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EVALUATION OF THE ANTIOXIDANT POTENTIAL OF SOME VARIETIES OF HONEY

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Abstract: Honey is a natural, sweet, and aromatic product that largely depends on its floral source. These properties may be associated with honey's high osmolarity, antibacterial properties, and antioxidant capacity. Honey quality is primarily determined by its sensory, chemical, physical, and microbiological characteristics. The aim of this study was to determine the total polyphenol and flavonoid content, as well as the antioxidant activity, of ethanol extracts obtained from five types of honey sourced from Morocco. The study included five types of honey from Morocco: orange blossom, carob, jujube, cactus, and oregano. Total polyphenol content was determined using the Folin-Ciocalteu method, flavonoid content by the sodium nitrite method, and the antioxidant activity of the extracts was assessed by the DPPH IC_{50} method. The results showed a correlation between polyphenol and flavonoid content and antioxidant capacity. Additionally, the highest extract concentration needed to reach IC_{50} was observed for the jujube honey extract obtained by agitation and the orange blossom extract obtained by ultrasonication.

• Introduction

The term apitherapy was coined to describe a wide variety of therapeutic remedies derived from honey and other bee products. Honey has been used as a common remedy in human medicine around the world. Ancient and modern cultures recognize the antimicrobial properties of honey. The quality of honey is mainly determined by its sensory, chemical, physical and microbiological characteristics. Honey is a naturally sweet and aromatic product that depends largely on its floral source. These properties could be associated with honey's high osmolarity, antibacterial properties and antioxidant capacity.

Oregano honey can be produced from *Origanum vulgare*, *Origanum compactum*, but also from other species such as *Origanum majorana*, as is the case with Zaraphyt honey. The color is dark amber with pH: 4.05 and a humidity of 17%.

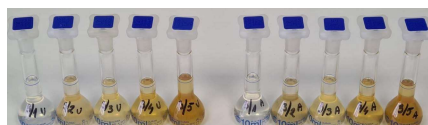
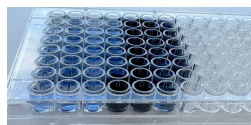
In some Mediterranean countries, such as Lebanon, Turkey and Morocco, cactus honey (*Euphorbia officinarum* subs. *Echinus*) is considered very valuable by consumers, but there are extremely few studies on this type of honey, being in fact one of the most little studied.

• Material and method

In the study, 5 varieties of honey from Morocco were used, namely: Orange, carob, jujube, cactus, oregano honey.

In order to determine the total content of polyphenols, the method described in the procedure was chosen, which consists in the use of Folin-Ciocalteu reagent 0.2 N and sodium carbonate and the use of gallic acid in different concentrations as a standard.

The total flavonoid content was determined by the sodium nitrite method and the antioxidant activity of the extracts was evaluated by the DPPH IC_{50} method.



• Results and discussions

The content of total polyphenols expressed in gallic acid equivalent for the 5 types of honey (orange, carob, Indian jujube, cactus and oregano) is shown in tables 1-2 and figure 1.

The extraction was done in 70 v ethanol, and two methods were used for the extraction, namely: extraction by shaking and extraction by ultrasonication.

Table 1.

Proba	Conținut de polifenoli totali (exprimat) în echivalent acid galic mg/g (ISO 14502-1:2005-1)				
Extracție prin agitare în etanol de 70v	Replicare 1	Replicare 2	Replicare 3	Media	SD
Extracție etanolică miere portocal	2.252	2.231	2.252	2.245	0.012
Extracție etanolică miere roșcov	4.541	4.519	4.541	4.534	0.013
Extracție etanolică miere jujubă	4.552	4.522	4.552	4.542	0.017
Extracție etanolică miere cactus	4.980	4.911	4.980	4.957	0.040
Extracție etanolică miere oregano	6.747	6.720	6.747	6.738	0.016

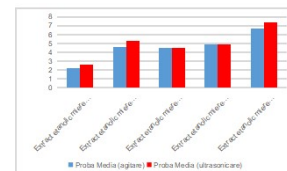


Table 2.

Proba	Conținut de polifenoli totali (exprimat) în echivalent acid galic mg/g (ISO 14502-1:2005-1)				
Extracție prin agitare în etanol de 70v	Replicare 1	Replicare 2	Replicare 3	Media	SD
Extracție etanolică miere portocal	2.685	2.654	2.685	2.675	0.018
Extracție etanolică miere roșcov	5.298	5.251	5.298	5.283	0.027
Extracție etanolică miere jujubă	4.533	4.499	4.533	4.521	0.019
Extracție etanolică miere cactus	4.952	4.917	4.952	4.940	0.020
Extracție etanolică miere oregano	7.460	7.404	7.460	7.441	0.033

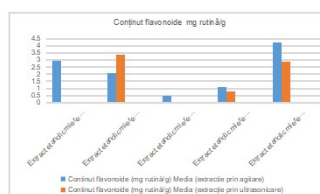


Fig.2. The dynamics of the flavonoid content in the honey varieties analyzed

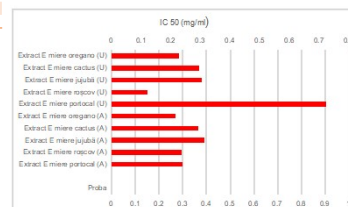


Fig. 3. Average for IC_{50} ethanolic extracts from the 5 types of honey tested (stirring and ultrasonication)

• Conclusions

Following the evaluation of five varieties of honey from Morocco regarding the content of polyphenols, flavonoids and antioxidant capacity, we found that:

- ✓ the highest amount of total polyphenols was obtained in the case of the ethanolic extract from oregano and carob honey;
- ✓ the lowest amount of total polyphenols was obtained for the ethanolic extract of orange honey;
- ✓ for the determination of total polyphenols we recommend the ultrasonic extraction method;
- ✓ the amount of flavonoids was the highest in the ethanolic extract of oregano honey;
- ✓ for the determination of flavonoids in the analyzed honey samples, the best extraction method proved to be the stirring method;
- ✓ a good antioxidant activity was presented by the ethanolic extract from carob honey followed by that obtained from oregano honey;

