Polysaccharides from the infusions of *P. tridentatum*, *F. angustifolia* and *M. suaveolens*

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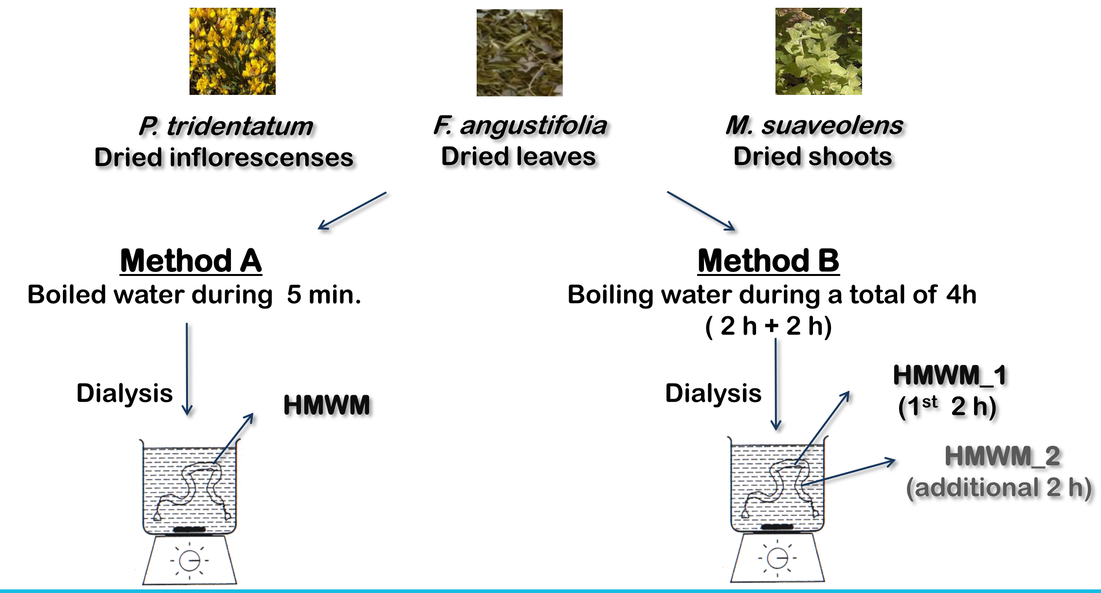
Introduction

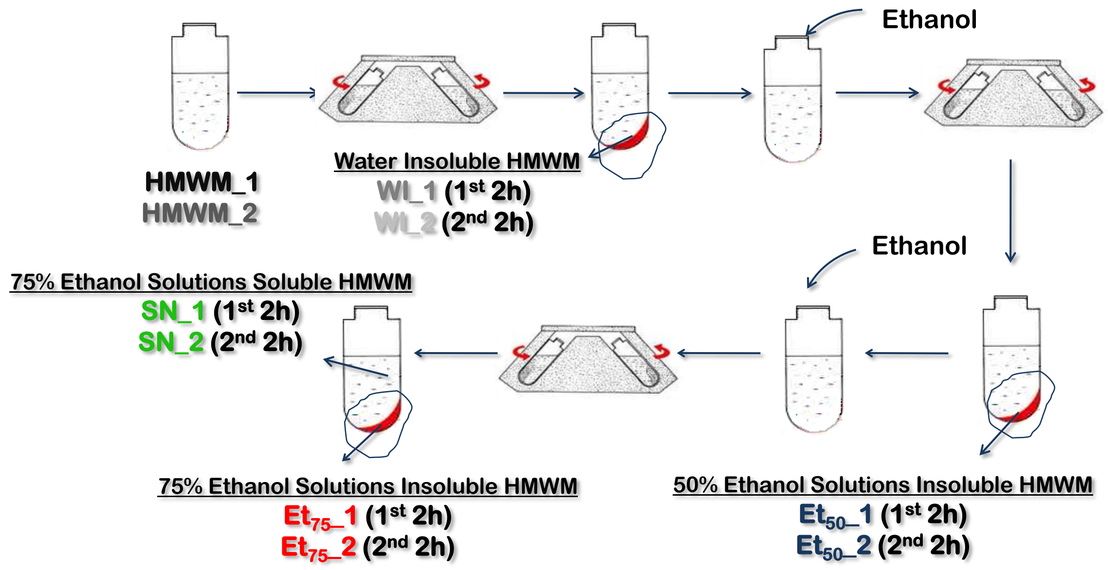
In Portugal, in Trás-os-Montes region, the small shrub (*Pterospartum tridentatum*), the narrow-leafed ash (*Fraxinus angustifolia*) and the apple mint (*Mentha suaveolens*) are plants used for medicinal purposes: the infusions of *P. tridentatum* inflorescences protect against cold, diabetes, high blood pressure, urinary tract diseases, and heart problems; the infusions of *F. angustifolia* dried leaves protect against high levels of cholesterol, blood pressure, and uric acid, and act against rheumatism; the infusions of *M. suaveolens* shoots are anti-haemorrhagic and anti-cholesterolemic [1]. Polysaccharides have been increasingly associated with some of the biological activities exhibited by plant infusions [2, 3]. However, the structures of the polysaccharides present in plant infusions and their involvement in the health benefits is still incipient. Therefore, this work provides a first approach on the structure of the polysaccharides present in the infusions of the above mentioned plants.

Methodologies

I- Preparation of the Infusions and High Molecular Weight Material (HMWM)



II- Ethanol Precipitation of the HMWM Obtained by Infusion Method B



Results

I- High molecular weight material (HMWM) and glycosidic yields

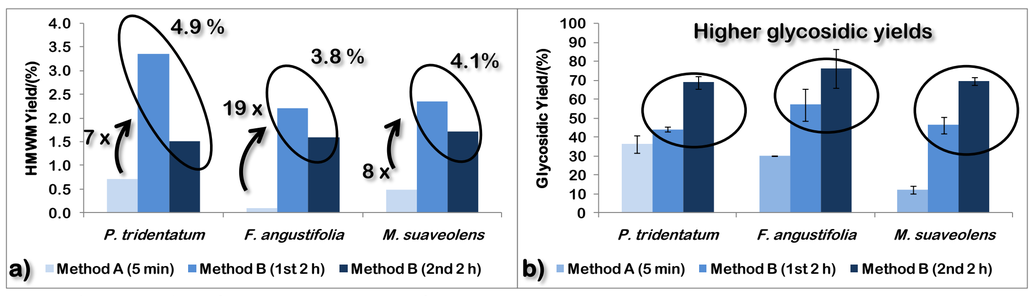


Figure 1- a) HMWM and b) glycosidic yields of the infusions.

II- Monomeric composition of the fractions obtained by ethanol precipitation of the HMWM obtained by Method B

Table I- Total sugar content and monomeric composition of the HMWM obtained by infusion Method B.

	Yield (%)	Total Sugars (mass%)	Monosaccharide Composition (mol %)						
			Rha	Ara	Xyl	Man	Gal	Glc	UA
P. Tridentatum		44.1	0.9	4.7	1.3	7.2	7.5	32.7	46.0
Et_{50}_1	43.9	91.3	0.5	3.3	1.1	1.8	6.2	6.6	80.7
Et_{75}_1	30.5	69.5	0.6	3.7	2.0	21.4	10.2	20.4	41.8
SN_1	25.6	24.7	1.0	8.9	1.4	4.0	4.3	65.9	14.7
F. Angustifolia		57.0	1.8	5.3	0.9	3.0	8.6	9.4	71.1
Et_{50}_1	48.6	81.0	2.1	3.5	1.6	0.5	3.2	3.0	86.3
Et_{75}_1	16.9	55.8	3.4	11.2	2.6	2.6	12.8	9.8	57.8
SN_1	34.5	33.0	8.4	17.0	1.2	11.0	5.3	33.9	23.3
M. Suaveolens		46.4	4.2	7.6	1.6	2.7	5.3	11.3	67.4
Et_{50}_1	39.5	97.4	1.3	3.0	0.5	0.5	3.5	2.0	89.5
Et_{75}_1	17.4	63.8	1.5	6.5	1.3	3.9	9.7	6.5	70.8
SN_1	43.1	26.2	3.2	5.0	1.5	8.5	16.9	23.6	41.5

III- Tentative structural features of the arabinan and galactan moieties present in the pectic polysaccharides "enriched" in homogalacturonan domains

P. tridentatum

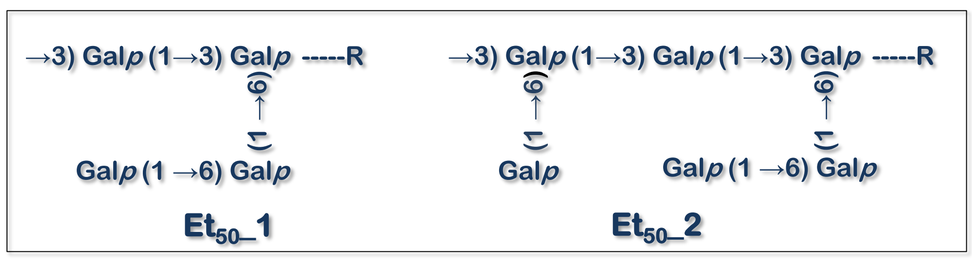
Ara*f*(1→5) Ara*f*(1→5) Ara*f*-----R Et_{50}_1 and Et_{50}_2

Gal*p* (1→6) Gal*p* (1→6) Gal*p* (1→6) Gal*p* -----R Et_{50}_1

Gal*p* (1→6) Gal*p* (1→6) Gal*p* -----R Et_{50}_2

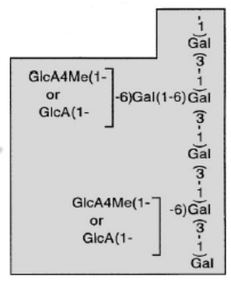
F. angustifolia

Ara*f*(1→5) Ara*f*(1→5) Ara*f*(1→5) Ara*f*-----R Et_{50}_1 and Et_{50}_2



Future Perspectives

Are the **AG-II** regions biologically active?



AG-II region reported as biologically active by Sakurai *et al.* [3]

Conclusions

- Treatment with boiling water with two steps of 2 h allowed to obtain higher yields of polysaccharides.
- The polysaccharides present were mostly pectic polysaccharides, although other types of polysaccharides could also be detected.
- These pectic polysaccharides exhibited different ethanol solubility due to their distinct uronic acid (UA) content, length and degree of ramification.
- Although additional studies need to be performed in order to fully elucidate the detailed structure of the pectic polysaccharides present and to assess their biological activity, linkage analysis suggested the presence of AG-II, which have been reported as biologically active.

- ❑ Ethanol precipitation of the HMWM´s allowed to obtain fractions enriched in glycosidic material.
- ❑ Et_{50} fractions are rich in pectic polysaccharides "enriched" in homogalacturonan domains.
- ❑ Et_{75} fractions are rich in pectic polysaccharides "enriched" in rhamnogalacturonan domains, probably with Type II arabinogalactans (AG II) attached. *P. tridentatum* also presents significant amounts of Man and Glc, suggesting the presence of other types of polysaccharides.

References

[1] Carvalho, A. M. P. "Etnobotánica del Parque Natural de Montesinho. Plantas, tradición y saber popular en un territorio del nordeste de Portugal". PhD Thesis-Universidad Autónoma de Madrid, **2005**.

[2] Inngjerdingen, K. T., Coulibaly, A., Diallo, D., Michaelsen, T. E., Paulsen, B. S. *Biomacromolecules* **2006**, 48-53.

[3] Sakurai, M. H., Kiyohara, H., Matsumoto, T., Tsumuraya, Y., Hashimoto, Y., Yamada, H. *Carbohydrate Research* **1998**, 219-229.

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