

**Title** Controlled atmosphere and heat shock affect *PAL1* and *HSP90* mRNA accumulation in fresh-cut endive (*Cichorium intybus* L.)

**Author** Abir Salman, Pascale Goupil, Heloisa Filgueiras, Florence Charles, Gérard Ledoigt and Huguette Sallanon

**Citation** European Food Research and Technology, 227, Number 3, 721-726, 2008

**Keywords** Red discoloration; CA storage; Heat shock proteins; *HSP90*; *PAL1*; *PAL2*

### Abstract

Stored fresh-cut endive gradually turns red, since tissue wounding induces de novo synthesis of phenylalanine ammonia-lyase (PAL), which activates the phenylpropanoid pathway. Once the pool of phenolic substrates is increased, polyphenols are oxidized and cause discoloration. Modified atmosphere packaging (MAP) and controlled atmosphere storage (CA) have been used to control browning. This paper describes the combined effects of heat shock (46 °C/120 s) and CA on the quality of cut endive stored at 10 °C. Heat shock protein (*HSP90*) and *PAL* expression patterns were analysed in endive sliced tissues. Real-time quantitative PCR (qPCR) was performed for *PAL1* and *PAL2* as well as for degenerated *HSP90* primers. *PAL1* and *PAL2* were strongly expressed in unheated cut tissues, in which maximum accumulation of *PAL1* mRNA occurred 12 h after cutting. Heat shock significantly reduced the level of *PAL1* transcripts in sliced endive, which was related to the prevention of discoloration. Controlled atmosphere storage had an effect on *PAL1* but not on *PAL2* transcription. Peak levels of *HSP90* transcript accumulation were found after 6 h, with an increasing and apparently cumulative effect of wounding and CA. Image analysis of the slices after 48 h clearly showed that heat-treated samples were similar to the control, with no significant difference between air and CA storage. These results show that there could be inhibition of *PAL1* isoform expression in endive slices after heating.

<http://www.springerlink.com/content/x45w26612w6k0pn7/fulltext.pdf>