NATIONAL RESEARCH FLAGSHIPS
Food Futures




Effects of High Pressure Processing on Sensory & Volatile Characteristics of Carrots

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Introduction

High pressure processing (HPP) uses pressure to extend food shelf life and improve microbial safety of foods.
In this study, HPP at 600 MPa for 2 minutes was used to process solid carrots slices, which were then stored at 4°C. Carrot samples were analysed raw, steamed or cooked by microwave. Descriptive sensory analysis and Gas Chromatography-Olfactometry-Mass Spectrometry (GC-O-MS) were used to understand the influence of HPP on the organoleptic properties of carrots.

Methods

- Carrot samples were HPP at 600MPa for 2 minutes, then stored at 4°C until testing.
- Samples were analysed raw or cooked. Three cooking methods were used: steaming for 20 mins, microwave for 4 mins, microwave for 7 mins.
- Nine trained sensory judges assessed the sensory properties of the samples.
- Volatile analysis was conducted by GC-O-MS, a GC-O panel was established (N=4) to profile the intensity of odour-active volatiles in control and HPP raw carrots. The effect of cooking treatment on the volatile flavour characteristics of carrots was not investigated.

Results

- PCA showed that HPP of carrots **reduced** *sweetcorn odour, sweet flavour, corn-like flavour, sweet aftertaste,* and *natural appearance* (Figure 1).
- PCA also showed that HPP **increased** *sour odour, chemical odour, sour flavour, processed flavour, sour aftertaste, bitter aftertaste, intensity of flesh colour, flexibility* and *chewing time* in the carrots (Figure 1).
- The aromagrams (Figures 2 & 3) show the perceptual differences between the samples during GC/MS-O, with the HPP sample having lower *floral/herbaceous* and *nutty* notes and higher *bitter/citrus* and *oily* notes than the control sample.
- Further analysis showed that the terpenoid content (responsible for the characteristic aroma and flavour of carrots) of control and HPP carrots were similar. However, cell damage during HPP caused differences in the sugar content, which presumably affected organoleptic properties of the HPP carrots.

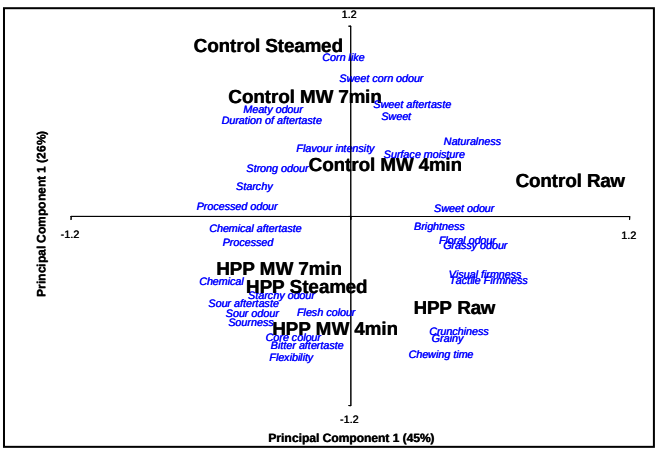

Fig 1: Difference between Control and HPP samples

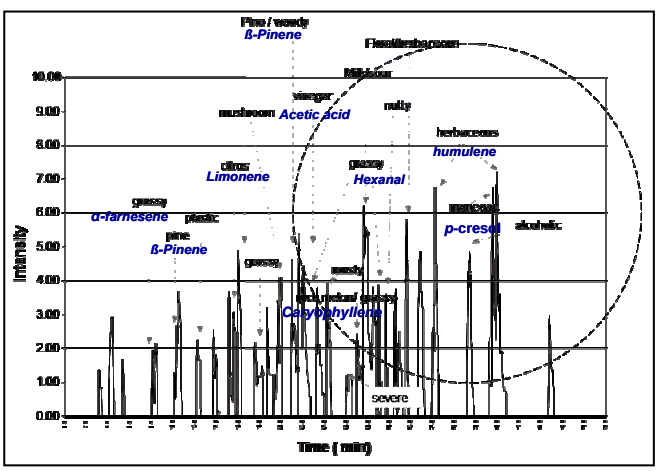

Fig 2: GC/MS-O analysis - Control Aromagram

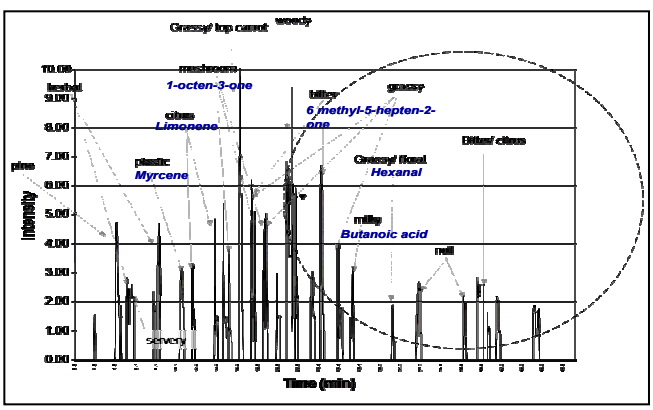

Fig 3: GC/MS-O analysis - HPP Aromagram

Conclusions

The bitterness perceived in the HPP samples by the sensory panel is likely to be due to loss of sugars from the cells during HPP.

A synergistic effect whereby reduced sweetness increases perception of bitterness is plausible.

Further work is on-going to examine the effects of HPP + cooking on organoleptic properties of carrots. The effect (if any) of HPP on the levels of the known bitter-tastants in carrots will also be examined.

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