EFFECT OF HEAT TREATMENT IN PREVENTING BROWNING IN SUGARCANE JUICE

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Introduction

Fresh sugarcane juice is a popular beverage in Malaysia. Its unique flavour and sweet taste makes a very thirst quenching drink especially when consume chilled. However, as reported by Sharma et al. (1989) sugarcane juice is highly perishable. A short time lag between extraction and consumption can cause its sensory properties namely colour, flavour and viscosity to change. The colour of the juice will gradually change from yellowish green to dark green and upon longer storage it will become brownish green. The colour change is often accompanied by change in flavour and taste, from sweet to an objectionably sourish taste. Buchelli and Robinson (1994) suggested that enzymatic browning was the major cause for the change in colour of fresh sugarcane juice. The enzyme responsible for enzymatic browning reaction has been referred to as polyphenoloxidase (PPO). Pasteurisation or conventional heat treatment of sugarcane juice is impractical since it would also cause nonenzymatic browning of the juice and at the same time impart a jaggery taste. The objective of this project was to study the effects of blanching treatment of the canes on juice quality as well as to determine the suitable time and temperature combination for the blanching treatment.

Materials and Methods

Sugarcane of the yellow variety was used in this study. Its supply was obtained from a farm in Semenyih. They were harvested at commercial maturity stage, approximately 8 months old. Upon arrival at the laboratory, they were cleaned, washed and cut into 3ft. lengths. The canes were then subjected to different blanching treatments: A) Water blanching i) at 75°C for 11,12,13 and 14 min. ii). At 80°C for 11,12,13, and 14 min. iii) at 85°C for 11, 12, 13 and 14 min; and B). Steam blanching at 100°C for 11, 12, 13 and 14 min. After the blanching treatments the canes were immediately cooled in ice water before extracting the juice. Sugarcane juice was extracted using a three roller power machine crusher, filtered and stored at 4°C before quality analysis were done. The quality parameters examined on the extracted juice were colour using the Hunter colour difference meter, PPO enzyme activity (Augustine et al. 1985), chlorophyll (Richard and Thompson, 1952) and sensory evaluation to detect the difference and preference for colour and taste of the treated samples.

Results and Discussion

Colour: The colour of sugarcane juice was monitored by recording its 'L' Lightness, '-a' greenness and 'b' yellowness values. It was apparent that both prolonged time of heating at a particular temperature as well as increasing the heating temperatures decreased the 'L', 'a' and 'b' values of the extracted juice. The decrease in 'L' value indicated that the juice was getting darker while the decrease in a/b value showed that the juice was becoming more yellow than green. In addition, the 'L', 'a' and 'b' values of juices extracted from canes that were blanched at 75, 80 and 85°C further decreased during storage at 5°C. The colour of the juices was observed to be brown. In contrast, the canes that were blanched at 100°C for 13 mins. did not develop any brown colour during storage. This indicated that blanching treatment had positive effects in preventing browning of sugarcane juice.

Enzyme activity: From the enzyme heat inactivation trials it was observed that low temperature heat treatment was not able to inhibit the enzyme activity. Heating the canes to an internal temperature of 100°C for 12–13 min managed to completely inactivate the enzyme

Chlorophyll: Chlorophyll was observed to contribute to the attractive colour of sugarcane juice. Results of this study indicated that blanching treatment reduced the total chlorophyll content of sugarcane juice. The higher the temperature and the longer the blanching time the greater was the amount reduced. This was in concomitant with the decrease in a/b values recorded above. The initial chlorophyll content was 250μg/liter. Blanching of canes at 75, 80, 85 and 100°C reduced the contents to 120, 89, 68 and 52μg/liter respectively. These values decreased further after a 12-hour storage at 5°C, perhaps due to the formation of dull, olive brown pheophytin (Jeanna, 1991) which contributed to the change from bright greenish to brownish colour.

Sensory evaluation: Results of panellists evaluation on the colour of sugarcane juice extracted from canes that were blanched at different times and temperatures showed there were no significant difference in the colour. However, comparing among products of the four temperature regimes, the colour of juice extracted from canes blanched at 100°C for 13 min was most preferred. For taste the canes that were blanched at 100°C for 12 min produced better tasting juice.

Conclusions

Several factors were involved in the loss of colour of sugarcane juice but the activity of the enzyme polyphenoloxidase and chlorophyll degradation were major factors. Blanching of canes helped to inactivate the enzyme. No intense browning was observed in cane juice extracted from blanched canes. Steam blanching was more feasible compared to water blanching. The optimum temperature and time for blanching of canes was 100°C for 12-13 mins.

References

Augustine, M.A., Ghazali, H.M. and Hashim, H. 1985. Polyphenoloxidese from guava (*Psidium guajava* L). *J. Sci. Food Agric.* 36,1259-1265.

Buchelli, C.S. and Robinson, S.P. 1994. Contribution of enzymatic browning in the colour of sugarcane juice. *J.Agric.Food Chem.* 42: 257-261.

Jeanna, G. 1991. Chlorophyll pigments in vegetables. Van Nostrand Reinhold Publication.

Richard, F.A. and Thompson, T.G. 1952. The estimation and characterisation of plankton populations by pigment analysis. ii. Spectrophotometric method for the estimation of plankton pigments. *J. Mar. Res.* 11(2): 156.

Sharma, K.P., Ratan, B.K. and Kanwar, R.S. 1989. Improvement in sugar recovery by preventing bacterial polysaccharide production in cane sugar,. *Bhartya Sugar.* 14: 15-18.

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