

## Application of pressurized liquid extraction on isolation of fennel seeds' polyphenols fractions

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### Abstract

Due to nowadays endeavoured green approach, the utilization of environmentally-friendly extraction techniques is encouraged, where pressurized liquid extraction (PLE) provides such possibility. The PLE application allows shorter extraction time and simultaneously less solvent consumption through combined temperature and pressure effect, thus improving energetic and economic efficiency. Accordingly, in order to accomplish satisfactory extraction yield, it is necessary to optimize PLE conditions, depending on sample type and aimed compounds. As fennel (*Foeniculum vulgare* Mill.) seeds are rich source of structurally different bioactive compounds, this study aimed to examine the influence of PLE temperature (75 and 100 °C), static time (5 and 10 min) and cycle number (1, 2 and 3) on the content of fennel seeds' polyphenols fractions: total hydroxycinnamic acids (THA), total flavonols (TF) and total flavan-3-ols (TFO). For this purpose, samples of grinded dry fennel seeds were extracted according to the mentioned PLE conditions in serial exhaustive extraction using solvents ordered by its polarity: hexane, aqueous acetone solution (30 %, v/v) and aqueous methanol solution (30 %, v/v). After defatting with hexane, acetone (AE) and methanol (ME) extracts of residues were collected (n = 24) and used for spectrophotometrically determination of THA, TF and TFO. In order to access data about effect of examined PLE conditions on analyzed parameters, results were statistically analyzed using multivariate analysis of variance (MANOVA) and Tukey's HSD test at significance level  $p \leq 0.05$ . Obtained results showed that observed fractions of polyphenols were present in 4–5 folds higher amounts in AE compared to ME, where established grand means in AE were as follows: THA = 312.82 mg/100 g, TF = 113.23 mg/100 g and TFO = 29.01 mg/100 g, while in ME they were THA = 56.90 mg/100 g, TF = 28.78 mg/100 g and TFO were determined in traces. As for influence of extraction temperature and time, content of all tested compounds was significantly affected by examined sources of variation in extracts of both solvent types, except static time on ME' THA content. Generally, 100 °C/10 min/3 cycles were conditions which yielded the highest THA, TF and TFO in AE, while ME results showed diversity upon examined conditions. Accordingly, the highest THA content was established at lower temperature (75 °C/10 min/2 cycles), while 100 °C/10 min/3 cycles conditions documented the greatest TF content.

### Conflict of Interest

There is no conflict of interest.