

Title Control of polyphenol oxidase and pectin methylesterase activities by ultra high pressure
Author Miyuki Miyawaki and Barry G Swanson
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Abstract

Fruit and vegetable processing aims for preservation of foods with acceptable quality and extended shelf life by minimizing the changes in natural color, texture, and flavor. Development of rapid determination methods of intrinsic enzyme activities to evaluate the adequacy of processing methods as well as selections of processing methods to control enzyme activities are of technological and economical importance to the food industry.

Polyphenol oxidase (PPO) catalyzes oxidation of phenolic compounds into *o*-quinones resulting in discoloration of fruits and vegetables. A rapid fluorescence oxygen probe method for the determination of PPO activity was developed and its performance compared to the conventional spectrophotometric method. The fluorescence oxygen probe method enables the direct determination of diphenol oxidase activity of PPO in fruit homogenates in a reasonably short time.

Nonthermal ultra high pressure (UHP) processing potentially inhibits intrinsic PPO activity. Combined exogenous cysteine proteases papain, bromelain, and ficin, and UHP treatments, involving the addition of EDTA and cysteine as activators for the proteases, were evaluated to inhibit Granny Smith apple PPO activity. Papain inhibited PPO activity in apple homogenates in the presence of cysteine during incubation at 25°C. PPO activity in apple homogenates containing papain and cysteine was inhibited by UHP treatment at 600 MPa and an initial temperature of 25°C. UHP treated apple homogenates containing only cysteine exhibited little discoloration during storage. The combined method adding papain and cysteine to apple homogenates followed by UHP treatment is a potential application for color preservation of apple products.

Pectin methylesterase (PME) catalyzes deesterification of pectins resulting in increased firmness of fruit and vegetable tissues. PME exhibits stability under combined pressures and temperatures compared to individual pressures or temperature treatments. Combined mild heat and UHP treatments of strawberries were examined to assess potential increases in fruit firmness attributed to endogenous PME activity and exogenous CaCl₂. The addition of CaCl₂ to syrups in packaged strawberries enhanced the firmness of strawberries treated with UHP at ambient temperature.