

Solid-phase microextraction for determining twelve orange flavour compounds in a model beverage emulsion

ABSTRACT

Solid-phase microextraction (SPME) coupled to gas chromatography has been applied for the headspace analysis (HS) of 12 target flavour compounds in a model orange beverage emulsion. The main volatile flavour compounds studied were: acetaldehyde, ethyl acetate, α -pinene, ethyl butyrate, β -pinene, myrcene, limonene, γ -terpinene, octanal, decanal, linalool and citral (neral plus geranial). After screening the fibre type, the effect of other HS-SPME variables such as adsorption temperature (25–55°C), extraction time (10–40min), sample concentration (1–100% w/w), sample amount (5–10g) and salt amount (0–30% w/w) were determined using a two-level fractional factorial design (2⁵-2¹) that was expanded further to a central composite design. It was found that an extraction process using a carboxen-polydimethylsiloxane fibre coating at 15°C for 50min with 5g of diluted emulsion 1% (w/w) and 30% (w/w) of sodium chloride under stirring mode resulted in the highest HS extraction efficiency. For all volatile flavour compounds, the linearity values were accurate in the concentration ranges studied ($r^2 > 0.97$). Average recoveries that ranged from 90.3 to 124.8% showed a good accuracy for the optimised method. The relative standard deviation for six replicates of all volatile flavour compounds was found to be less than 15%. For all volatile flavour compounds, the limit of detection ranged from 0.20 to 1.69mg/L.

Keyword: Solid-phase microextraction; Headspace analysis; Orange beverage emulsion; Fractional factorial design; Central composite design; Extraction efficiency