Physiochemical Properties for Some Kinds Honey in Iraqi Markets

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Abstract

The aim of the present study was to analyses Physico-chemical properties of honey samples collected from different regions Iraq and other kinds by using different analyses tests, Moisture content, conductivity , total acidity , color density , Ash content,PH .Physicochemical properties were examined according to the AOAC methods. Eucalyptuses (1) honey was the most acidic PH 6.00, Conductivity 1507.0µS, TDS750mg/L and moisture 41.400 whereas flower honey had the lowest PH content at3.2, TDS 39.600, Citrus has lowest Total acidity 20.1400 . Trefoil was the lowest color 0.144. ANOVA method was used to study Statistical analysis.

INTRODUCTION

Honey is a natural substance produced by bees, mainly *Apismellifera*L., and is a nutritious food of economic importance worldwide [(1)]. Honey is a sweet and viscous fluid produced by honeybees from the nectar of flowers. It is important to note that honey produced by insects other than honeybees has very different properties [(2)]. Interestingly, honey has been cited in the Quran, a Holy book for Muslims (Section 16 surat68-69), in reference to its medicinal properties [(2).]

The study of the physical and chemical properties of honey has increased in recent years because these parameters are important for the certification process that determines honey quality. The objectives of this study were to characterize Iraqi honey with respect to international standards and to investigate the effects of adulteration with sugar syrup on the physical properties of honey [(2).]

Honey was used from ancient time both as a natural sweetener and a healing agent (National Honey Board, 2002). The composition and flavor of honey varies, depending mainly on the source of the nectar(s) from which it originates and to a lesser extent on certain external factors - climatic conditions and beekeeping practices in removing and extracting [(3).]

The composition and properties of a particular honey sample depend strongly on the type of flowers the bees visited, on the climatic conditions in which the plants grow and on the beekeeper's contribution[(3).]

The quality of honey is mainly determined by its sensorial, chemical, physical and microbiological characteristics. The criteria for ensuring quality honey have been specified by the EC Directive. The major criteria are moisture content, electrical conductivity, ash content, color intensity, TDS, PH [(4).]

Honey is mainly composed of a complex mixture of carbohydrates and other minor substances, such as organic acids, amino acids, proteins, minerals, and vitamins. In

almost all honey types, fructose predominates glucose being the second main sugar. These two account for nearly 85–95% of the honey carbohydrates. More complex sugars made up of two or more molecules of glucose and fructose constitute the remaining carbohydrates, except for a trace of polysaccharide. Honey also contains volatile substances which are responsible for the characteristic flavor (4).

Honeybees are bio indicators of environment and eusocial hymenopterans which are reliant on floral wealth like nectar and pollen. The amount of honey produced from the nectarines depends on the total quantity of nectar secreted and the sugar concentration of the nectar. Since times immemorial; honey and milk are considered as symbol of prosperity and sanctity. Honey besides milk, curd, sugar and ghee are essential ingredients of panchamrutha, food offerings to God and religious ceremonies.[(5)]
Honey was found to be a suitable alternative for healing wounds, burns and various skin conditions and also to have a potential role in cancer care. The intrinsic properties of honey have been reported to affect the growth and survival of microorganisms by bacteriostatic or bactericidal actions [(5).]

The medicinal properties of honey were known since ancients, it was mentioned by different cultures as Mesopotamians, Egyptians Indians as well as Europeans [(6).]

Collection of Honey Samples

Twelve honey samples were characterized through physico-chemical analysis. The samples were provided by local producers at the end of 2013and sprig in 2014 were collected and stored in clean glass bottles and sealed the Table (1) shoes sours of honey bees

Table(1)1.the sources and name of collected honey samples

Honey name	**Source**
flower	Arable
Trefoil	Babble
Seder(1)	College of Science of Women
Seder(2)	Alnajef
Eucalyptuses(1)	Alnajef
Nigella sativa	Baghdad
Mountain	Sulaymaniyah
Eucalyptuses(2)	College of Scienceof Women
Citrus	Baghdad
Eucalyptuses(3)	ALaniber
Honey Germany	Germany
American Honey	American

Reagent and materials

Reagents and material are of analytical purity grade without further purification. Distilled and deionizwater was used for all dilution steps.

2.2. Instruments

- For determination of pH in the honey W.T.W pH meter (Germany)
- Electrical conductivity and total dissolved solids were measured using an HI 98311 conductivity meter (Hanna Instruments, Mauritius).

- Determination of ash and moisture in honey bee by using mufflefurnace (Germany).
- Color intensity was measured using spectrophotometer

Physical analysis

Determination of moisture content

The moisture content was determined according to AOAC (2000). In this regard, the sample materials were taken in a flat-bottom dish (pre-weighed) and kept overnight in an oven at 100–110°C and weighed [3] these test was repeated for five times .

Determination of ash content

For determination of ash content, the method of AOAC (2000) was followed. According to the method, 10 g of each sample was weighed in a silica crucible. The crucible was heated in a muffle furnace for about 3 to 5 h at 500°C. It was cooled in desiccators and weighed. To ensure completion of ashing, it was reheated again in the furnace for half an hour more, cooled and weighed. This was repeated consequently till the weight became constant (ash became white or grayish white) [3].

Determination of pH

The method of AOAC (2000) was used for determination pH in honey bee. The pH meter was calibrated with buffers at pH 4.0,7.0 and 10 Sample solution was taken in the beaker and inserted. When the first reading was completed, the electrode was washed with distilled water and dried-up with tissue paper. Similarly, as a continue series, all other samples were determined accordingly [5] the measured was repeated for five times .

Electrical conductivity and total dissolved solids

Prepared20% (w/v) solution of honey suspended in deionizes water. The electrical conductivity and total dissolved solids of each sample were analyzed five times, and the mean values were expressed in µS/cm and ppm, respectively,the deionize water was determined to be less than 10 µS/cm[6].

Color intensity

The honey samples were diluted to 50% (w/v) with warm water (45-50 °C), sonicated for 5 minutes, and filtered to eliminate large particles. The net absorbance was defined as the difference between the spectrophotometric absorbance at 450[7].

Total acidity

The free, lactonic and total acidity were determined as follows, by the titrimetric method: the addition of 0.05 M NaOH was stopped at pH 8.50 (free acidity), immediately a volume of 10 ml 0.05 M NaOH was added and, without delay, back-titrated with 0.05 M HCl to pH 8.30 (lactonic acidity). Total acidity results were obtained by adding free and lactone acidities [8]. One way ANOVA used for Statistical analysis .

Results and discussion

The ash content of honey: The ash content is mainly determined by soil and clime characteristics. Honey normally has low ash content and it depends on the material

collected by the bees during foraging on the flora. The wide variability of honey composition is reflected also in the ash content; this parameter, used for the determination of the botanical origin (floral, mixed or honeydew) showed values between 0.176% and 0.956%. The ash content is a quality criterion for honey botanical origin; the Eucalyptuses (1) honey and Eucalyptuses (3) have lower ash content than honeydew honeys. The variability in the ash content of honeys could be due to harvesting processes, beekeeping techniques and the material collected by the bees during the foraging on the flora [(1).]

The moisture content of honey: Honey moisture content depends on the environmental conditions and the manipulation from beekeepers at the harvest period, and it can vary from year to year [(9).]The honey samples showed moisture content from 11.2 to34.4 %, which show optimum harvesting and proper degree of maturity as can been seen in Table 2. The moisture content of honey is an important factor contributing to its stability against fermentation and granulation during storage. Moisture content was affected by climate, season of the year, degree of maturity/ripeness, processing techniques, storage conditions, botanical origin of the sample and moisture content of original plant nectar [(1).]High moisture content could accelerate crystallization in certain types of honey and increase its water activity to values where certain yeasts could grow([10]). Moisture content is an important parameter of honey quality and defines the amount of water present in honey [(11).]

The pH of honey: All honey of the investigated samples were acidic (pH 3.53 - 4.03) (Table 2) and were within the limit (pH 3.3 to 6.0) that indicates freshness. Among all the honey types, Eucalyptuses (1) honey was the most acidic (pH6.0000±0.158). The pH values of honey sample Iraqi were similar to those previously reported in Indian, Algerian, Brazilian, Spanish and Turkish honeys (between pH 3.49 and 4.70) except Eucalyptuses (1).The high acidity of honey is an indication of the fermentation of sugars present in the honey into organic acid, which is responsible for two important characteristics of honey: flavor and stability against microbial spoilage [(11).]

The electrical conductivity EC is one of the important factors in the determination of the physical characteristics of honey. Some Iraqi honey and others kinds. Varies with botanical origin and conductivity values recorded ranged from 0 - 124 µs/cm American Honey to 0-1507 µs/cm in Eucalyptuses (1), where the values are within the limits (lower than 0.8 mS/cm). This parameter depends on the ash, organic acids, proteins, some complex sugars and polyols content, and varies with botanical origin. The value of electrical conductivity changes, when the amount of the plant pollen decreases .The electrical conductivity of the honey is closely related to the concentration of mineral salts, organic acids and proteins; it is a parameter that shows great variability according to the floral origin and is considered one of the best parameters for differentiating between honeys with different floral origins [(1)].

Color intensity ABS450:

Honey color depends on various factors, being their minerals content an important one. Light-colored honeys usually have low ash contents, while dark-colored honeys generally have higher ash contents. In our case, the dark color observed for most of the analyzed

honeys corresponded to high ash contents [9]. This marked difference might be a reliable evidence of the presence of pigments such as carotenoids and Maillard reaction products. This could be due to specific contaminating pigments arising from handling, processing, and storage [10].

Total dissolved soiled: The total dissolved solids (TDS) was very high in Eucalyptuses (1) honey, TDS is a measure of the combined content of all inorganic and organic substances in honey such as molecular, ionized or micro-granular (colloidal solution) suspended forms. Our results demonstrated that there is a correlation between EC and TDS, suggesting that both parameters are good indicators for honey purity [10].

Statistical analysis

Assays were performed in triplicate, and the results were expressed as mean values with standard deviations (SD).The significant differences, represented by letters, were obtained by a one-way analysis of variance (ANOVA).

Table (2) shows the results obtained for the physicochemical parameters analyzed in the twelve samples of honey.

Table 2.The physicochemical of different types of honey .

Type of honey	pH mean ±SD*	Conductivity µS mean ±SD*	TDS mg/L mean ±SD*	Color ABS450nm mean ±SD	Mousier mean ±SD*	Ash % mean ±SD*	Total acidity mean ±SD*
Flower	3.2600±0.055	233.0±8.36660	39.600±0.548	0.4720±0.012	17.740±0.183	0.312±0.0130 4	40.20±0.0837
Trefoil	3.7400±0.055	244.0±4.18330	39.600±.5774	0.1440±0.006	11.240±0.230	0.518±0.0130	44.5000±0.1000
Honey Germany	4.6000±.0000	758.0±14.83240	370.000±0.00	0.3266±0.001	38.200±0.212	0.730±0.0212	53.1200±0.1303
Seder(1)	4.3800±0.228	368.0±2.73861	183.000±2.79	0.2175±0.009	21.140±0.134	0.414±0.0167	29.6200±0.4147
Seder(2)	4.8000±0.071	336.0±8.94427	183.000±4.13	0.3886±0.001	13.840±0.055	0.246±0.0055	73.2000±0.1871
Eucalyptuses(1)	6.0000±0.158	1507.0±52.15362	750.000±17.3	0.2662±0.382	41.400±0.548	0.176±0.0055	33.2520±16.319
Nigella sativa	4.0800±0.312	212.0±2.73861	102.000±2.74	0.6312±0.001	7.900±0.0000	0.385±0.0058	39.9400±0.0894
American Honey	4.0600±0.152	124.0±5.47723	47.200±23.17	0.2844±0.001	12.638±0.008	0.204±0.0055	36.7000±0.0354
Mountain	3.9000±0.000	389.0±7.41620	186.000±5.48	0.3192±0.002	16.920±0.084	0.624±0.0089	56.1000±.10000
Eucalyptuses(2)	3.5000±0.071	182.0±8.36660	150.500±65.1	0..1745±0.031	15.140±0.134	0.794±0.0089	29.9200±0.1095
Citrus	3.6400±0.055	540.0±.00000	120.600±0.55	0.2344±0.001	21.940±0.089	0.686±0.0055	20.1400±0.1342

***average five measurements**

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