Comparative assessment of PLE and SFE for the selective extraction of compounds of interest from *Ruta graveolens*

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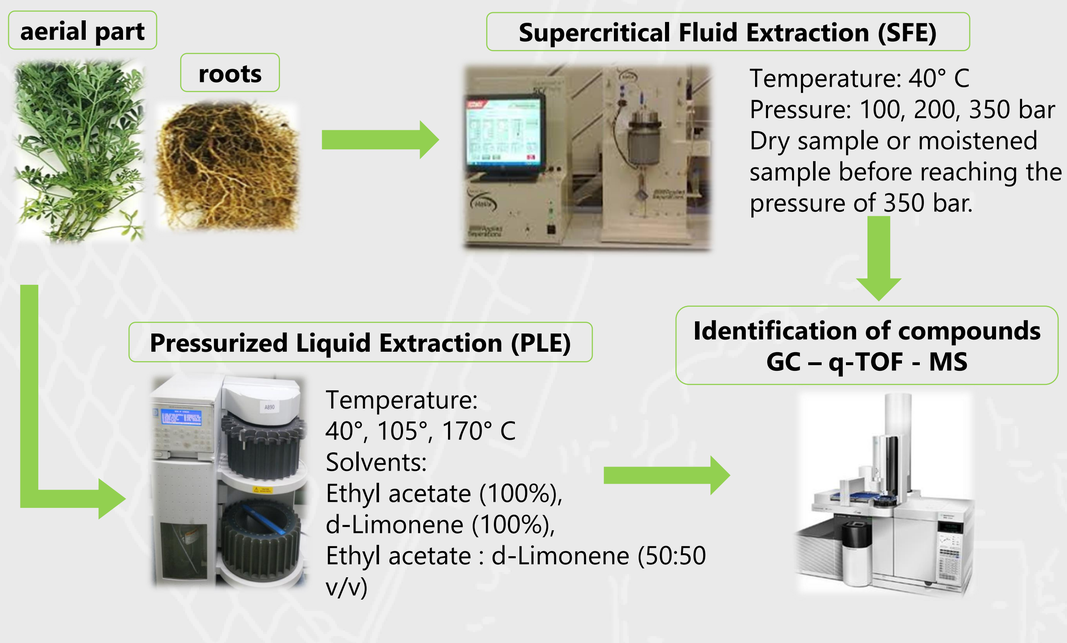
INTRODUCTION

Ruta graveolens, commonly known as rue, is an herbaceous perennial plant with bluish-green leaves that emits a powerful odor and has a bitter taste. This plant has shown different pharmacological activities and is employed in folk medicine for treatment of rheumatism, dermatitis, pain and many inflammatory diseases[1]. The main components reported in *Ruta graveolens* are quinoline, furoquinoline, acridone alkaloids, flavonoids, and coumarins, mainly furanocoumarins[2]. Although traditional extraction of these compounds is mainly done by maceration, nowadays the use of green extraction techniques provides an efficient, fast, selective and environmentally friendly alternative. In this regard, technologies based on compressed fluids play an important role, being supercritical fluid extraction (SFE) and pressurized liquid extraction (PLE) the most widely employed[3]. The aim of this work was to evaluate the ability of PLE and SFE to selectively extract families of compounds of interest from the aerial part and root of *Ruta graveolens*.

MATERIALS AND METHODS



RESULTS AND DISCUSSION

Alkaloids, terpenes and furanocoumarins were identified in all extracts, and differences in abundance and selectivity according to the compressed fluid used and the conditions tested were found. Furthermore, arborinine is an alkaloid that was only identified in the aerial part of the plant, while furanocoumarins - isopimpinellin and xanthotoxin- along with some other coumarins and amides were only identified in the root.

Concerning PLE, the alkaloids extraction in the aerial part was promoted by ethyl acetate while the extraction of terpenes improved with d-limonene and mixture ethyl acetate:d-limonene (50:50 v/v) (Fig. 1A); concerning extraction of alkaloids from the root, it was favored with all the solvents used (Fig 1B).

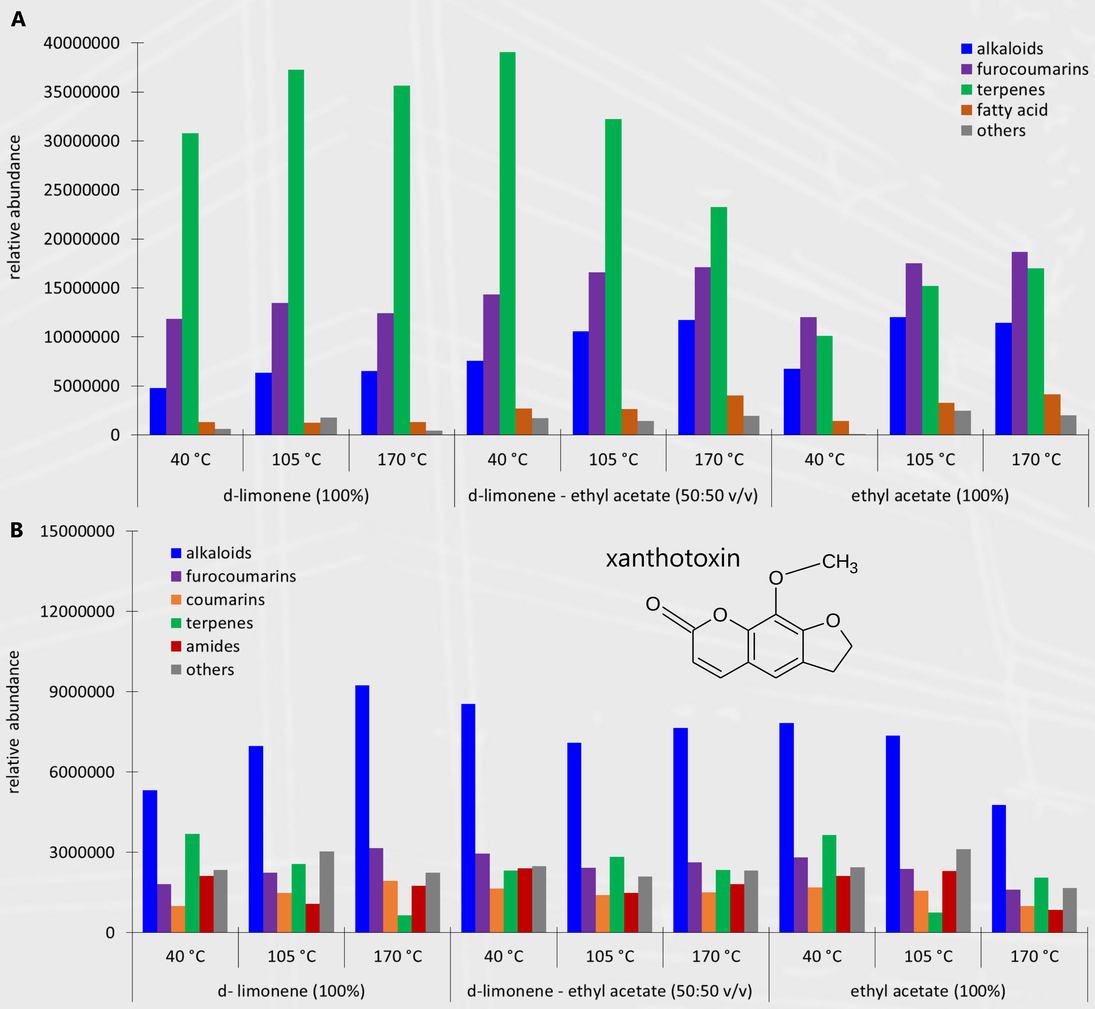


Figure 1. Relative abundance of the different families of compounds obtained from the aerial part (A) and roots (B) of *Ruta graveolens* by PLE

Regarding SFE, the extracts of aerial part a 200 bar pressure fatty acid abundance increased, and moistening the sample at 350 bar pressure facilitates the extraction and recovery of alkaloids (Fig. 2A). The extracts of roots at 100 bar pressure alkaloids were identified, but moistening the sample at 350 bar pressure facilitates the extraction and recovery of alkaloids and furocoumarins in the first 15 minutes of extraction (Fig. 2B).

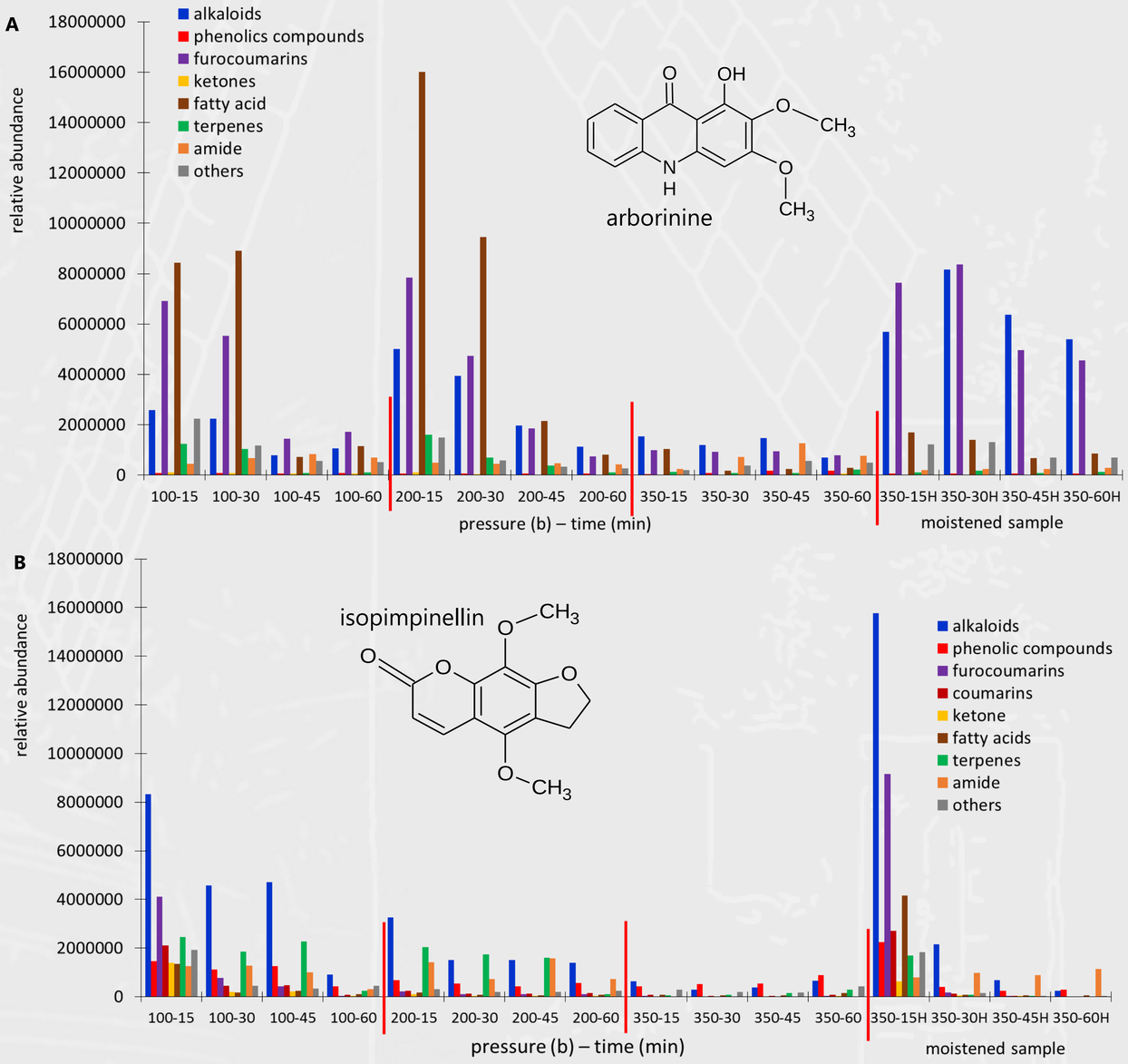


Figure 2. Relative abundance of the different families of compounds obtained from the aerial part (A) and roots (B) of *Ruta graveolens* by SFE

CONCLUSIONS

In this study, two different compressed fluid technologies, PLE and SFE, were described for the first time to extract phytochemicals from the aerial part and the roots of *Ruta graveolens* using GRAS – generally recognized as safe – solvents. Specific compounds were identified for each part of the plant and selectivity of different families of compounds could be reached under different processing conditions.

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