district since POJ 2878 became popular, and planters have begun to eliminate this variety from their fields". Such poor juice qualities and low juice purities, have almost invariably ~~been~~ given, in the case of POJ 2878, continuous clarification troubles.(37)

H.G.Sorensen found in Cuba that the juices from POJ 2878 canes settled very slowly, filtered slowly, and gave sugars of high dye test.(38) Another report stated that "The juice of POJ 2878 defecates badly; it forms a great deal of foam, which makes it difficult to recognise the point at which the boiling should be interrupted. Settling is prolonged and decantation is rendered difficult. There is also some complaint as to the quality of the bagasse".(23) Finally from Cuba it has been recorded that "More than five to six hours have been needed for decantation and, at that, there remains a turbidity consisting principally of Colloidal Silica".(39)

During the 1930-31 season in Puerto Rico there were frequent complaints about the quality and defecation rates of the juice of POJ 2878.(18) When handling large quantities of this variety, acid clarification has been practised in order not to decrease the tons of cane per hour ground in the mills.

In Trinidad trouble was experienced in the clarifiers with POJ 2878 during the 1935 crop at the College Experimental

Sugar Factory, and it is recommended that BH 10(12) and POJ 2878 be ground together in the proportion of 3 parts of the former to 1 of the latter.(40)

In Antigua & St.Kitts clarification troubles when handling POJ 2878 juices have from time to time been experienced, but the proportion of this variety grown in these islands is relatively small and this matter is therefore not of such great consequence as it is in other districts where a greater acreage is cultivated.

In Brazil slow settling rates of POJ 2878 juices have also been reported and raising the $P_{2}O_5$ content of these juices or grinding 20 to 30 percent of other varieties along with this variety have been recommended.(30) At Central Leao this slow rate of settling forces a reduction of more than 20 percent in the grinding rate, whereas in settling tests with test-tubes the rate of settling was even slower.(31)

From Hawaii it is reported that "Difficulty has been experienced at Paauhau in the clarification of juices from POJ 2878 due to slow settling. Although the $P_{2}O_5$ content of the juice was sufficiently high to indicate that good clarification might be expected, clarification was unsatisfactory, the settled juices being turbid and dark. In laboratory tests it was not possible to secure a reasonably clear settled juice at any reaction".(41) At another factory an investigation was made of the clarifying qualities of POJ 2878 cane in comparison with Yellow Caledonia and POJ 36. It was found that Yellow Caledonia and other canes would clarify in about forty-five minutes, with a turbidity reading of 3.5 to 4.0 cms. When POJ 2878 was crushed alone and limed to pH 8.0 to 8.3 in the ordinary way, however, it took two hours and thirty-eight minutes to settle at a turbidity reading of 2.6 cms. Under these conditions the tonnage of cane had to be reduced and the mills shut down to clear the settling tanks.(42)

Finally it has been reported that "During the past few years the Hawaiian sugar mills have been faced with the

fact that clarification of the refractory juices of the newer cane varieties, as POJ 2878, cannot be handled satisfactorily by simple lime defecation, so that clarification has become a major problem of study by the Hawaiian Sugar Experiment Station.(43)

The above extracts conclusively prove that clarification difficulties when handling the juice of POJ 2878 has been experienced in nearly every sugar cane country which grows this variety. This fact together with the increased yields obtained as previously pointed out, gives every justification for working on POJ 2878 and paying special attention to obtaining efficient clarification and settling of these juices.

(C) Outline of Work done.

The juices of POJ 2878 were compared with the juices of BH 10(12), which was chosen as a standard, on account of the fact that its juices are readily clarified in the factory.

First a series of quantitative analyses of various components of these juices were carried out, with a view to finding any marked difference in the quantity of one or more constituents of the juices, which difference might have been responsible for the inefficient clarification of the juices of POJ 2878. Unfortunately there was no marked difference, the analyses varying considerably from sample to sample.

Since it was not possible to show that any component or components of the juices of POJ 2878 could be held responsible for its slow settling, the problem was approached from another angle. The comparison of the juices of the two varieties (POJ 2878 and BH 10(12)) was further carried out in order to find a method which would consistently give efficient clarification of both juices.

A series of different methods of clarification was tried out on both juices which resulted in one method being selected, and further investigated both in the laboratory and

in the factory. This method, as will be seen later, gave good results throughout, and has shown itself to be the possible solution of the difficulty of clarification of POJ 2878 juices.