

EuroFoodChem XV

FOOD FOR THE FUTURE

- the contribution of chemistry
to improvement of food quality

Book of Abstracts

Copenhagen, Denmark
5-8 July 2009

Ab124:**Evaluation of the in vitro antioxidant activity of three Lamiaceae often used in Portuguese folk medicine**

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Keywords: Antioxidants extraction, Lamiaceae, Lipid peroxidation inhibition, Radical scavenging capacity

Many wild plants gathered from the scrubland were preserved and used for medicinal and food purposes in the north-eastern region of Portugal. Since they are important ingredients of the folk pharmacopoeia and traditional cuisine some of these wild botanicals have been semi-domesticated and are still cultivated in homegardens and present in every homesteads. Several ethnobotanical surveys conducted in this Portuguese region have highlighted the use of three particular Lamiaceae. Ground ivy (*Glechoma hederaceae*), oregano (*Origanum vulgare* subsp. *virens*) and mastic thyme (*Thymus mastichina*) are widespread Mediterranean perennial herbs widely considered as medicinal plants, although it has also been reported some other common uses. Epidemiological and experimental studies have consistently shown an inverse association between consumption of vegetables and fruits and the risk for chronic diseases, such as cardiovascular diseases, arthritis, chronic inflammation and cancers. These physiological functions may be partly attributed to the abundance of antioxidants such as vitamin C, vitamin E, β -carotene and phenolics. This study reports the first approach to the antioxidant potential evaluation of three Lamiaceae often used in Portuguese folk medicine. The lipid peroxidation inhibition capacity of ground ivy, oregano and mastic thyme was accessed by biochemical assays used as models for the lipid peroxidation damage in β -carotene bleaching in the presence of biomembranes, namely inhibition of linoleic acid radicals and inhibition of thiobarbituric acid reactive substances (TBARS) formation in brain homogenates. The antioxidant properties were also evaluated through the reducing power determination and radical scavenging activity of 2,2-diphenyl-1-picrylhydrazyl (DPPH) radicals. Bioactive compounds such as phenolics, flavonoids and ascorbic acid were also determined. Oregano proved to have the highest radical scavenging and lipid peroxidation inhibition capacity (EC50 values lower than 0.45 mg/ml). Particularly, the very low EC50 value (0.01 mg/ml) obtained for TBARS inhibition in brain homogenates is very promising, considering that brain is highly sensitive to oxidative damage. This species also revealed the highest content in antioxidants such as phenols (0.96 mg/g) and ascorbic acid (0.17 \pm 18.18 mg/g), flavonoids (224.15 \pm 368.58 0.01 mg/g). Significantly negative linear correlations were observed between the bioactive compounds and antioxidant activity EC50 values of the three Lamiaceae.

Evaluation of the *in vitro* antioxidant activity of three Lamiaceae often used in Portuguese folk medicine



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INTRODUCTION

Many wild plants gathered from the scrubland were/are preserved and used for medicinal and food purposes in the north-eastern region of Portugal. Since they are important ingredients of the folk pharmacopoeia and traditional cuisine some of these wild botanicals have been semi-domesticated and are still cultivated in home-gardens and present in every homesteads.

Several ethnobotanical surveys conducted in this Portuguese region have highlighted the use of three particular Lamiaceae: A- ground ivy (*Glechoma hederaceae*), B- oregano (*Origanum vulgare* subsp. *virens*) and C- mastic thyme (*Thymus mastichina*). These Lamiaceae are widespread Mediterranean perennial herbs widely considered as medicinal plants, although it has also been reported some other common uses.

This study reports the first approach to the antioxidant potential evaluation of three Lamiaceae often used in Portuguese folk medicine.



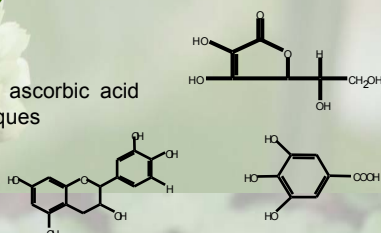
Ethnobotanical characteristics of the Lamiaceae used in the present study (Bragança, Vinhais, Miranda do Douro).

Species	Common name	Local name	Edible uses	Medicinal uses
<i>Glechoma hederaceae</i>	Ground ivy	Malvela, malbela	Condiment/spices flavouring and seasoning traditional dishes. In soup mixed with other greens	Depurative, antiseptic, digestive, carminative, emmenagogue, dysmenorrhic, restorative, panacea
<i>Origanum vulgare</i>	Oregano	Oregão, mangerico do monte	Condiment/spices flavouring and seasoning traditional dishes and sausages. Summer salads. To preserve olives	Stomachic, digestive, carminative, laxative, expectorant, cold, cough, kidney regulator
<i>Thymus mastichina</i>	Mastic thyme	Bela-luz, sal-puro, salpurro, tomilho-branco	Condiment/spices flavouring and seasoning traditional dishes and salads. To preserve olives. Used instead of salt.	Indigestion, carminative, cold, cough, throat pain, nasal congestion, panacea

METHODOLOGY

Phytochemicals analysis

- Phenolics, flavonoids and ascorbic acid by spectrophotometer techniques



Antioxidant properties

- Chemical assays: DPPH radical scavenging capacity and reducing power

-Biochemical assays: inhibition of β -carotene bleaching and inhibition of lipid peroxidation in brain tissue (TBARS assay)

RESULTS

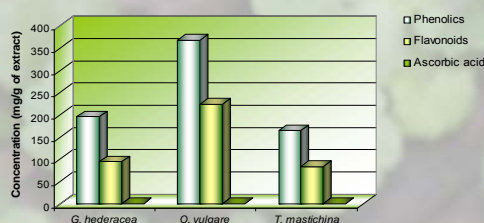


Figure 1. Bioactive compounds *Glechoma hederaceae*, *Thymus mastichina* and *Origanum vulgare*.

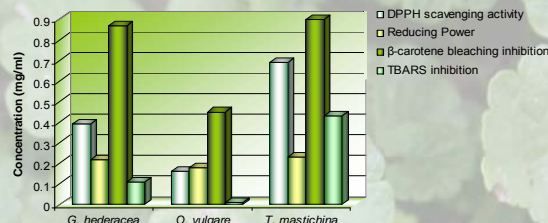


Figure 2. Antioxidant activity EC_{50} values of *Glechoma hederaceae*, *Thymus mastichina* and *Origanum vulgare*.

Phenolics, and particularly flavonoids, were the main antioxidant compounds found in the samples.

O. vulgare presented the highest values.

Origanum vulgare gave the best results in all the antioxidant activity assays (EC_{50} values ≤ 0.45 mg/ml), which is in agreement with the highest content in phenolics found in this species.

The very low EC_{50} value (0.01 mg/ml) obtained for TBARS inhibition in brain homogenates is very promising, considering that brain is highly sensitive to oxidative damage.

Significantly negative linear correlations were established between the phenolics and flavonoids content, and EC_{50} values of the antioxidant assays. This proves that the extraction methodology was adequate, being the sample with the highest bioactive compounds content the most efficient in antioxidant activity (with the lowest EC_{50} values).

Conclusion

The radical scavenging activity and lipid peroxidation inhibition capacity of these Lamiaceae from North-eastern Portugal could help in the explanation of their uses in folk medicine against several chronic diseases known to be related to the production of ROS and oxidative stress.