

FURTHER INVESTIGATIONS INTO THE BEHAVIOUR OF REDUCING SUGARS  
DURING CANE SUGAR MANUFACTURE.

1. INTRODUCTION.

In sugar factory processes, the inversion of sucrose into equal parts of laevulose and dextrose is one of the main factors causing the "undetermined losses". All operations therefore aim as far as possible at control of inversion. But apart from the reducing sugars generated by this reaction, fresh cane juices always contain these substances, and just as factory treatments bring about inversion, they also cause destruction of these reducing sugars, both originally present and generated.

These processes may be simultaneous, which makes the problem of the reducing sugar relationships very much more complicated than appears at first sight.

Now laevulose and dextrose behave differently under different conditions of temperature and acidity, and if these conditions can be accurately defined for the sugar factory, much light will have been shed on this very interesting problem.

Interest in the fate of reducing sugars was recently renewed by some results from Yearwood's<sup>(51)</sup> work on the manufacture of Yellow Crystal sugars. It was his opinion that laevulose is destroyed by acid treatment in the pan, but he was unable to substantiate this theory. Foster<sup>(16)</sup> took up the investigation of the individual transformations of laevulose and dextrose in clarification, evaporation and crystallization, publishing his results in 1940. For his analyses of laevulose and dextrose, he used the recently developed method of Jackson and Mathews, and gives full reasons for his choice.

Unfortunately, however, it was only during the evaporation process that Foster was able to produce any well-defined results: Those from the clarification and crystallization stages were too erratic to be acceptable in their entirety.

He was nevertheless able to indicate that there is some destruction of reducing sugars in both of these processes, and that this destruction is mainly confined to the dextrose fraction.

One of his major difficulties was the selection of an adequate reference standard against which amounts of sugar could be compared before and after any treatment. The possibilities studied included °Brix, % Potash and % Chloride, and of these three the last-named seemed to offer the greatest promise. Brix possesses the very real disadvantage of not being a true standard, since sugar destruction or accumulation is synonymous with destruction or accumulation of Brix. The drawback to the use of Potash in this connection lies in the difficult nature of any potash analytical procedure.

The objects of this present investigation may therefore be summarized as follows:-

(1) A further examination of the methods of analysis, with special reference to that of Jackson and Mathews for laevulose and dextrose in pure solution.

(2) Similar trials with impure sugar cane products, with or without added sugar.

(3) Development of a reliable reference standard, with % Chloride as the first line of enquiry.

(4) Investigation of certain factory processes with a view to discovering the factors chiefly responsible for sucrose inversion and reducing sugar destruction. The study of the course of these reactions, and, if possible, the means that may be taken to control them.

The original intention for the factory research was a further survey of reducing sugars in Clarification and crystallization. This plan was however modified, enquiries into the sugar relationships in pressure evaporation being substituted for the clarification problem.