

Title Inhibitory effects of ultrasound with antibrowning agent on apple browning
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Abstract

Enzymatic browning of the cut surfaces is one of the most restrictive factors for the shelf-life of fresh-cut fruits and vegetables, especially sliced apples. This study was conducted to investigate the inhibitory effect of ultrasound with ascorbic acid on the polyphenol oxidase activity of fresh-cut apples. Apples tissue discs were prepared from the slices using a cork borer and treated with distilled water(control), 0.5~3%(w/v) ascorbic acid(AA), ultrasound(US), and a combination of AA and US (AS). Half of samples were then placed in plastic Petri dishes and another half were placed in micro tubes after crushing and filtering and stored at 25°C for 24 h. CIE L*, a* and b* values were directly measured and catechol treatment was performed to verify the location and existence of polyphenol oxidase. The results showed that the apple slices underwent color changes, as can be observed by the increase in L* and a* value. AA treated samples had significantly higher CIE L* value thus lighter color was maintained for 24 h, especially at 3% AS treated samples. Inhibitory effect was dependent on AA concentration. There was no significant difference in CIE L* value between 1% AS and 3% AA after 24 h. Browning occurred in 0.5% AA treated samples very rapidly, showing the highest ΔE value. Lighter color was maintained in the filtrands of 3% AA and 3% AS treated samples. However, browning was observed the part exposed to air in 3% AA treated samples after 24 h, contrary to light color in who filtrand treated with 3% AS. After catechol treatment, 3% AS treated samples showed light color with no color change. On the contrary, control and 0.5% AA treated samples showed about 25% decrease in PPO inhibitory effect which had severe change in color all over samples, as compared to 1% AS treated samples. 1% AA treatment after US treatment resulted in about 50% reduction of PPO inhibition effect. Serial treatment of AA and US treatment were not effective on inhibition of PPO activity in contrast with 1% AS treatment which has almost the same effect as 3% AA treatment. Our study revealed that the use of ultrasound in combination with ascorbic acid had a positive effect on inhibition of apple browning and PPO activity.