

# Medicinal plants and folk uses in Trás-os-Montes (Portugal). An overview of phytochemical properties and bioactive compounds potential

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## Abstract

Ethnobotanical surveys, conducted in north-eastern Portugal and based on field studies using ethnographic methodologies, have reported and documented plant knowledge and local uses of several wild species in folk medicine.

Taking advantage of a multidisciplinary team, besides botanical inventories and sociocultural and anthropological studies, we set out applied phytochemical research on locally used medicinal plants (more frequently cited, i.e. frequency of citation > 50%) that have special cultural significance.

Considering the use reports and informants' selected sites, as well as, local consumers' criteria and the optimal growth stage of each species, samples were collected for analysis with informants' permission and cooperation.

Epidemiological and experimental studies have consistently shown an inverse association between consumption of greens and fruits and the risk for chronic diseases. These physiological functions may be partly attributed to the abundance of antioxidants such as vitamin C, vitamin E,  $\beta$ -carotene and phenolics.

This presentation reports the phytochemical composition and antioxidant properties of several species often used in folk medicine of Trás-os-Montes. Chemical characterization included determination of sugars by HPLC-RI, fatty acids by GC-FID, tocopherols by HPLC-fluorescence, phenolics, flavonoids, carotenoids and ascorbic acid, by spectrophotometric techniques. Bioactivity was evaluated through screening of antioxidant properties: radical scavenging effects, reducing power, and inhibition of lipid peroxidation. Significantly negative linear correlations were observed between the bioactive compounds and antioxidant activity EC<sub>50</sub> values.

Experimental phytochemical research points to pharmacological effects that confirm the importance of the empirical use of these species and their contribution to a good health condition.

Local knowledge and practices, orally transmitted over centuries are important and useful approaches not only to chemical analysis, activity assays and standardization of phytochemical composition of medicinal species, but to researchers in phytopharmacology, phytotherapy and phytotoxicology as well.

## Bioactive Compounds and Antioxidant Activity EC<sub>50</sub> Values

Medicinal species	Bioactive compounds				Antioxidant properties (EC <sub>50</sub> values: mg/ml)			
	Phenolics (mg GAE/g)	Flavonoids (mg CE/g)	Vitamin C (µg/g dw)	Vitamin E (µg/g dw)	DPPH scavenging activity	Reducing power	$\beta$ -carotene bleaching inhibition	TBARS inhibition
<i>Castanea sativa</i> Mill. (flowers)	587.61 ± 3.91	165.45 ± 2.48	1634.80 ± 82.01	1634.21 ± 42.19	0.07 ± 0.00	0.07 ± 0.00	0.11 ± 0.01	0.03 ± 0.00
<i>Centaurea paniculata</i> (flowering stems)	35.87 ± 1.79	22.47 ± 0.29	404.51 ± 11.50	106.03 ± 6.64	3.62 ± 0.13	1.33 ± 0.02	1.25 ± 0.09	0.74 ± 0.03
<i>Crataegus monogyna</i> Jacq (flowers)	330.32 ± 1.82	103.78 ± 7.65	1007.51 ± 7.30	1598.42 ± 250.57	0.03 ± 0.00	0.02 ± 0.00	0.05 ± 0.00	0.01 ± 0.00
<i>Cytisus multiflorus</i> L.(flowers)	45.62 ± 3.29	7.86 ± 0.42	2674.78 ± 12.57	482.77 ± 9.32	2.02 ± 0.11	0.64 ± 0.02	0.35 ± 0.01	0.30 ± 0.02
<i>Filipendula ulmaria</i> (L.) Max (flowers)	227.60 ± 0.53	62.40 ± 4.83	2696.26 ± 27.02	496.67 ± 16.06	0.05 ± 0.01	0.06 ± 0.00	0.09 ± 0.01	0.05 ± 0.00
<i>Foeniculum vulgare</i> Mill. (stems)	8.61 ± 0.09	n.d	181.77 ± 0.53	2.89 ± 0.44	12.16 ± 0.94	2.82 ± 0.04	2.38 ± 0.12	0.27 ± 0.01
<i>Glechoma hederacea</i> L.	196.61 ± 6.09	95.02 ± 2.73	168.40 ± 2.20	3691.80 ± 57.12	0.39 ± 0.02	0.22 ± 0.00	0.87 ± 0.10	0.11 ± 0.01
<i>Helichrysum stoechas</i> (L.) Moench (flowers)	184.42 ± 0.35	34.75 ± 0.83	1570.71 ± 104.82	736.11 ± 38.52	0.52 ± 0.00	0.14 ± 0.01	0.25 ± 0.08	0.13 ± 0.00
<i>Malva sylvestris</i> L. (leafy flowering stems)	317.93 ± 2.61	143.40 ± 7.86	200.10 ± 4.01	349.20 ± 0.60	0.59 ± 0.08	0.10 ± 0.00	0.10 ± 0.00	0.05 ± 0.00
<i>Matricaria recutita</i> L. (flowering stems)	139.62 ± 3.02	126.82 ± 3.95	615.71 ± 8.12	73.51 ± 0.32	0.80 ± 0.05	0.21 ± 0.02	0.66 ± 0.02	0.18 ± 0.00
<i>Mantha pulegium</i> L. (flowering stems)	331.69 ± 19.63	139.85 ± 1.27	79.03 ± 1.70	897.02 ± 47.92	0.56 ± 0.05	0.12 ± 0.01	0.01 ± 0.00	0.08 ± 0.00
<i>Origanum vulgare</i> L. (inflorescences)	368.58 ± 18.18	224.15 ± 0.96	170.70 ± 5.30	126.61 ± 5.55	0.16 ± 0.03	0.18 ± 0.00	0.45 ± 0.05	0.01 ± 0.00
<i>Rosa canina</i> L. (galls)	495.89 ± 19.18	22.81 ± 1.35	1061.50 ± 22.80	55.40 ± 1.10	0.08 ± 0.00	0.06 ± 0.00	0.04 ± 0.00	0.02 ± 0.00
<i>Rosa canina</i> L. (petals)	270.28 ± 35.54	18.41 ± 1.19	721.80 ± 60.70	138.01 ± 0.03	0.22 ± 0.01	0.24 ± 0.03	0.12 ± 0.03	0.03 ± 0.00
<i>Rosa micrantha</i> Borrer ex Sm. (petals)	424.20 ± 31.77	78.46 ± 3.92	2950.80 ± 86.10	353.50 ± 6.80	0.15 ± 0.00	0.05 ± 0.01	0.04 ± 0.00	0.05 ± 0.00
<i>Rubus ulmifolius</i> L. (flower buds)	257.89 ± 3.28	172.45 ± 3.42	1728.80 ± 18.90	122.80 ± 2.10	0.12 ± 0.00	0.10 ± 0.00	0.21 ± 0.00	0.07 ± 0.00
<i>Sambucus nigra</i> L. (inflorescences)	92.73 ± 4.66	26.18 ± 0.51	1729.41 ± 4.79	324.31 ± 4.61	0.57 ± 0.03	0.27 ± 0.01	0.16 ± 0.01	0.12 ± 0.01
<i>Thymus mastichina</i> L. (inflorescences)	165.29 ± 1.11	83.85 ± 1.42	128.70 ± 2.20	41.43 ± 2.01	0.69 ± 0.04	0.23 ± 0.00	0.90 ± 0.09	0.43 ± 0.02
<i>Thymus pulegioides</i> L. (flowering stems)	210.49 ± 21.16	128.24 ± 6.00	59.52 ± 1.11	134.82 ± 9.10	0.68 ± 0.03	0.49 ± 0.03	0.03 ± 0.00	0.22 ± 0.01
<i>Trifolium angustifolium</i> L. (inflorescences)	95.61 ± 1.48	26.78 ± 3.10	1638.01 ± 24.80	1638.04 ± 24.80	0.70 ± 0.04	0.45 ± 0.01	0.91 ± 0.11	0.29 ± 0.01
Trolox	-	-	-	-	0.04 ± 0.00	0.03 ± 0.00	0.003 ± 0.00	0.004 ± 0.00

Bioactive compounds and antioxidant activity EC<sub>50</sub> values obtained using the best extraction conditions. The results are expressed as mean ± SD (n=3).

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