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Chemical Compositions of the Jackfruit Juice (*Artocarpus*) Cultivar J33 During Storage

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Abstract: Chemical properties such as pH, total acidity, Total Soluble Solid (TSS) and sugar content changes during ripening of jackfruit cultivar J33 were evaluated at ambient temperature (±27°C; 70-80% RH). There are significant changes pH, total soluble solids, total acidity and sugar content at different ripening days. In this study, data obtained suggests that the ripening process of jackfruit cultivar J33 was at its optimum at day 9 after harvest at ambient temperature. The results will help to make the best use of jackfruit for different purposes and applications.

Key words: Jackfruit, storage, total soluble solid, pH, total acidity, sugar

INTRODUCTION

Jackfruit belongs to the genus *Artocarpus* (family Moraceae) which is one of the tropical fruit. Jackfruit is indigenous to South Western India. Jackfruit have three botanical names, which are *Artocarpus integra* Merr., *Artocarpus integrifolia* Linn. and *Artocarpus heterophyllus* Lam, of which the last one is now widely accepted (Manjunath, 1948). The value of its versatility is enhanced by its availability during the monsoon period when the supply of other vegetables is small (Singh, 1963). Therefore, it is commonly referred as the poorman's food. Rahman *et al.* (1995) reported that the weight of jackfruit usually reach 10-25 kg at maturity. Individual fruit weight varying between 2.10 and 20 kg (Mitra and Mani, 2000; Reddy *et al.*, 2004). However, the large size of jackfruit can be as much as 50 kg (Selvaraj and Pal, 1989). Bhatia *et al.* (1995) investigated in ripe jackfruit, the bulbs, seeds and rind form 29, 12 and 59% of the bulk, respectively. The edible bulb contains pH 5.1, 25% carbohydrates and 1% total ash (Nanjundaswamy, 1990). Threaten clusters (44 genotypes) of jackfruit had an average Total Soluble Solid (TSS) ranged from 15.1 to 25.9°Brix (Maiti *et al.*, 2002). The objective of this study is to determine the chemical changes of jackfruit from variety J33 during ripening. These data provide important information in improving the quality and processing characteristics in jackfruit processing industry.

MATERIALS AND METHODS

Preparation of juice: Fresh jackfruits from cultivar J33 were purchased from a commercial farm in Selangor. The total number of jackfruit that was required for the experiment was 17. The fruits were harvested according to the farmer experience, i.e., fruit approaches maturity but in unripe stage. Harvested fruit were carefully packed and transported immediately to the laboratory. Jackfruit J33 were then allowed to ripen at an ambient temperature (±27°C; 70-80% RH) until its fully ripe. The experiments were started after day 3 of storage. The fruits were cleaned and sample was taken from middle section of the fruit. During day 1 and 2, the fruit's flesh is white in color with milky white latex and not suitable for cutting. Analysis of the fruits was conducted everyday. Fruit bulbs were removed and deseeded for extracting of juice using a domestic juicer (Power juicer, Smart Shop™, US). All experiments were conducted at room temperature and carried out in three replications.

Chemical analysis: The Total Soluble Solid (TSS), expressed as °Brix, of jackfruit juice was determined using a digital refractometer (Model AR-2008, Kruss, Germany). The total acidity and pH of juices were measured using a digital autotitrator (Model 785 DMP Titrino, Metrohm, Switzerland). Ten milliliter of sample juice is treated with 40 mL distilled water. The principal sugars in jackfruit are fructose, glucose and sucrose. The amount of these

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sugars were determined by High Pressure liquid Chromatography (HPLC) with a Jasco RI-1530 detector and a Jasco PU-1580 pump. The column used to analyze the sample was a 10 μm uBondapak™-NH2 column (3.9×300 m) with NH_2 polar bonded stationary phase. Degassed 80% acetonenitrile was used as a mobile phase. All experiments were conducted at room temperature and the average values of three replications were reported.

RESULTS AND DISCUSSION

Total Soluble Solids (TSS): The total soluble solids content ranges from 19.03 to 32.53°Brix. Figure 1 shows that the total soluble solids gradually increased ($p<0.01$) with fruit ripening until day 8. At day 9, the total soluble solid decreased ($p<0.01$) to 29.33°Brix. This may due to the fruit is overripe and has some sourness. Sharaf and El-Saadany (1987) had indicated that the increase in soluble solid content could be attributed to the conversion of starch to sugars and a later decrease due to the use of these sugars by respiration.

pH: Figure 2 shows pH of jackfruit ranges from 4.70 to 5.72. The pH value was lowest in the unripe jackfruit which is at day 3 and increase significantly ($p<0.01$) during the ripening stages, followed by a significant decrease ($p<0.01$) at day 9 after harvest. These are probably related to the value of total soluble solid and total sugars. Overall, the average pH was in an increasing trend during the early ripening stages. A lower pH in the fruit indicates a more sour fruit with high acidity.

Total acidity: Acidity in jackfruit J33 shows a range from 0.27 to 0.75%. Reddy *et al.* (2004) had reported a similar variation in acidity which is in range of 0.18 to 0.68%. The high percentage of acidity was found at the early stage of ripening. A significant ($p<0.01$) decrease in titratable acidity was observed from day 5 to 8 and shows little change subsequently at day 9 which is in the overripe stage. The decrease in acidity during storage might be due to a rapid utilization of acids by respiration (Edmundo *et al.*, 1998). The total acidity in jackfruit is low at the ripe stage (0.13%) (Bhatia *et al.*, 1995) (Fig. 3).

Sugar content: The sugar profile of jackfruit is an important component of chemical composition and provides valuable information regarding the authenticity of fruit juices. Data indicates that the sucrose content was always higher than fructose and glucose. The fructose content varies between 0.47 to 2.06%. Figure 4 shows the changes of sugar content in jackfruit juice. The fructose content increased with significant ($p<0.01$) during the

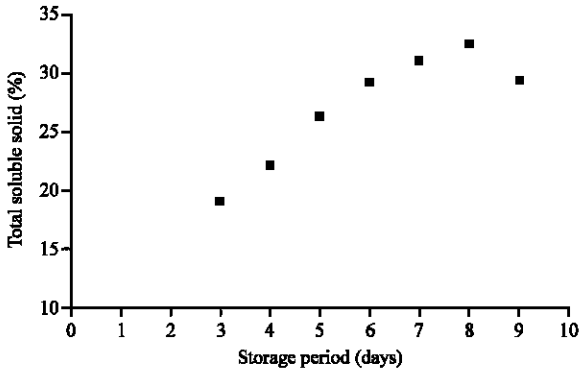

Fig. 1: Changes in total soluble solids during storage

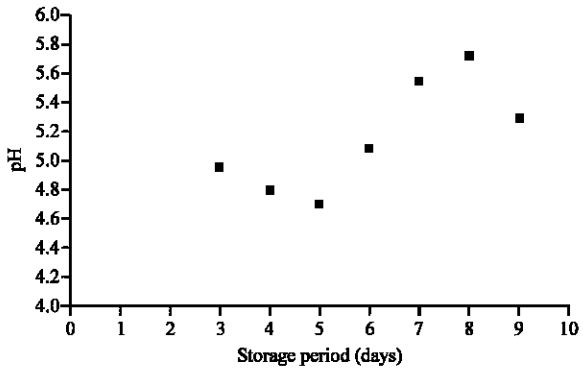

Fig. 2: Changes in pH of jackfruit juice during storage

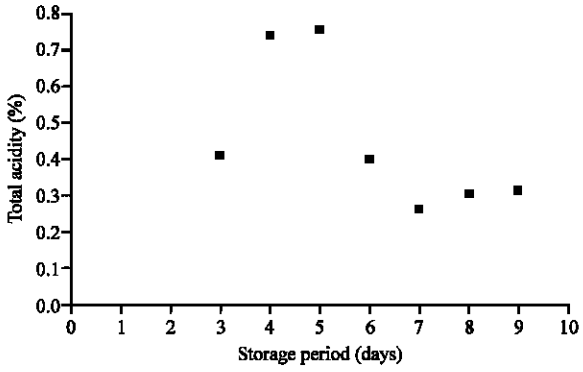

Fig. 3: Changes in acidity of jackfruit juice during storage

ripening process from day 3 to 8 and decrease significantly at day 9. The same trend was observed for the glucose and sucrose content. Most of fruits in their ripening stage contain high percentages of glucose, fructose and sucrose while these sugars may remain absent or present in very minor proportions in their immature stages (Rahman *et al.*, 1999). With increasing ripeness, there was an increase in free sugar content of fruit. In jackfruit, a three-fold increase in sucrose concentration was observed during ripening with a

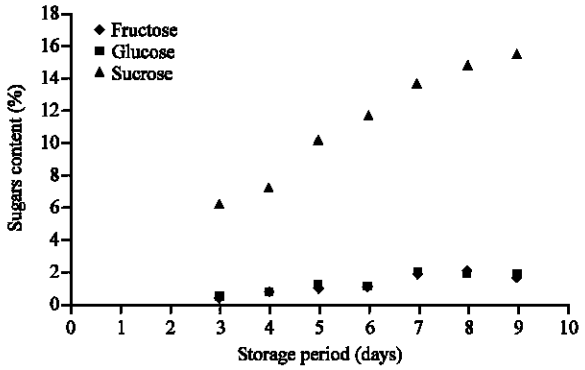

Fig. 4: Changes in fructose, glucose and sucrose of jackfruit juice during storage

corresponding increase in the concentration of glucose and fructose which were six- and five fold respectively (Selvaraj and Pal, 1989).

CONCLUSION

The results show that there are a significant changes in the chemical properties of jackfruit such as total soluble solid, pH, total acidity and sugar content change during the ripening process. The results of the study provide important informations to the processing industry to produce products with a better quality and investigate whether jackfruit cultivar J33 has a potential market for commercial cultivation.

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