# The Absence of Carbonate in Beet Molasses

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Reports on the composition of European and American beet molasses list carbonate as one of the major inorganic constituents (1, 2)[2]. It is not clear whether the molasses samples contained carbonate or whether it was one of the major constituents of the ash and produced only by ashing a mixture of organic and inorganic material. If the latter is the case we may be unduly concerned about the effect of carbonate on sucrose solubility and crystallization rate (3).. It might appear that carbonate would be a normal constituent of molasses, since carbon dioxide is used during processing and in many cases sodium carbonate is added to preserve the alkalinity of the juice. However, if sufficient calcium ions are available, carbon dioxide or carbonate should be precipitated as calcium carbonate. We would expect to find carbonate occurring as a molasses component only when adequate calcium or other suitable ions are not present or when the acidity is high enough to prevent the formation of insolble carbonates.

Because of its effect on crystallization (3) the amount of carbonate present was selected as one phase of a composition study of 1956 molasses. One 1955 and eleven 1956 samples of final factory molasses representative of the various beet processing areas of the country were examined. Samples were selected from factories using non-Steffen, Steffen, barium and ion exchange processes of purification.

The procedure used for the determination of carbonate was as follows. One gram of molasses was diluted to 50 ml. with distilled water and a 5 ml.. aliquot introduced into a Van Slyke manometric apparatus. After degassing the solution, one ml. of a one-to-one sulfuric acid solution was introduced and the mixture allowed to react for one minute under reduced pressure. The volume of gas liberated was adjusted to two ml. and the pressure measured. The gas was then transferred to a Hempel pipette containing 10 percent sodium hydroxide solution and after adsorption of the carbon dioxide the gas was returned to the Van Slyke apparatus for measurement of the pressure at the two ml. volume. The amount of carbonate present in the sample may be calculated from the difference in pressure before and after the gas is treated with the sodium hydroxide solution.

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[2] Numbers in parentheses refer to references.

Under these conditions a decrease in pressure of one cm. corresponds to about 0.05 mg. of carbon dioxide or 0.07 mg. of carbonate in the molasses aliquot. This amount would be equivalent to 0.07 percent carbonate in the original sample. Recovery of carbonate was checked by adding 4 mg. of sodium bicarbonate to 5 ml. aliquots of the diluted sample. The carbon dioxide was recovered quantitatively. Sulfite apparently does not interfere because no additional gas was evolved when 5 mg. of sodium sulfite was added to a 5 ml. aliquot of diluted sample or to 5 ml. of water.

None of the 12 molasses samples tested showed more than 0.07 percent carbonate and within the limits of accuracy of the method (0.07 percent) no carbonate was detected.

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### References

(1) McGINNIS, R. A. 1950. Beet Sugar Technology, p. 439, New York, Reinhold Publishing Corp.

(2) OLBRICH, H. 1955. Die Bedeutung und Verwertung der melasse unter besonderer Berucksichtigung ihrere Vergarung und Verhefung. Branntweinwirtshaft, 77, 374-344.

(3) RORABAUGH, GUY and NORMAN, LLOYD W. 1956. The effect of various impurities on the crystallization of sucrose. Jour. Am. Soc. Sugar Beet Tech. 9:238-252.