The HFCS from the isomerization step contains 42% fructose, 52% dextrose, and about 6% oligosaccharides. To obtain 55%- and 90%-fructose syrups, the fructose in 42% syrup needs to be concentrated. Fructose preferentially forms a complex with some cations such as calcium. This is used for concentrating fructose in HFCS. There are two different commercial processes for enrichment of fructose from 42% syrup. One process utilizes an inorganic resin for selective molecular adsorption of fructose. Another process employs chromatographic fractionation using organic resins. Fructose is selectively held in fractionating columns but dextrose is not. Deionized and deoxygenated water is used for the elution of fructose from the column. Usually a column packed with low cross-linked fine-mesh polystyrene sulfonate-Ca cation exchange resin is used for enrichment purpose. The enriched syrup contains nearly 90% fructose and is called very enriched fructose corn syrup (VEFCS). The VEFCS is blended with 42%-fructose syrup to obtain the desired fructose content, such as 55%. The effluent from the isomerization step may be recycled back to the feed solution to obtain 42%-fructose syrup in the effluent of the isomerization column. The raffinate stream rich in oligosaccharides is recycled back to the saccharification step. The water used as an eluent in enrichment columns should be minimized to maximize the solids content of the syrup.

Since 1972 HFCS has replaced sucrose as a low-calorie sweetener to a large extent. The price of sucrose was 31 cents/lb and the price of HFCS was 21 cents/lb, about 70% of the sucrose price in 1981. This difference has become larger with the recent developments in HFCS production technology. Consequently, HFCS has replaced sucrose and glucose as a low-calorie sweetener used in soft drinks, canned fruits, ice cream, and certain bakery products over the last twenty years. Low-calorie sweetener consumption is expected to level off at 130 lb per capita per year.

SUGGESTIONS FOR FURTHER READING

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