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Physicochemical study of some types of Algerian honeys

Djahida. Nabti[1,]*, Mohamed Achou[1] and Fatma Moulka Hadjira Braia[2]

[1]Laboratoiry of Applied Animal Biology, Department of Biology, Faculty of Sciences, Badji-Mokhtar University, Annaba, (Algeria)
[2]Laboratory of environmental Biomonitoring, Department of Biology, Faculty of Sciences, Badji-Mokhtar University, Annaba, (Algeria)
Corresponding Email : nabtidjahida@gmail.com

ABSTRACT

The modern bee-keeping proposes various types of honeys of floral and geographical origin, of very varied savor and aspect. It is often the only source of sugar of the most withdrawn indigenous populations of the tropical forests. Good for health, honey is also for the environment. The present manuscript is to determine its physicochemical characteristics, six types of samples were collected in various areas of the East of Algeria. These honeys are analyzed for the determination of the pH, the water content, electric conductivity, the ashes content, acidity, and the content of hydroxyl methylfurfural (HMF), the index of diastase (I.D). The results showed that there were differences of a honeys samples to the other and they which they all answer almost the international norms. The physicochemical analyzes studied is to control quality of Algerian honey who is considered an indicator of the environmental pollution.

Keywords: Honey, physicochemical parameters, quality of honey, floral origin, environment.

INTRODUCTION

Honey has characteristics sensory and physicochemical very variable due to the climatic conditions and environmental and the diversity of the origins of the plants from which they are collected [1, 2]. On the nutritional level, honey is a food of first category, high energy value and presenting certain therapeutic properties. It is an alive product which undergoes during time a certain number of modifications leading to the loss of its essential qualities. The bee-keeping in Algeria counted approximately 1,2 million colonies and 20 000 bee-keepers. The evolution of the production of honey shows a clear increase of 2002 to 2010 .l' evolution of the number of hive of the year 2002 to 2010 which passes from 200000 to 1600000 hives is approximately 3 times more thanks to different the agricultural programs. In parallel one notices an evolution of the production of safe honey into 2006, 2007 and 2009 when the quantity of honey decreased probably had with the conditions climatic and forest fires but also with the massive use of the pesticides in the agricultural mediums [3].

MATERIALS AND METHODS

Sampling

Our study related to six honey samples collected during season 2014-2015 of the East Algeria localities. Honeys are classified according to their floral origins and their sources (Table). The samples were conditioned in bottles out of glass hermetic and preserved at 4°C until the analysis. The physicochemical analyzes was carried in two laboratories of the quality control in the wilaya of El Taref and Annaba.

Physicochemical analyses of honey

Determination of humidity

The humidity is determined by the measurement of the index of refraction to 20°C using a refractometer [4].

Determination of the Ashes content
The ash content is based on the incineration from 5 to 10 G of honey in a muffle furnace with 600°. These measurements were expressed as a percentage (%)[4].

Conductivity
The measurement of the electric conductivity of each honey sample is taken using a conductmeter. The technique is based to the measure of electrical resistance to 20°C [4].

pH
The pH is measured using a pH measures gauged by solutions standards on a honey solution with 10% [4].

Determination of acidity
Free acidity is obtained by the neutralization of 25 ml of this solution with NaOH (0,05N)[4].

Hydroxy Methyl Furfural (HMF)
The quantity of hydroxyl methylfurfural (HMF) was obtained with the method of[5]. The principle is based to the measure of the absorption of the HMF to a wavelength of 284 Nm then with 336 Nm using a spectrophotometer.

Index of Diastase (I.D)
The activity diastase (amylase) depends on the floral origin of honey and the treatment that this sudden last. A heating of honey destroys these enzymes. I.D is determined by the method[6]. It uses the starch like a substrate and the activity of the diastase is expressed by the Schade units. The ID is calculated according to the formula:

ID = 300/tx; with tx: Reaction time (tx) corresponding to the absorption 235 Nm.

RESULTS

Physicochemical analyzes of honey
Tables 1; 2; 3; 4; 5; 6 present values of pH included between 4,35; 4,85, honeys of flowers generally have low values of pH varying 3,32 to 3,95, (Table 4; 6). Honeys of honeydew have buffer effect, because it has higher salt content.

Fig1.Different colors and components of honey (A; B).

Concerning the humidity, samples of analyzed honeys, the values go from 8,28% to 13,84% (Tableau1; 3; 4), which is largely in lower part of the maximum limit recommended by the Food Codex 2001 which is of 20% maximum. In fact, the bees covers cells when the water content borders the 18% and not rained of 20%.

The ash content in the analyzed samples varies from 0,11 to 0,21%. These values are similar to that found by [8] and[9] B.[10]reported that the honey of nectar is of 0,6%. Studied honeys had electric conductivities varying between 186 and 248 µs/cm. Two samples of Tréat (Annaba) and Ben Amar (El-Taref) had the lowest value compared to the other studied varieties of honey. The values of the total acidity varying from 18,89 to 33,74 méq/kg. It is noted that the values of total acidity were in the normal fork fixed by the [7] which is of 50 meq/kg,

that indicates the absence of undesirable fermentations. The spectrometric analysis of the samples of honey reveals contents of HMF which are located between 8,46 and 40,56 Mg/kg, who is conformity with the norms by the [7] which is of 60 mg/kg. The normal values of the ID of honeys varying from 9,6 to 12,7. It is noted that these values who is conformity with the norms by [7] which is > 8. On the other hand honeys of Tréat, of El Eulma have a ID of 6,6 and 7 respectively. Thus one can say that the latter were heated or badly stored.

Table 1.Physicochemical analysis of the honey of Tréat(Annaba)during the second period of collect (2014).

Parameters physicochemical of honey	Results
Humidity %	8,28%
Conductivity(µs/cm)	186
% Ashes	0,11
PH	4,35
Acidity(meq/Kg)	22,31
HMF (mg/Kg)	17,67
I.D	6,6
Aspect	Fluid

Table 2.Physicochemical analysis of the honey of Ben Amar (El Taref)during the second period of collect (2014).

Parameters physicochemical of honey	Results
Humidity %	11,13%
Conductivity(µs/cm)	192
% Ashes	0,19
PH	4,35
Acidity (meq/Kg)	33,14
HMF (mg/Kg)	36,67
I.D	10
Aspect	Fluid

Table3. Physicochemical analysis of the honey of Sidi Kaci (El Taref) during the second period of collect (2014).

Parameters physicochemical of honey	Results
Humidity %	13,84%
Conductivity(µs/cm)	233
% Ashes	0,21
PH	3,95
Acidity (meq/Kg)	18,89
HMF (mg/Kg)	10,60
I.D	12,7
Aspect	Fluid

Table4.Physicochemical analysis of the honey of Azzaba (Skikda) during the second period of collect (2014).

Parameters physicochemical of honey	Results
Humidity %	8,28%
Conductivity(µs/cm)	198
% Ashes	0,11
PH	3,72
Acidity(meq/Kg)	33,74
HMF (mg/Kg)	40,56
I.D	8,4
Aspect	Fluid

Table5.Physicochemical analysis of the honey of ElEulma (Sétif) during the second period of collect (2014).

Parameters physicochemical of honey	Results
Humidity %	11,52%
Conductivity(µs/cm)	213
% Ashes	0,14
PH	4,85
Acidity (meq/Kg)	29,0
HMF (mg/Kg)	38,50
I.D	7,0
Aspect	Fluid

Table6.Physicochemical analysis of the honey of SidiFredj (Souk Ahras) during the second period of collect (2014).

Parameters physicochemical of honey	RESULTS
Humidity %	6,19%
Conductivity (µs/cm)	248
% Ashes	0,20
PH	3,88
Acidity (meq/Kg)	19,69
HMF (mg/Kg)	8,46
I.D	9,6
Aspect	Fluid

DISCUSSION

The pH which is acid, included between 3,72 for 4,85. Our results are in conformity with those represented by [11] which announced that honeys resulting from nectar have a pH ranging between 3,5 and 4,5 on the other hand those coming from honeydews lie between 5 to 5,5.

These values are similar to those reported for other honey samples of India, Brazil, Spain and Turkey which would have a pH 3,49 and 4,70 [12]. The visual observations of an aqueous solution of anthocyan show the strong red coloring of a solution with very acid pH, coloring decrease when the pH increases towards neutrality. A neutral solution of anthocyane coldly prepared is blue but is faded quickly. These changes of colors are due to chemical balances between various forms which the anthocyane can take [13] .

The variation of humidity is due to the various conditions environmental such as: climate, the floral origin , with the water content of nectar [5;10], also the techniques of treatment and the condition of storage [14]. Our results are similar to those reported for other Algerian honey samples[8].

The values ashes were in lower part of 0,6% and these results are thus in agreement with the limit authorized by [7]. The variation of the ash content can be explained by the processes of collect, the techniques of the bee-keeping and the materials collected by the bees at the time of the search for food on the flower [15] and mainly given by the soil and the climate characteristics [16].According to the studies carried out by [8;17], the electric conductivity of Algerian honeys also meet the norms. it is in positive correlation with the content soluble salts. The content of the latter in the diluted solutions is proportional to conductivity [18] .The HMF is influenced by certain factors in particular the type of sugar, its concentration, the shelf life, the temperature and the acidity or the value of pH [5] The HMF is an excellent method to appraise the quality. It's an good indicator of degradation [19] . Our results are close to those found for by [8;17].

CONCLUSION

Honey is considered as a pure product but it is not free from polluting products, present in very small quantity, like lead and cadmium. The evaluate of these pollutants in honey is particularly interesting because it constitutes a good indicator of environmental contamination.

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