HIGH FRUCTOSE CORN SYRUP: REPLACEMENT FOR SUCROSE IN ANGEL CAKE

by

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INTRODUCTION

Sucrose prices have risen considerably during the past several years. Commercial use of corn syrup, dextrose and high fructose corn syrup (HFCS) has increased dramatically since 1970, primarily because corn sweeteners are less expensive than sucrose (Robinson, 1975). The major reason for the increased usage of corn sweeteners was the development in 1967 of first-generation HFCS containing 42% fructose, 52% glucose and 6% higher saccharides (Vuilleumier, 1980). Although other functional properties may differ, HFCS theoretically is equivalent to sucrose in sweetness because it contains glucose and fructose in a proportion similar to that of sucrose. HFCS has found wide application as a less expensive alternative to sucrose in food products such as soft drinks, yeast-leavened baked goods and canned fruits, where the main function of the sugar is to provide sweetness (Inglett, 1981).

One of the most difficult applications of HFCS is in cakes, because the amount and type of sugar present greatly affect the flavor, volume, texture and browning of the product. A manufacturer of HFCS, the Clinton Corn Processing Company (1980), has proposed the replacement of sucrose with HFCS in angel cakes. Substitution of HFCS for sucrose in angel cakes could result in a reduction in ingredient cost.

No research studies were found concerning the use of HFCS in angel cakes. This study was undertaken to investigate selected physical and sensory characteristics of angel cakes with 25, 50, 75 or 100% of the sucrose replaced with first-generation HFCS.

REVIEW OF LITERATURE

Physical properties of HFCS

A typical first-generation HFCS contains 29% water and 71% solids consisting of 52% glucose, 42% fructose and 6% higher saccharides (Vuilleumier, 1980). HFCS has haze-free clarity, a "water-like" color and no overriding flavors or odors to mask other ingredients (Robinson, 1975; Wardrip, 1971). The sugars in HFCS are fully fermentable (Henry, 1976), but the high osmotic pressure in HFCS resists microbial growth during storage (Wardrip, 1971).

Second-generation HFCS containing 55 to 90% fructose have been available since 1976. The major uses of 55% HFCS are in soft drinks, frozen desserts, jams, jellies and breakfast cereals (Inglett, 1981). Under some conditions, a smaller quantity of 90% HFCS than sucrose can be used to achieve the same sweetness as sucrose, resulting in calorie reduction. Uses of 90% HFCS include "light" foods and beverages, salad dressings, table syrups, wines and low-calorie frozen yogurts (Inglett, 1981).

Relative sweetness of HFCS

All sugars in solution change in sweetness under varying conditions of temperature, pH and concentration (Hodge and Osman, 1976). The relative sweetness of glucose is fairly stable under varying conditions (Shallenberger and Birch, 1975a). The wider shifts in sweetness by fructose under comparable conditions have been attributed to changes in the equilibration of anomeric forms and ring isomers (Hodge and Osman, 1976).

HFCS has been reported to be as sweet or slightly sweeter than