Title Enzymatic browning of lettuce: Involvement of microbiological factors

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Abstract

Enzymatic browning of mechanically wounded tissues is one of the major postharvest problems in lettuce, either harvested as whole heads or fresh-cut. Browning in plant systems is usually associated with enzymatic oxidation of phenolic compounds, primarily by the enzyme polyphenol oxidase (PPO). In lettuce, the major part of phenolic compounds providing a substrate PPO is synthesized de novo on the wounding site after tissue damage (Saltveit, 2000). The involvement of bacteria in lettuce browning was suggested by Pascoe and Premier (2000). The research was aimed at testing possible involvement of microbiological factors in browning of cut lettuce tissues. Dipping in disinfectant solutions (chlorine, acidified sodium chlorite, peroxyacetic acid, or ethanol) or antibiotic (carbenicillin) treatment reduced browning severity of lettuce core tissues. Moreover, aseptic excision of core tissues reduced browning without any special chemical intervention. Several bacterial species were isolated from lettuce tissues showing browning symptoms, among them genera Pseudomonas, Serratia and Acinetobacter. The symptomless aseptically excised pieces showed no bacterial microflora. Inoculation of aseptically excised core discs or midrib sections with Pseudomonas putida isolated from lettuce enhanced their browning. Inoculation resulted in enhanced accumulation of phenolic compounds in midrib sections. The bacterial inoculation did not induce browning in core discs preliminarily subjected to heat treatment as described by Saltveit (2000). However, these inoculated non-browning discs subsequently underwent fast deterioration (maceration). Based on the results presented, we suggest that microbiological factors, in particular presence of bacteria, can be involved in the induction of biosynthetic pathway in wounded lettuce tissues, bringing to the production of phenolic compounds eventually oxidized by PPO. This phenomenon may be a part of plant defense response to microbial attack.