Research Note

SUGAR LOSSES DURING THE POSTHARVEST WASHING OF SUGARCANE[1]

Since the mid-1950's sucrose recovery from Puerto Rico sugarcane has progressively declined. As early as 1963 Arceneaux[2] depicted this trend as having reached an "alarming proportion", and cautioned against the continued delivery of unclean cane to sugar mills. Although reports from Hawaii,[3] Mexico,[4] and Queensland[5] show that sugar losses in the factory are not strictly a Puerto Rican phenomenon, mechanization of the Island's sugar industry has been attended with still greater reductions in sucrose yield. At Central Roig the washing operations prior to extraction were suspected of contributing to unusually poor recoveries. Recent analyses of wash-water samples from Roig support this contention, and suggest that additional research is justified in order to minimize these losses.

Three sets of samples were collected at the Roig factory and delivered to the Agricultural Experiment Station for sugar analysis between April 29 and June 8, 1971. These consisted of "clean" water recycled from the condensers for use in washing cane, and water collected after usage in the cleaning operation. Mud and debris suspended in the samples was easily removed by passage through Whatman no. 1 filter paper. After dilution, the filtrate's yellow-amber color produced only negligible interference with colorimetry. Ketoses were determined by the resorcinol method of Cardini et al.[6] and reducing sugars by the dinitrosalicylic acid technique.[7] All analyses of fresh samples were completed within a few hours after collection. The third set of samples was taken at 1-hour intervals, between 8:00 a. m. and 4:00 p. m., and frozen for simultaneous assay of the entire set at a later date. No evidence of post-milling inversion was found in any of the sugar solutions.

Sucrose was readily detected in all wash-water solutions, the latter re-

[1] Manuscript submitted to the Editorial Board August 16, 1971.

[2] Arceneaux, G., Decline of sugar recoveries in Puerto Rico, Commonwealth of Puerto Rico, Dept. of Agr., Tech. Bull. No. 1, 1963.

[3] Hughes, R. H., Sugar losses-field and factory, Haw. Plant. Rec. 55: 167–75, 1956.

[4] Turner, A. W., and Rojas, B. A., Deterioration of sugarcane after cutting, Proc. Int. Soc. Sugar Cane Technol. 11: 312–18, 1963.

[5] Egan, B. T., Post-harvest deterioration losses in sugarcane in Queensland, Proc. Int. Soc. Sugar Cane Technol. 13: 1729–35, 1969.

[6] Cardini, C. E., Leloir, L. F., and Chiriboga, J., The biosynthesis of sucrose, J. Biol. Chem. 214: 149–55, 1955.

[7] Sumner, J. B., Dinitrosalicylic acid: A reagent for estimation of sugar in normal and diabetic urine, J. Biol. Chem. 197: 15–22, 1934.

quiring 1:10 dilution for precise analysis. Sucrose was particularly abundant in the initial samples of "used" wash water, amounting to 3.73 mg./ml., representing a sucrose loss in the order of 1 ton in 64,000 gallons of water. However, about 75 percent of the sugar was already present in the "clean" water prior to its use in the washing process. The second and third sets of samples contained lesser amounts of sucrose in the recycled or clean water whereas the used water contained additional quantities in the order of 0.60–0.70 mg./ml. This probably typifies the amount of sugar being dissolved under Roig conditions as the extraneous matter, soil, and trash was washed from the stalks. This suggests that a ton of sucrose would be removed in about 300,000 gallons of water. Approximately 240,000 gallons of water were used hourly, and the average grinding day was about 18 hours.

The final set of samples showed that considerable variation in sucrose removal may occur on an hour-to-hour basis. This may reflect the soundness of stalks being delivered to the mill, or the degree of stalk shattering which occurred as the cane was washed. Specific data relative to the cane's cultural history and handling operations between harvest and milling were not available.

These analyses suggest that washing losses do not in themselves account for the low sucrose recoveries at Central Roig, but they probably constitute a contributing factor. Additional research should be performed along two lines: (a) Evaluation of mechanical injury effects, including harvest, transportation, and cleaning operations which produce stalk fissures allowing wash-water penetration: and (b) effects of the cane cultural history on its propensity to be injured and to give up sugar in aqueous solution from the intact stalk.

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