Enzymatic browning of shredded vegetable and the effect of NaCl on the browning

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Summary

When shredded vegetable is stored at refrigerator, it gradually turns brown. We examined the factors of this enzymatic browning such as amount of phenolics, phenylalanine ammonia lyase (PAL) activity and polyphenol oxidase (PPO) activity during storage of shredded lettuce. We next examined the inhibitory effect of NaCl, an inhibitor of PPO, on the browning.

Lettuce was shredded and stored at 4^{o}C during about 1 week. The degree of browning was estimated visually or by color difference meter. The two values gradually raised and showed good correlation. Shredded lettuce turned brown after 3 or 4 days of storage. The amount of phenolics was measured by HPLC method. Dicaffeoyltartaric acid, caffeoyltartaric acid and 5-caffeoylquinic acid (5-CQA) were the major phenolics. PPO and PAL activities of crude extract of shredded lettuce were spectrophotometrically measured using 5-CQA and Phe as the substrates, respectively. PPO catalyzes the oxidation of *o*-diphenols to corresponding quinones. *o*- Quinones are yellowish compounds and are easily polymerized to form brown pigments. PAL is a key enzyme of biosynthesis of phenolic compounds. PPO activity was almost constant during storage, while PAL activity intensively raised at 3 days after cutting. There was no relation between browning and phenolics and between browning and PPO activity, while there was significant correlation between browning and PAL activity. This result showed that PAL activity was induced in shredded lettuce as the response against injury, newly synthesized phenolics were successively oxidized by PPO and that shredded lettuce turned brown.

Next the effect of NaCl on browning of shredded lettuce was examined. NaCl did not show any effect on PAL activity and phenolics biosynthesis. NaCl and other chlorides inhibited PPO activity of shredded lettuce, however, Na salts such as Na_2SO_4 and $NaNO_3$ did not inhibit PPO. This showed Cl^- inhibited PPO. However the inhibitory activity of NaCl against lettuce PPO was weak (Ki=0.11 M) and NaCl did not inhibit the browning of shredded lettuce. Further synergistic effect of NaCl and other inhibitors such as PAL inhibitors should be examined to regulate enzymatic browning of shredded lettuce.