EXTENDED ABSTRACT

The Effect of Ultrasound Treatment on the Quality of Pineapple (Ananas comosus)

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SUMMARY

Pineapple contains a lot of sugars. Therefore, it is not recommended for people with limited sugar consumption. The reduction in total sugar content (TSS) was carried out using ultrasound wave. The observed parameters were TSS, pH, vitamin C and total color difference (⊗E*). Ultrasound was able to reduce TSS and acidity of pineapple without significantly affecting the color of pineapple. The largest decrease of TSS was approximately 29%. The best treatment was using ultrasound wave at frequency of 20 kHz for 30 minutes with TSS of 10.87%, pH at 3.63, vitamin C of 12.67 mg/100g and ⊗E* of 3.76.

Keywords: Acidity, Colour, Pineapple, Soluble sugar, Ultrasound

INTRODUCTION

Pineapple contains a lot of nutrients; however, it is not recommended for consumers with limited sugar intake. The selected technology in food processing should be environmentally friendly. The involvement of ultrasound in food processing has long been applied. A few researchers had performed experiments on ultrasound for dehydrating pineapple both in single application and combined with other methods (1,3-4). None of the research focused on decreasing TSS. Ultrasonic wave generates alternating low- and high-pressure waves in liquids, leading to formation and violent collapse of small vacuum bubbles called cavitation. Factors affecting the performance of ultrasonication include frequency, temperature, contacting time and food properties. A study reported that ultrasound frequency had an indirect effect on the lycopene degradation in tomato puree (5). This study evaluated the effect of ultrasound wave on some quality parameters of pineapple before and after ultrasonication.

MATERIALS AND METHODS

Pineapple of queen variety was obtained from pineapple growers in Prabumulih district, south Sumatera. The peeled pineapple was put in the processor bath of ultrasonic processor that had been filled with distilled water. The frequency and contacting time were set according to the experimental design. The treated pineapple was analysed for its physical and chemical characteristics (TSS by a refractometer, pH by a pH meter, and vitamin C by titration method with the iodine solution, total color difference by a color reader). The research was conducted using a factorial randomized design. The experiments consisted of two factors: An A Factor was the ultrasound frequency (A1=20 and A2=40 kHz), and B factor was the sonication time (B1=10, B2=15, B3=20, B4=25, B5=30, B6=40 minutes). The HSD (Honestly Significantly Difference test) at 5% was used to analyse the significant difference treatments.

RESULTS AND DISCUSSION

The average TSS content of all treated pineapple can be seen in Figure 1. ANOVA showed that the decrease in total sugar content was not significantly different. This was presumably because the pineapple was not sliced, causing the intensity of the ultrasonic waves not to penetrate maximally into the flesh of the fruit.

The effect of contact time on the pH is shown in Table I. The more gas bubbles that are formed due to a longer contact, the more cavitation energy that results in cell damage (vacuoles). Organic acids contained in pineapples such as citric acid, malic acid and oxalic acid which are water soluble were released.

The results showed that the average ΔE* of treated whole fresh pineapple ranged from 3.76 to 11.50. ANOVA showed that the ultrasound frequency, contact time and the interaction between the two treatment factors had no significant effect on ΔE* of treated whole fresh pineapple.

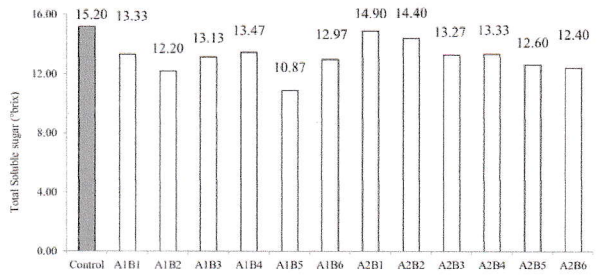

Fig.1: TSS content (°Brix) of treated pineapple

Table I: HSD test (5%) for the effect of contact time on pH of treated pineapple

Contact time	pH
B1 (10 mins)	3.47^{a}
B2 (15 mins)	3.53^{ab}
B3 (20 mins)	3.63^{ab}
B4 (25 mins)	3.65^{ab}
B5 (30 mins)	3.68^{ab}
B6 (40 mins)	3.78^{b}

Values followed by the similar letter of the superscript are not statistical significantly different at P>0.05, HSD 5%=0.26

The results showed that treated pineapple contained an average of 10.33 mg/100g of vitamin C to 12.67 mg/100g, while the vitamin C content of pineapple without treatment (control) was 14.08 mg. /100g. Ultrasound frequency, contact time and interaction between the two factors had no significant effect on vitamin C of treated pineapple.

CONCLUSION

Ultrasound wave was not significantly different in decreasing TSS and vitamin C, but it was significantly different in increasing pH. Based on the largest TSS reduction, the recommended ultrasound treatment for pineapple was ultrasound frequency at 20 kHz for 30 minutes of contact time which could reduce total soluble sugar content from 15.20 °Brix into 10.87 °Brix.

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