

# Phenolic compounds and antioxidant capacity of three *Thymus* species plants

Afonso A<sup>1,2</sup>, Pereira OP<sup>3</sup>, Cardoso SM<sup>2,\*</sup>

<sup>1</sup>Public Health Laboratory of Bragança, Local Health Unit, Bragança, Portugal, <sup>2</sup>QOPNA, Department of Chemistry, University of Aveiro, Aveiro, Portugal, <sup>3</sup>Department of Diagnostic and Therapeutic Technologies, School of Health Sciences, Polytechnic Institute of Bragança, Bragança, Portugal  
\*susanacardoso@ua.pt

## INTRODUCTION

*Thymus* represents an important genera from *Lamiaceae* family. These plants comprise numerous species and some of them possess many beneficial effects on health, such as antioxidant activity [1]. Whilst phenolic compounds are commonly associated to health-beneficial properties of *Thymus*, the specific phenolic composition of *Thymus herba barona*, *Thymus caespititus* and *Thymus fragrantissimus* is presently unknown [2].



Figure 1. *T. herba barona*



Figure 2. *T. caespititus*



Figure 3. *T. fragrantissimus*

**AIM:** Determination of the phenolic composition and antioxidant activity of *T. herba barona*, *T. caespititus* and *T. fragrantissimus*

## METHODS

- ✓ Extracts of the aerial parts of *Thymus* species were prepared by extraction with boiling water [3];
- ✓ Total phenolic contents were determined according to the adapted Folin-Ciocalteu method [4];
- ✓ Identification of the phenolic compounds was performed by high performance liquid chromatography (HPLC-DAD-ESI-MS<sup>n</sup>);
- ✓ Antioxidant activity of extracts was carried out by DPPH<sup>•</sup> scavenging assay and ferric reducing antioxidant power assays [3].

## REFERENCES

- [1] Pereira OR and Cardoso SM (2013) Current Analytical Chemistry, 9:382-396  
 [2] Ferreira FM et al. (2012) Ciencia y Tecnologia Alimentaria - Journal of Food 10:92-102  
 [3] Catarino MD et al. (2015) Arabian Journal of Chemistry, in press

## ACKNOWLEDGEMENTS

The authors acknowledge to the FCT/MEC for the financial support to the QOPNA research Unit (FCT UID/QUI/00062/2013) through national funds and where applicable co-financed by the FEDER, within the PT2020 Partnership Agreement.

## RESULTS

Aqueous extracts of *T. herba barona*, *T. caespititus* and *T. fragrantissimus* were enriched in rosmarinic acid (MW 360) and contained moderate amounts of other caffeic acid derivatives such as salvianolic acid K (MW 556) and 3'-O-(8''-Z-caffeoyl)rosmarinic acid (MW 538) and the flavone luteolin-7-O-glucuronide ([M-H]<sup>-</sup> at *m/z* 461→285) (Table 1). The three *Thymus* species extracts showed high antioxidant activity based on EC<sub>50</sub> values obtained in DPPH and reducing power tests (Table 2).

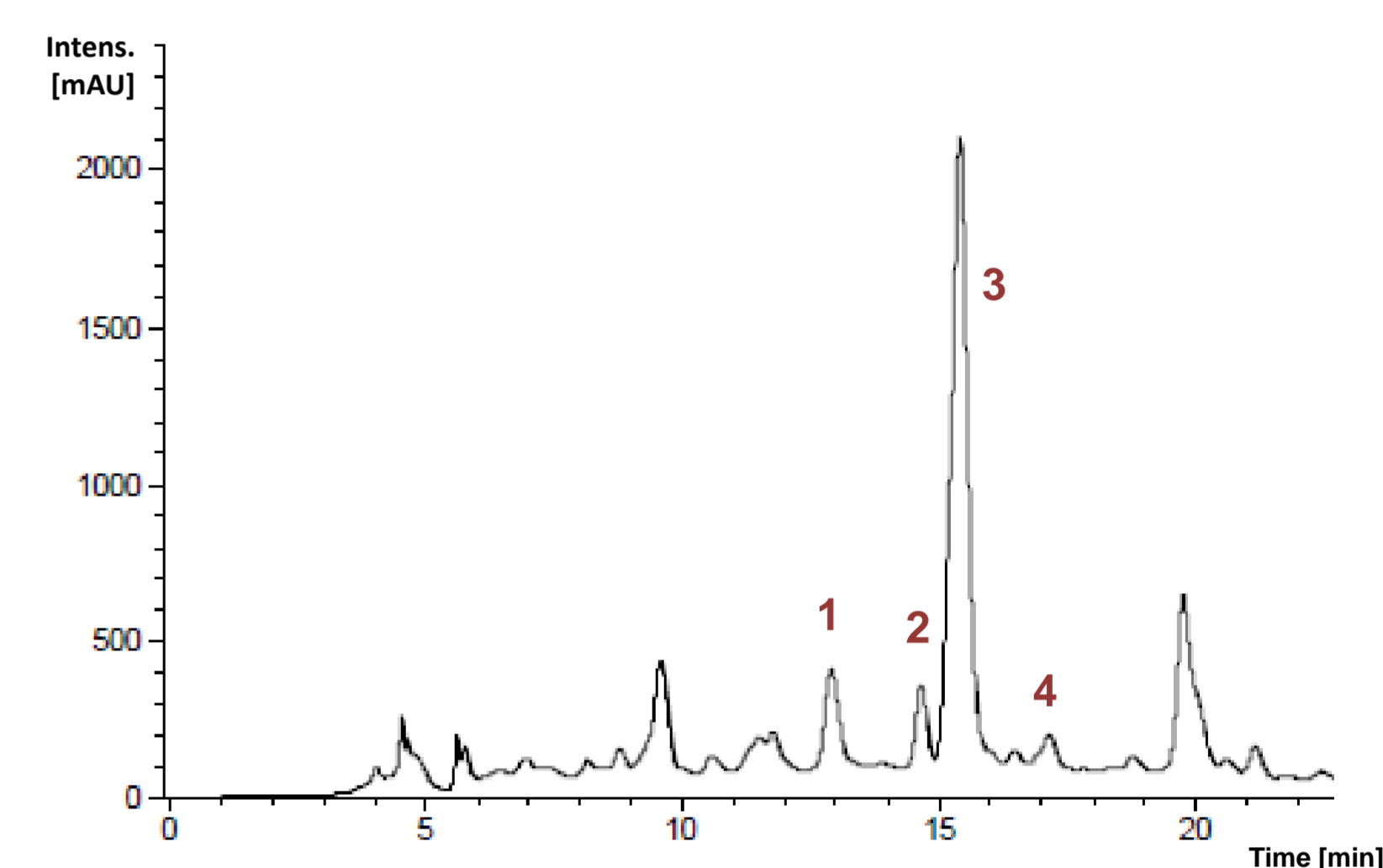


Figure 1- Chromatographic profile of *T. herba barona* species at 280 nm

Table 1- HPLC data of eluting fractions in extracts of three *Thymus* species

RT (min)	$\lambda_{max}$ (nm)	MW	Compound
<b><i>T. herba barona</i></b>			
12.9	253, 265, 345	462	Luteolin- <i>O</i> -glucuronide (1)*
14.7	285sh, 325	556	Salvianolic acid K (2)*
15.4	290, 325sh	360	Rosmarinic acid (3)*
17.2	289, 320sh	538	3'- <i>O</i> -(8''- <i>Z</i> -caffeoyl)rosmarinic acid (4)*
<b><i>T. caespititus</i></b>			
12.9	254, 265, 345	462	Luteolin- <i>O</i> -glucuronide
14.7	288sh, 322	556	Salvianolic acid K
15.5	290, 325sh	360	Rosmarinic acid
17.2	289, 328sh	538	3'- <i>O</i> -(8''- <i>Z</i> -caffeoyl)rosmarinic acid
<b><i>T. fragrantissimus</i></b>			
12.9	254, 265, 345	462	Luteolin- <i>O</i> -glucuronide
14.7	288sh, 321	556	Salvianolic acid K
15.4	290, 328sh	360	Rosmarinic acid
17.1	290, 324sh	538	3'- <i>O</i> -(8''- <i>Z</i> -caffeoyl)rosmarinic acid

\* Number in between parenthesis correspond to the fraction of the chromatogram (Fig. 1)

Table 2- Total phenolics and antioxidant activity of aqueous extracts from *T. herba barona*, *T. caespititus* and *T. fragrantissimus*

	Total phenolics (µg GAE/mg)	DPPH <sup>•</sup> IC <sub>50</sub> (µg/mL)	Reducing power test IC <sub>50</sub> (µg/mL)
<i>T. herba barona</i>	273±17	11.6±0.9	35.1±4.5
<i>T. caespititus</i>	236±27	13.8±0.6	39.3±2.7
<i>T. fragrantissimus</i>	263±27	10.9±1.2	32.4±4.3

## CONCLUSIONS

Since caffeic acid derivatives and luteolin-*O*-glucuronide are major phenolic constituents of *T. herba barona*, *T. caespititus* and *T. fragrantissimus* extract, these compounds may be partly responsible for their high antioxidant capacity.