



Mineral composition of pollen using inductively coupled plasma atomic emission spectroscopy

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Introduction

Pollen collected by honey bees (bee pollen) is promoted as a health food supplement with a wide range of nutritional and health beneficial properties. While honey is an important source of proteins for the bee colony, pollen is the bees' main source for other important nutrients, such as minerals, fats, fibers, carbohydrates, and other substances. The composition of pollen is rather variable and depends on the botanical origin of the pollen. In this work we studied the mineral content of bee pollen of three botanical origins (*Cistus ladanifer* L., *Rubus ulmifolius* Schott, and *Calluna vulgaris* (L.) Hull) and two geographic sites in the central Portugal (Caniçal and Vale Grande).

Methods



Table 1- Wavelength and limits of quantification for the analyzed minerals.

Element	Wavelength (nm)	Limit of quantification (mg kg ⁻¹)
Cd	228,802	0,1
Cu	205,571	0,5
Cr	327,395	0,1
Fe	259,940	1
Mn	257,610	0,1
Pb	283,305	1
Zn	213,857	1

Results

Table 2- Mineral concentration (copper, iron, manganese and zinc) of bee pollen (mg/kg).

Sites	Species	Cu (mg/kg)	Fe (mg/kg)	Mn (mg/kg)	Zn (mg/kg)
Caniçal	<i>C. ladanifer</i>	7.4	40.7	8.6	63.0
	<i>R. ulmifolius</i>	12.7	80.5	203.0	47.0
	<i>C. vulgaris</i>	8.8	123.4	266.0	36.0
Vale Grande	<i>C. ladanifer</i>	7.4	39.8	9.0	46.0
	<i>R. ulmifolius</i>	13.2	83.2	197.0	48.0
	<i>C. vulgaris</i>	8.6	124.7	250.0	32.0

➤ The concentrations of micronutrients (Cu, Fe, Mn and Zn- Table 2) presented characteristic profiles which differed between the three plant species, but were similar in the two geographic areas.

➤ The main minerals observed for *R. ulmifolius* and *C. vulgaris* were Fe and Mn, and Zn for *C. ladanifer*.

Table 3- Mineral concentration (cadmium, chromium and lead) of bee pollen (mg/kg).

Sites	Species	Cd (mg/kg)	Cr (mg/kg)	Pb (mg/kg)
Caniçal	<i>C. ladanifer</i>	<0.1	2.9	<1.4
	<i>R. ulmifolius</i>	<0.1	<0.4	<1.4
	<i>C. vulgaris</i>	<0.1	<0.4	<1.4
Vale Grande	<i>C. ladanifer</i>	<0.1	2.8	<1.4
	<i>R. ulmifolius</i>	<0.1	<0.4	<1.4
	<i>C. vulgaris</i>	<0.1	0.8	<1.4

➤ Heavy metals (cadmium, chromium and lead) were present at low concentrations (Table 3), indicating that there were no sources of contamination.

Conclusions

➤ The determination of micronutrients in pollen could be suitable for the identification of botanical species.

➤ The investigation of element profile, in combination with modern statistical data evaluation techniques, can be a promising approach to identify the botanical source of pollen.

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