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Effect of thermal and combined thermal/high-pressure treatments on the stability and activity of purified pepper pectin methylesterase

Sónia M. Castro¹, Ann Van Loey², **Jorge Saraiva¹**, Chantal Smout², and Marc Hendrickx². (1) Dept. of Chemistry, University of Aveiro, Campus Santiago, Aveiro, 3810-193, Portugal, phone: + 351 234 370 716, fax: +351 234 370 084, scastro@dq.ua.pt, (2) Laboratory of Food Technology, Katholieke Universiteit Leuven, Dept. of Food & Microbial Technology, 22 Kasteelpark Arenberg, Heverlee, B-3001, Belgium

When heated, fruits and vegetables soften due to loss of turgor and various chemical (β -elimination) and enzymatic reactions (pectin methylesterase and polygalacturonase) that occur in the cell wall matrix polysaccharides. But controlled enhancement of the enzymatic reaction catalysed by pectin methylesterase (PME) can improve texture of fruits and vegetables.

The aim of this work is to study the effect of thermal and combined thermal/high-pressure treatments on the stability and activity of purified pepper PME, at pH 5.6.

PME was extracted and purified from green bell peppers (*Capsicum annuum*) by affinity chromatography. After desalting, the enzyme solution was diluted either in citrate buffer (pH 5.6) or in pectin solution. While residual PME activity was measured by titration, the enzyme activity *during* the treatments was determined colorimetrically.

At atmospheric pressure and temperatures higher than 54°C, purified pepper PME starts to inactivate, but when temperature and mild high-pressure treatments are applied ($T \geq 54^\circ\text{C}$, $P \leq 300\text{MPa}$), an antagonistic effect of pressure and temperature on the enzyme inactivation is observed. For temperatures higher than 50°C, an enhancement of PME activity up to 200-300MPa, followed by a decrease at higher pressures, was obtained. Pressure seems to protect PME from thermal inactivation and, at the same time, enhance the enzyme activity. A 3rd-degree polynomial model was successfully applied to describe the temperature/pressure dependence of both inactivation rate constant of the labile purified pepper PME fraction and initial rate of methanol formation.

The obtained results clearly illustrate the potential of mild heat/pressure treatments in increasing the stability and activity of enzymes and create the opportunity to use high-pressure technology as a tool for improving textural properties of fruits and vegetables.

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