

Physicochemical Characterisation and Phenolic Content of Algerian Honey Samples Collected from Different Bioclimatic Areas

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Abstract: Honey has been used for medicinal purposes for centuries and has been reintroduced in modern medical practice. The Aim of the present study was to investigate the biochemicals, physical of three different Algeria honey collected from different localities. three local Algerian honey samples have been chosen in the capital of Algeria between May 2021 and July 2021.

Physical parameters, such as pH, moisture content, electrical conductivity (EC), Total soluble solids (Brix), Total solide compounds (ppm). Total sugar and sucrose content were measured. The mean pH was 3.68 ± 0.25 , and moisture the content was $17.64 \pm 0.82\%$. The mean of Refractive index was 1.51 ± 0.031 . The mean EC was $532 \pm 66.43 \mu\text{mS/cm}$, and the mean TDS was 316.92 ± 0.92 , and the mean 5-hydroxymethylfurfural (HMF) content was $21.9 \pm 1.99\text{mg/kg}$. The highest concentration of polyphenols was determined to be $477.18 \pm 1.22 \text{mg/kg}$ for sample of Médéa confirming a key role on human health.

Keywords: Biochemicals, Honey, Physicals, HMF, Polyphenols.

1. Introduction

Honey has been used for medicinal purposes for centuries and has been reintroduced in modern medical practice. Natural products have been traditionally used in the control of various diseases, because they are a source of many active compounds that show multiple therapeutic effects, in addition to constituting models for the synthesis of a large number of pharmaceuticals [1,2].

According to a previous report [3], the chemical composition of honey is complex, containing approximately 181 substances including sugars, proteins, moisture, vitamins, minerals, 5-hydroxymethylfurfural (HMF), enzymes, flavonoids, phenolic acids and volatile compounds. The quality of honey is mainly determined by its sensorial, chemical, physical and microbiological characteristics [4,5]. Although honey is widely consumed in Algeria, there is still a lack of information on the physicochemical properties of Algerian honeys. The Aim of the present study was to investigate biochemicals, the physicochemical characteristics of three different Algeria honey collected from different localities.

2.Experimental and Methodology:

2.1. Honey Samples

Three local Algerian honey samples (N= 3), have been chosen in the capital of Algeria between May 2021 and July 2021 (Figure 1).



Fig. 1: Area Source where the samples were taken.

2.2. Physical Analysis and Determination of HMF

The pH of honey was measured using a pH meter whereby 10 g of honey at a temperature of 20 °C was dissolved in ultra-pure water. The moisture content was determined using a refractometric method. To determine electrical conductivity, a conductivity bridge was employed to analyze a 20% (w/v) distilled water–honey solution [6].

HMF concentrations were determined using an HPLC method based on the method published by the International Honey Commission (IHC) [7].

2.3. Total Polyphenols and Flavonoids Content

Total phenolic content was calculated using the light modified method of Singleton et al.,1999. The reaction was kept in the dark for 90 min, after which the absorbance was read at 725 nm using a T 60 UV/VIS spectrophotometer (PG Instruments Ltd, London, UK). The flavonoid contents were determined with some modifications of honey solutions. The absorbance was read at 415 nm, and the total flavonoid content was reported as mg of quercetin equivalent (Q.E.) per 100 g of honey [8].

2.4. Data Analysis

Results were expressed as mean value \pm SD in All statistical analyses were performed on GraphPad Prism 7 software. Statistical analysis between all samples of honey was performed after a variance analysis (ANOVA)

3. Results and Discussion

3.1. Physical Analysis

3.1.1. PH:

Honey is a natural food item produced by honey bees. Honey from different botanical source presents a great variability in chemical, physical properties. The acidic Algerian honey samples (3.47and 3.83) in our study was previously reported with Algerian honey from different bioclimatic areas of Algeria [9].

3.1.2. Moisture Content:

The limit moisture content recommended by the international quality regulation was (≤ 20) [10]. Generally, all of the investigated Algerian honey samples were of good quality, as indicated by the low moisture content (Table 1).

3.1.3. Electrical Conductivity and Total Dissolved Solids TDS

The EC values of samples were within the allowed parameters (619.66 ± 17.38) (Table 1). The present analysis is similar reported in a previous study by Homrani et al.,2020, when EC values of some Algerian honeys were reported to be 0.133 mS/cm–4.7 mS/cm. TDS is a measure of the combined content of all inorganic and organic substances in honey in the molecular, suspended forms. Our results demonstrate that there is a good correlation between EC and TDS, indicating that both parameters can be used to determine honey purity. In addition Tukey's multiple comparisons test of TDS showed a significantly different between samples of Ain Defla and Medea. The variance analysis showed a very significant difference ($p = 0.000$, $p < 0.001$) of all the physicochemical analyses tested according to the different types of honey.

3.1.4. HMF

HMF is an important parameter for the first differentiation of samples. Our result of HMF indicate that contained the value ranging from 19.97 ± 2.1 to 23.4 ± 1.01 mg/kg (Table 1). ANOVA was performed to mark no significantly differences between sample. High HMF formation may occur due to overheating, exposure to high temperatures [11] or the type of sugar present in the honey. Overall, the low HMF concentrations of the tested Algerian honey confirm that these samples are of good quality (Table1).

TABLE I : Physicochemicals properties and 5-hydroxymethylfurfural formation.

Parameters	Honey simple			
	Honey-1	Honey-2	Honey-3	Mean \pm SD
PH	3.47 ± 0.35^a	3.83 ± 0.15^a	3.76 ± 0.05^a	3.68 ± 0.25
Moisture content (%)	18.1 ± 0.26^a	18.2 ± 0.57^a	16.83 ± 0.15^b	17.64 ± 0.82
Electrical Conductivity (μ mS/cm)	484 ± 4.58^a	619.66 ± 17.38^b	492.65 ± 5.03^c	532 ± 66.43
Total dissolved compounds (ppm) TDS	233.26 ± 39.36^a	328.23 ± 52.36^a	371 ± 49.80^b	310.83 ± 73.62
HMF (mg/kg)	19.97 ± 2.12^a	22.33 ± 1.04^a	23.4 ± 1.01^a	21.9 ± 1.99

Data are expressed as means \pm standard deviation of triplicate replications. Honey-1 Ain Defla, Honey-2 Blida; Honey-3 Medea;. Significance at $p < 0.05$. Values on the same row with different letters (a, b) are significantly different.

4. Bioactives Molecules Analysis :

The highest concentration of polyphenols was determined to be 477.18 ± 1.22 mg/kg for sample 3, indicating its high antioxidant potential. In addition Flavonoid content is expressed as mg of catechin per kg of honey. The Honey sample of Médéa region contained the highest amount (78.13 ± 0.75 mg/kg) of flavonoids (Table 2). This result is similar to a previous study in which honey samples with high polyphenol concentrations also contained high flavonoid levels [4].

TABLE II : Total Polyphenols and Flavonoids Content

Samples	Total polyphenols	Flavonoides
	Mean \pm SD mggallic acid/kg	Mean \pm SD mggallic acid/kg
Honey 1 Ain Defla	388.11 ± 1.44^a	25.5 ± 0.88^b
Honey 2 Blida	433.5 ± 2.55^a	50.2 ± 0.05^a
Honey 3 Médéa	477.18 ± 1.22^a	78.13 ± 0.75^a

Data are expressed as means \pm standard deviation of triplicate replications. Honey-1 Ain Defla, Honey-2 Blida; Honey-3 Medea;. Significance at $p < 0.05$. Values on the same row with different letters (a, b) are significantly different.

5. Conclusion

Overall, samples a natural product with better quality physicochemical properties and rich of phenols compounds wich plays a key role on human health.

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7. References

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