Odisee University College
School of Technology
Chemistry, Ghent

How to start an apple wood revolution

CHARACTERIZATION OF PHENOLIC COMPOUNDS FROM APPLE WOOD

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Introduction

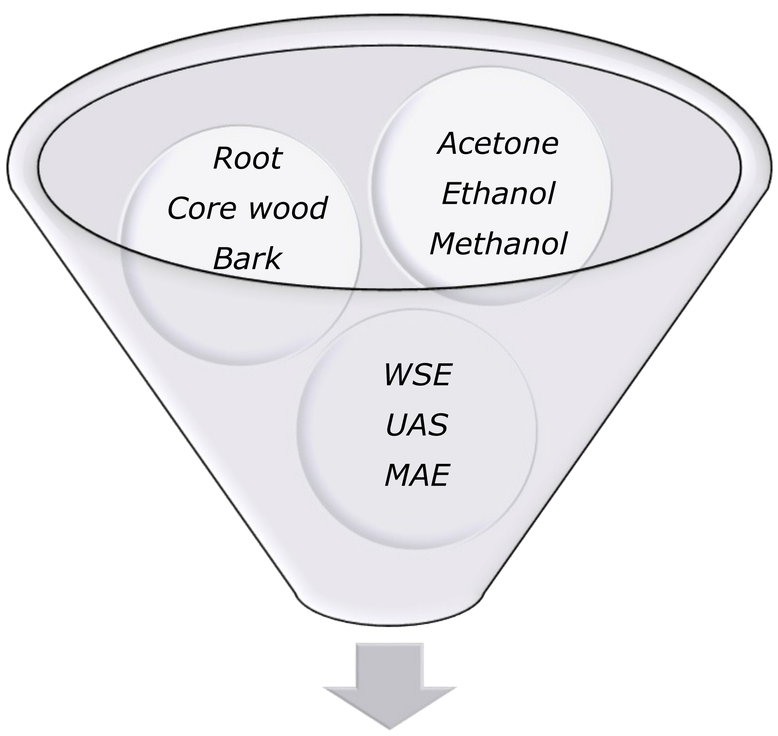
Polyphenolic compounds are widely occurring secondary metabolites in the plant kingdom, acting as contributors to plant pigmentation, antioxidants and protective agents against UV light, among others. *Malus domestica* 'King Jonagold' is a common cultivated apple tree in Belgium. Fruit growers annually have hundreds of tons of wood waste.

root *core wood* *bark*

The aim of the present work is the optimization of the solvent extraction technique for the identified compounds and the characterization of the phenolic profile of apple root, bark and core wood (*Malus domestica* 'King Jonagold').

Each fraction was shredded and grinded, directly after harvesting. After transport to the School of Technology of the Odisee University College, each fraction was dried at 103 °C or 60 °C till constant weight and stored vacuum sealed at -32 °C.

Materials and methods



Evaluation of the bioactive phenolic composition of the extract

In this study, root, bark and core wood are subjected to various extraction techniques (WSE: Warm Solvent Extraction; UAE: Ultrasonic-Assisted Extraction and MAE: Microwave-Assisted Extraction), and types of solvent (acetone; ethanol and methanol) in order to investigate its effect on the bioactive phenolic composition of the extract.

References

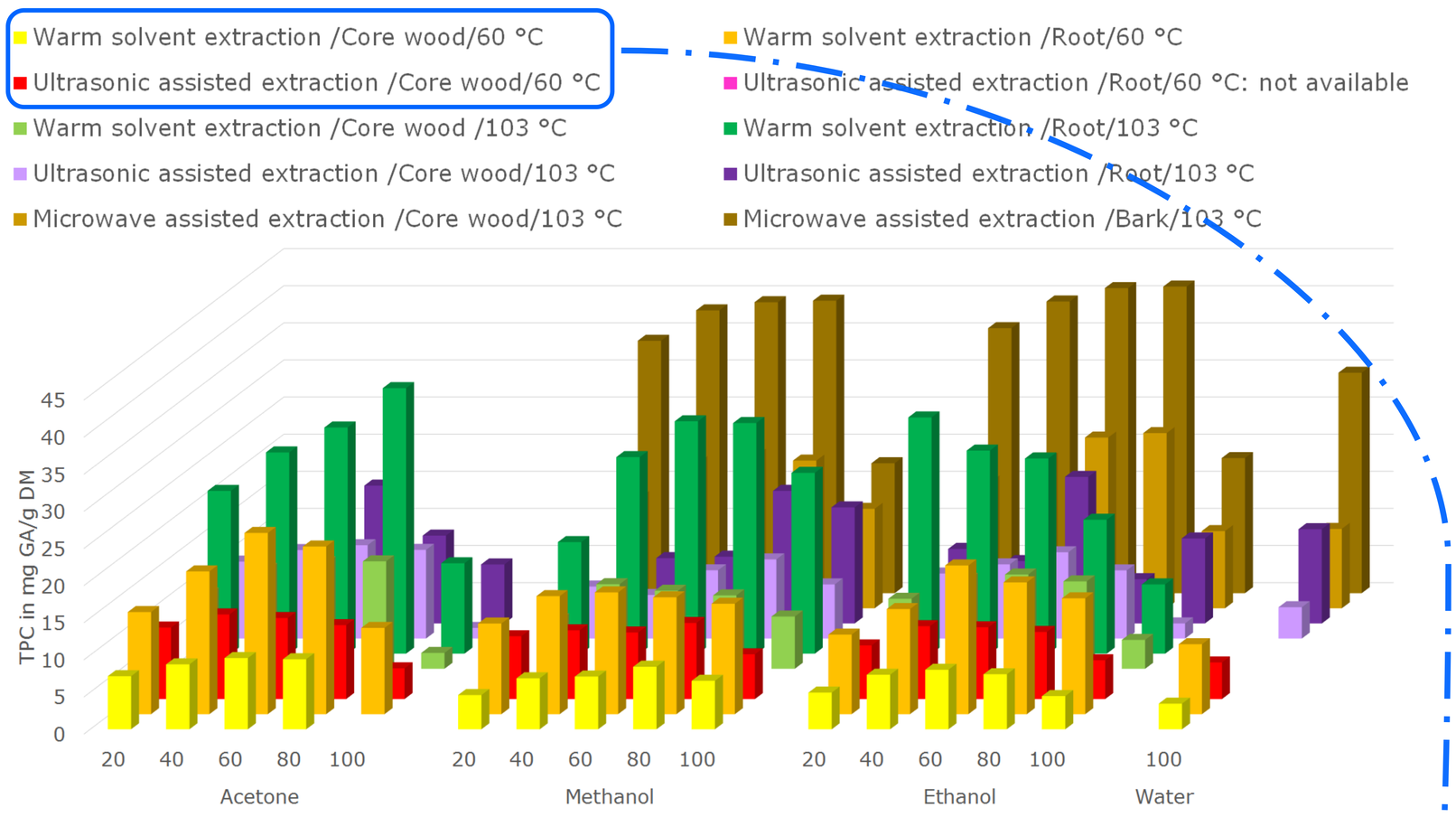
[1] Dvorakova M., Guido L.F., Dostálek P., Skulilová Z., Moreira M.M. and Barros A.A., Journal of the Institute of Brewing, 2008, 114(1), 27-33

[2] Rubilar M., Pinelo M., Shene C., Sineiro J. and Nunez M.J., Journal of Agricultural and Food Chemistry, 2007, 55, 10101-10109

Results and discussion

Solvent type and concentration

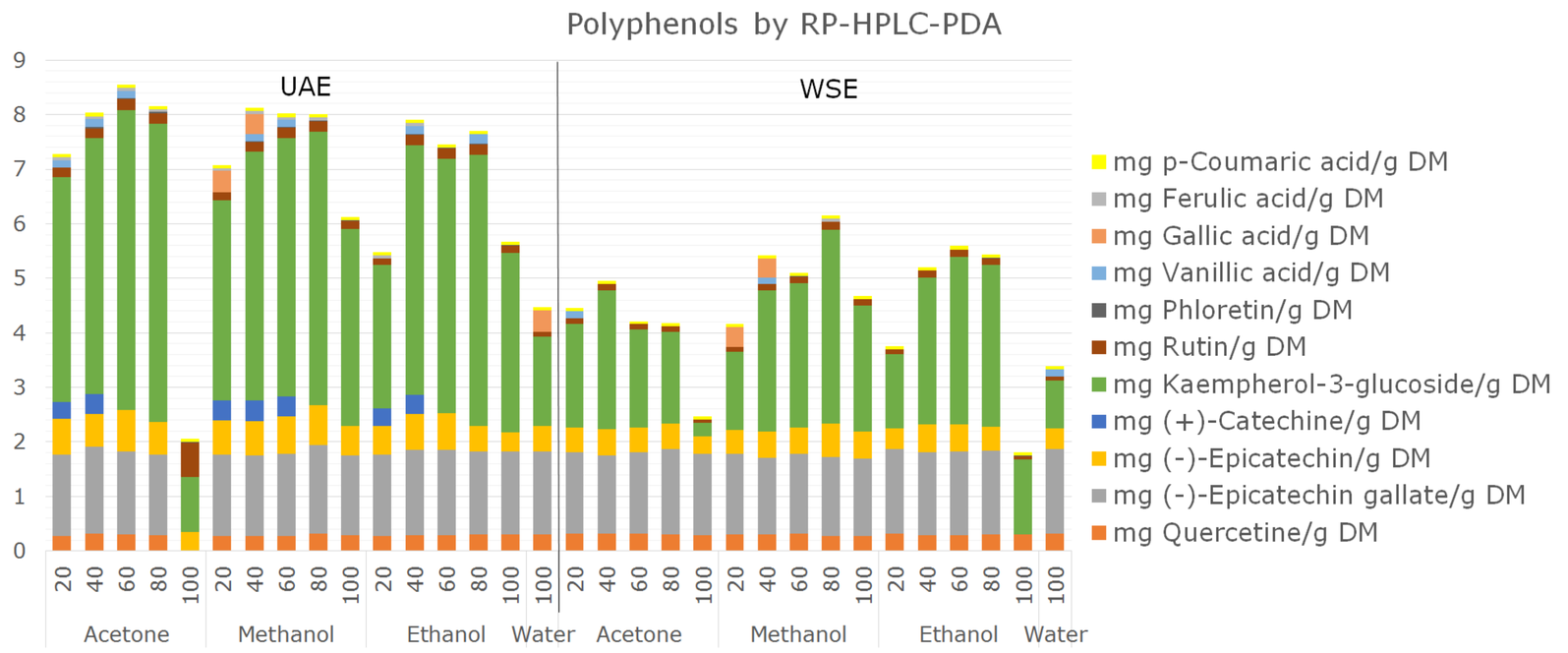
The total phenolic content was evaluated by the modified Folin Ciocalteau method [1]. The results are expressed as mg gallic acid on 1 g of dry mass of the sample (mean, n=3).



The samples extracted by warm solvent (at 60 °C) with 60 and 80 % v/v acetone contain the highest amounts of total polyphenols. Acetone is not used for MAE. The results indicate that for bark a high amount of total polyphenol content (TPC) is obtained with MAE. The TPC is lower for WSE and UAE when the wood is dried at the more economical temperature 60 °C in stead of 103 °C. The UAE always has a higher TPC than the similar WSE and than UAE.

HPLC assay of UAE and WSE extracts of core wood previously dried at 60 °C

The RP-HPLC-PDA method determines the individual polyphenols in the obtained extracts with the HPLC method described by Rubilar et al. with slight modifications [2]. Taken the moisture content of the samples into account, the results are expressed as mg/g dry matter (DM).



Conclusion

HPLC analysis of extracts obtained by MAE (not shown here) indicate that the most abundant phenolic compounds are β-resorcylic acid and naringin with a content of respectively 1.05 and 1.22 mg/g DM bark. UAE of core wood have a relative high amount of kaempherol-3-glucoside (60 % v/v acetone: 5.50 mg/g DM) and (+)-catechine (40 % v/v methanol: 0.38 mg/g DM). UAE results in more flavonoids and phenolic acids than WSE.

Partners

GRAQ Grupo de Reação e Análises Químicas — isep Instituto Superior de Engenharia do Porto — requimte
Faculteit Industriële Ingenieurswetenschappen — KU Leuven Technology Campus Ghent — Laboratory of Enzyme, Fermentation and Brewing Technology (EFBT) — Katedra Chemii Analitycznej i Ekologicznej

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