Abstract

This thesis focuses on measuring calibration factors and the dependence of their stability on experimental conditions for the purpose of quality control and the safety of alcoholic beverages using gas chromatography with flame ionization detection (GC-FID). Ten volatile compounds (acetaldehyde, methanol, methyl acetate, ethyl acetate, 1-propanol, 1-butanol, 2-butanol, isobutanol, acetal, 3-methyl-1-butanol) were monitored according to the legal regulations of the European Commission. These target compounds were analysed in prepared solutions under 27 different measurement conditions. Taguchi's multifactorial statistical method was used to determine the influence of individual measurement parameters on the stability of calibration factors. The chosen variables for measurements were matrix composition, concentration of volatile compounds, GC injector temperature, sample injection volume, injection split ratio, and detector temperature. Within the experiments, each of these variable factors took one of three possible values. Relative response factors (RRF) for each analysed compound were compared using two internal standard (IS) methods. One method utilised commonly used 1-pentanol as the internal standard, while in the other, ethanol, the main component of all alcoholic beverages, was used as the internal standard.

The obtained results indicate that different factors and their levels have varying effects on the stability of relative response factors. The overall variability of values was 13,3 ± 1,6 % for the traditional internal standard method and 7,8 ± 1,8 % for the "Ethanol as IS" method. It was demonstrated that under changing analysis conditions, the "Ethanol as IS" method provides more stable RRF values. The introduction of this method into everyday practice could lead to the simplification of existing procedures for measuring alcoholic products and increase the accuracy of the obtained analytical results.