

Comparing thermal inactivation to a combined process of moderate heat and high pressure: effect on quality attributes and ascospores in strawberry puree

Rian Timmermans¹, Jan Dijksterhuis², Hasmik Hayrapetyan¹, Martijntje Vollebregt¹, Ben Langelaan¹

¹ Wageningen Food & Biobased Research, Wageningen University & Research, Wageningen, The Netherlands

² Westerdijk Fungal Diversity Institute, Utrecht, The Netherlands



Background

High Pressure Processing is a mild preservation process that is industrially applied to pasteurise food products, aiming to inactivate pathogenic and spoilage microorganisms and to enhance the shelf life combining it with refrigerated storage.

Objective

The aim of this study was to investigate if a combination of high pressure and moderate heat could be used to produce a shelf stable product, focusing on inactivation of target spoilers and maintaining quality during shelf life.

Material & Methods

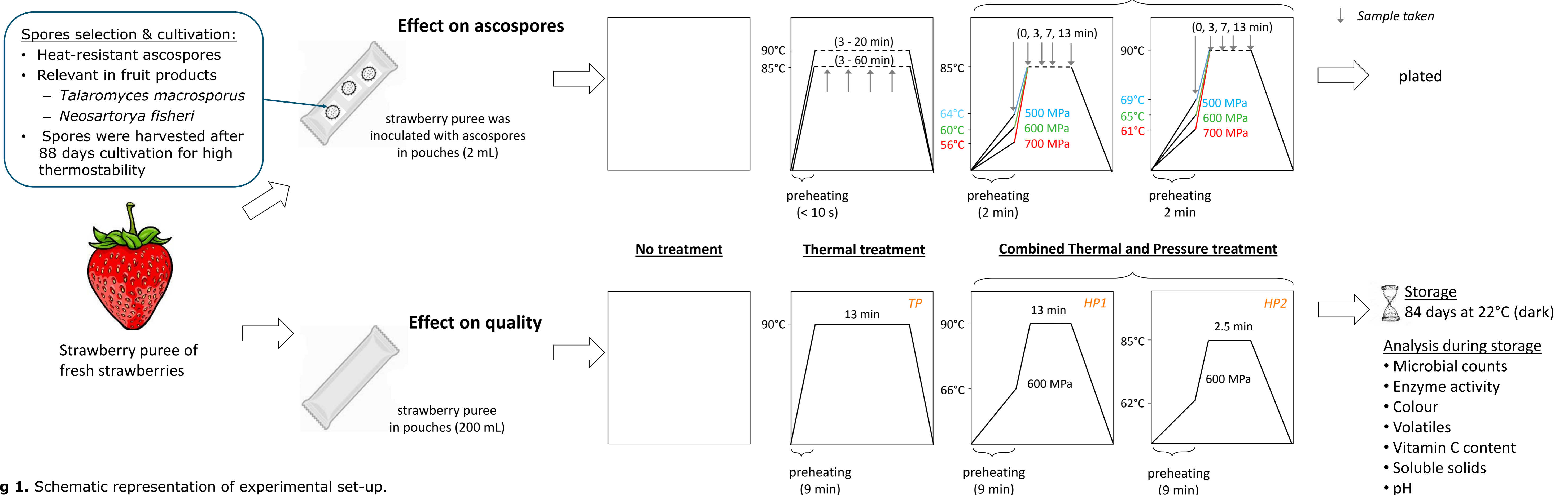


Fig 1. Schematic representation of experimental set-up.

Results & Discussion

Effect on ascospore inactivation

- Heat and pressure in combination were more effective in inactivation of ascospores than heat only or pressure only (0 min holding) (Fig 2).
- Preheating for 3 min at 85 or 90°C or applying pressure of 500-700 MPa (0 min) activates spores of *Neosartorya fisheri* and *Talaromyces macrosporus* (Fig 2).
- Increase of pressure, holding time and maximum temperature lead to more inactivation (Fig 2).
- Neosartorya fisheri* is more robust to treatment than *Talaromyces macrosporus*.

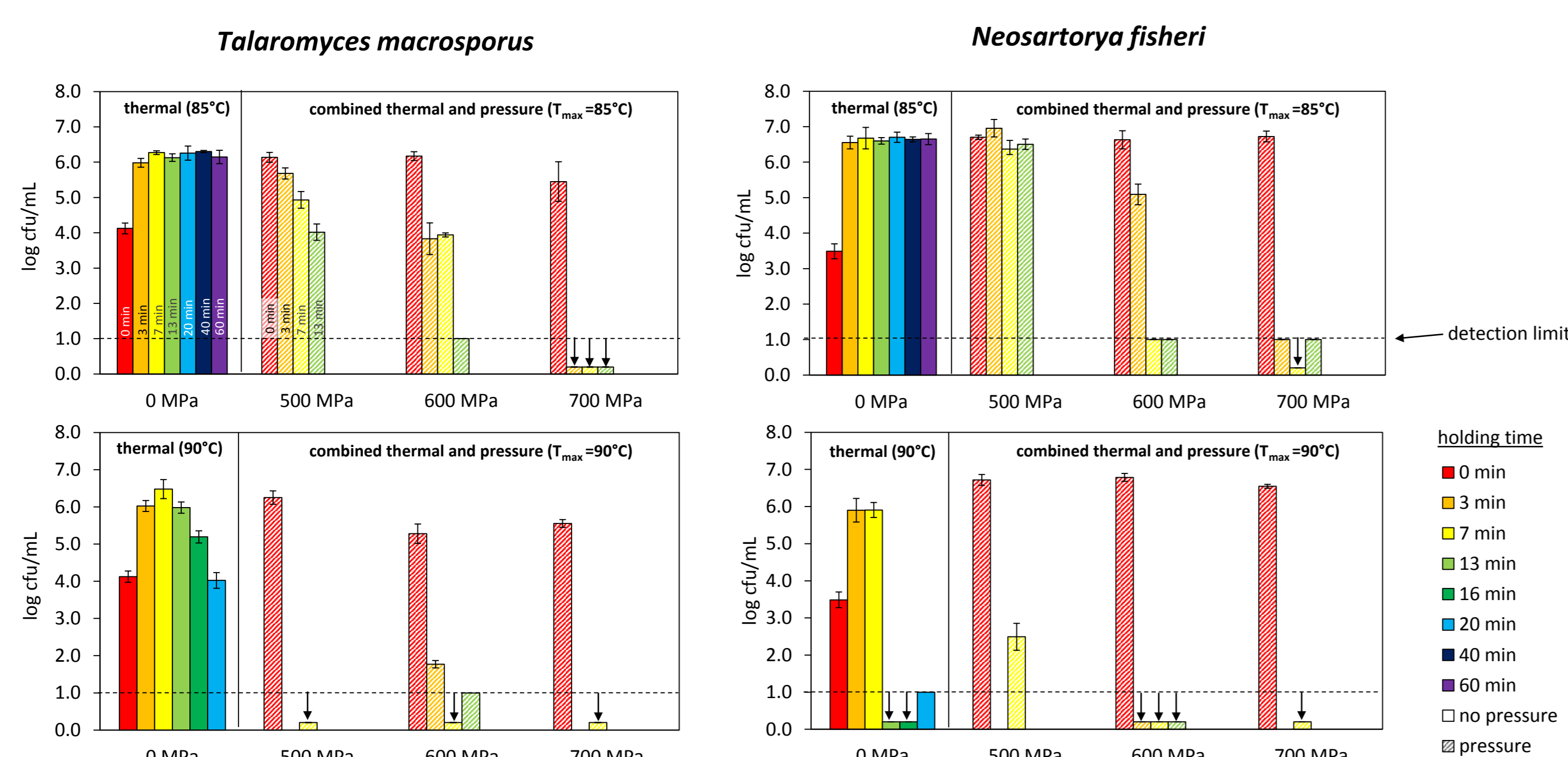


Fig 2. Viable counts of *Talaromyces macrosporus* and *Neosartorya fisheri* suspended in strawberry puree that received a thermal treatment or a combined process of preheating (2 min), pressure and holding time with maximum temperatures of 85°C or 90°C. Dashed line indicates the detection limit.

Effect on quality and shelf life

- Microbiologically stable during 84 days storage at 22°C (yeasts, moulds and total plate count below detection limit) for TP, HP1, HP2.
- Enzymes: 97% PME inactivated (TP, HP1), 71% PME inactivated (HP2), no changes during storage.
- Soluble solids and pH: no effect of processing (TP, HP1, HP2) and during storage.
- Vitamin C: HP2 slightly better retention than TP, but more than HP1, decrease for all samples after 28 d. storage.
- Volatiles (headspace, SPME GC-MS): fresh compounds highest in untreated > HP2 > HP1 > TP, aroma's associated with cooked flavour highest in TP > HP1 > HP2 > untreated.
- Colour: HP2 preserves the red colour the best. ΔE (colour difference compared to untreated) is smallest for HP2, also during storage time (Fig 3).

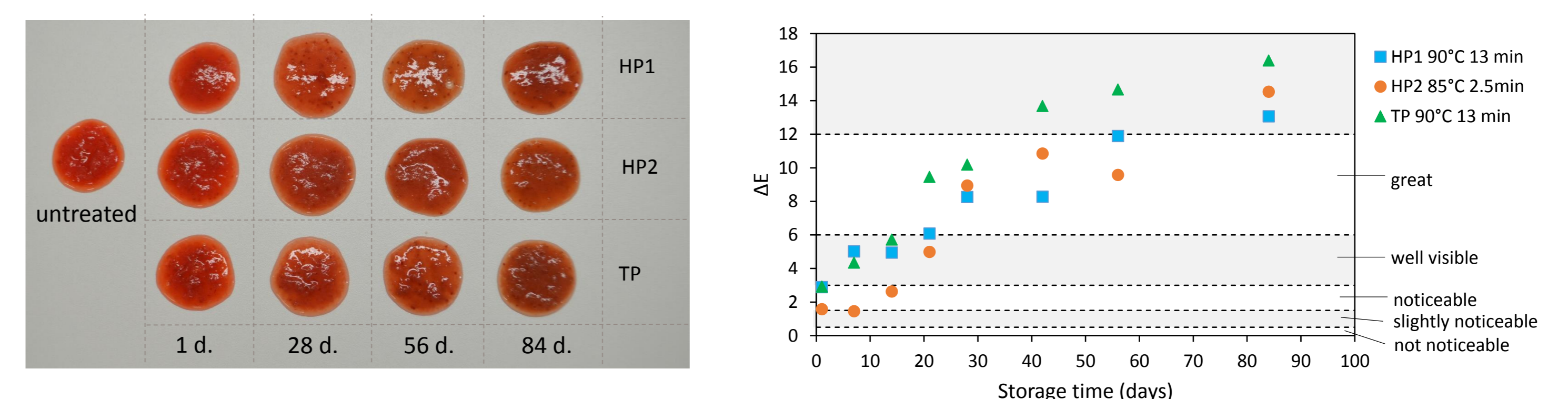


Fig 3. Colour of TP, HP1 and HP2 during shelf life, or measured with Hunter $L^* a^* b^*$ values. ΔE indicates difference using Hunter-Scottfield's equation compared to untreated strawberry puree.

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Wageningen University & Research
P.O. Box 17, 6700 AA Wageningen, The Netherlands
Contact: rian.timmermans@wur.nl
T + 31 (0)317 48 13 05
www.wur.nl/wfbr

Conclusion

The combined process of moderate heat and high pressure is an effective method to inactivate ascospores, meanwhile reducing processing time compared to thermal reference, leading to fresher products.