



The composition of sugarcane juice and production of granulated sugar



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Abstract

The aim of study was the chemical composition of sugarcane juice and production of granulated sugar. Process development is to apply for the intelligence of locality to develop product standard. Effect of chemical composition such as pH, total soluble solid, sucrose and the process parameter is final heating temperature on the crystallization, moisture content, sucrose, reducing sugar, and color value (ICUMSA) of granulated sugar was studied. The pH optimum adjusts 5.8-6.2, the total soluble solid 20-24 brix, sucrose is a range of 85.0 to 90% by weight of total sugar, and heated to reach final temperature is 130°C. To reduce moisture of granulated sugar is drying at 70 °C for 1 hour the moisture content it is not more than 2.0% by weight.

Introduction

Consumers have been concerned about sugar intake and tend to prefer soft brown sugar that has flavor nutrients and minerals. (Mizutani et al., 1999). D-Psicose is a C-3 of D-fructose, which is found in very small quantities in nature and it may be used as sweetener to reduce caloric intake (Matsuo et al., 2002). Oshima, Kimura and Isomori (2006) report that high amount of psicose is found in brown sugar.

Granulated sugar is a dried form of brown sugar that made from boiled-down sugarcane juice to sugar and molasses. It is mixed in a centrifuge (Noncentrifugal sugars). Those products can be produce using relatively low-cost and low technology process suitable for small-scale production. In most cases this sugar is produced using open pan boiling technique. However, the process still requires experience, skill and knowledge to be success and Thai farmer groups have the problem to control the quality of sugar product. The purpose of this work is to develop the process of granulated brown sugar in OTOP organization by applying the intelligence of local people.

Materials and Methods

Materials

Mature stems of sugarcane about 9-12 months were checked sucrose and reducing sugar. Soft brown sugar was analyzed moisture content, sucrose, reducing sugar, and color value (ICUMSA)

Crystallization experiments

An open pan was used as an evaporator and transferred to a heated vial gas cooker. Preparing sugarcane juice before heating step is measure and adjusted degree Brix of 15-25 and pH 5.0-7.0. To bring the sugarcane juice concentration to syrup at final temperature 120-140 °C. The crystallization of sugar syrup was carried out with a strong shearing force and drying by hot air oven or exposed to the sun. It then will become granulated sugar.



Sugarcane



Cane Milling



Evaporation



Crystallization

Determination of soft brown sugar properties

Moisture content, sucrose, reducing sugar, and the main *minerals* which were potassium calcium iron magnesium were determined following Association of Official Analytical Chemists (AOAC, 2000)

Results and Discussion

Chemical composition of sugarcane juice differences between varieties and locations can be established. (Chen and Chou, 1993) Sugarcane juice consists of a sucrose solution containing soluble and insoluble impurities (i.e non sucrose species). It's was also slightly acid with the pH between 4.8 to 5.2, TSS 15.0-24.0 and sucrose 10.14 - 18.45 % w/w.

The ability of sucrose to crystallize depends upon sugar content and pH. The acid condition can cause the sucrose to be hydrolyzed to invert sugars during processing depending on pH and temperature. (Jetoo, 2000) This is controlled before heating step by adding sugar to adjust sucrose content to a range of 85-90% w/w or the total soluble solid 20-24 brix and maintaining the pH 5.8-6.2 using sodium bicarbonate. If pH is too low, sucrose will decompose remarkably in heat, whereby crystallization of solid sugar tends to become difficult. If pH is too high, the color tends to change to brown sugar because of maillard reaction. (Mizutani et al., 1999)

For the evaporation, heating temperature is preferably at 130 °C. The lower temperature showed the higher moisture content. The higher temperature (135 °C) the darker and more bitter because the calamelization. The syrup is cooled to solidify with a scratch on wood tray to soft brown sugar. If the soft brown sugar is evaporated at 70 °C within 1 hour or basked in order to reduce its moisture, it will become granulated sugar. The moisture of granulated sugar should not be greater than 2%.



pH < 5.8



Sucrose < 85%



Soft brown sugar



Soft brown sugar

Conclusions

Sucrose content and pH is base on the ability of sucrose to crystallize and control of the syrup temperature in a heating. This technique was transferred to farmers who produce soft brown sugar.

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