

ABSTRACT

The present work is devoted to an investigation of the major constituents of Jamaican final molasses and the quantitative and qualitative effect of some of these components on its exhaustibility.

Part I of this thesis reviews the various theories of molasses formation and exhaustion and the work done during the past one hundred years on the composition of cane final molasses all over the world. The influence of some of these components on molasses exhaustion is discussed and the derivation of related exhaustibility formulae outlined. Work done over the previous decade by selected sugar producing countries is detailed. This chapter also contains discussion on the keeping qualities of cane molasses in storage as well as a short review of various other methods of obtaining more sucrose from final molasses.

Studies on the composition of Jamaican final molasses are detailed in Part II. Jamaican final molasses has been found to contain the major constituents present in cane final molasses produced all over the world, but the proportion of certain constituents differ, presumably due to differences in climate, geography and agricultural and factory practices.

The constituents assayed in final molasses include water, total and original reducing sugars, raffinose, sulphated and conductivity ash, various inorganic components viz:- potassium, sodium, calcium, magnesium, iron, zinc and copper as well as chloride, silicate and phosphate anions. The influence of many of these constituents, potassium, potassium + sodium and chloride in particular has been clearly shown. Preliminary qualitative studies by gas liquid chromatography have revealed the presence of at least five organic acids, acontic, malic, oxalic, citric and fumaric and/or succinic acids. Preliminary studies on the relative flow rates of final molasses were also undertaken. No raffinose was detected in Jamaican final molasses.

The methods of analysis used included Flame and Atomic Absorbtion Spectrophotometry, Ion Selective Electrode analysis and various colorimetric and volumetric methods. Simple statistical analyses between several of the methods were undertaken and in some cases equations were derived relating the values obtained from two methods. Thus for easy determination of true dry solids an equation linking the results of true dry solids by freeze drying, a method which to our knowledge has been used for this determination for the first time, and refractometer brix measurements was derived.

A formula relating sulphated ash and conductivity ash measurements was also derived. Both formulae give accurate results of the respective calculated values and reduce considerably the time normally needed to obtain these measurements.

Statistical analysis of various selected components and True Purity of laboratory exhausted molasses resulted in the derivation of several exhaustibility formulae. Of these, three formulae have been selected for further evaluation in the industry. The formulae link True Purity with reducing sugars, potassium and chloride content respectively. These have been judged suitable on the basis of their correlation coefficient and standard error of estimate. These formulae give accurate predictions of exhaustibility of Jamaican molasses.

On the basis of the findings of this study, it has been proposed that the SJM formula be used to calculate recoverable sugar and that a Target True Purity of 41 be substituted for M in the formula. Sucrose control has also been advocated for the Jamaican sugar industry.