Available online at www.sciencedirect.com
SCIENCE DIRECT
Food Control 18 (2007) 52–58
FOOD CONTROL
www.elsevier.com/locate/foodcont

Physicochemical characteristics and pollen spectrum of some Algerian honeys

Salim Ouchemoukh [a], Hayette Louaileche [b,*], Paul Schweitzer [c]

[a] *Département de Biologie Physico-chimique, Faculté des Sciences de la Nature et de la Vie, Université de Bejaia, Route de Targa-Ouzemour 06000 Bejaia, Algeria*
[b] *Département des Sciences Alimentaires, Faculté des Sciences de la Nature et de la Vie, Université de Bejaia, Route de Targa-Ouzemour 06000 Bejaia, Algeria*
[c] *CETAM Lorraine, Laboratoire d'Analyses et d'Ecologie Apicole, 1B, Rue Jeanne d'Arc 57310 Guénange, France*

Received 1 September 2004; received in revised form 4 August 2005; accepted 7 August 2005

Abstract

The characterisation of Algerian honeys was carried out on the basis of the microscopic (pollen analysis) and physico-chemical properties. The samples were analysed for parameters including refractive index, moisture, density, dynamic viscosity, pH, specific rotation, electrical conductivity, ash, sugars, proteins, proline and phenolic compounds contents. The results obtained in the present study show the variability of chemical composition of the honey samples. The botanical families Myrtaceae, Apiaceae and Ericaceae are most frequently found. The most pollen types are *Eucalyptus* which is present in five samples. The samples are found to meet national and international honey specifications.

Keywords: Honey; Physico-chemical characterisation; Botanical origin; Pollen analysis

1. Introduction

Honey is produced by honeybees from nectar of plants, as well as from honeydew. This latter is a sugar-containing substance excreted by some plant-sucking insects. Honey contains at least 181 substances (Louveaux, 1985; Sato & Miyata, 2000). Chemically, honey comprises sugars (70–80%), water (10–20%) and other minor constituents such as organic acids, mineral salts, vitamins, proteins, phenolic compounds and free amino acids. The monosaccharides, fructose and glucose, are the main sugars found in honey (Jean-Prost, 1987; Nagai, Inoue, Inoue, & Suzuki, 2002; Terrab, Vega-Pérez, Diez, & Heredia, 2001). Amino acids account for 1% and proline is the major contributor with 50–80% of the total amino acids (Hermosin, Chicon, & Dolores Cabezudo, 2003).

Studies have shown that honey has both antimicrobial and antioxidant properties, useful in stimulation of wounds and burns healing and gastric ulcers treatment (Gheldof & Engeseth, 2002). The antimicrobial properties of honey is well documented (Al-Somal, Coley, Molan, & Hancock, 1994; Brady, Molan, & Harfoot, 1996; Molan, 1992).

Physical and chemical properties of different kinds of honey have been reported by many scientists (Rodriguez-Otero, Paeiro, Simal, Terradillos, & Cepeda, 1992; Cano, Felsner, Bruns, Whatanabe, & Almeida-Muradian, 2001; Persano Oddo, Piazza, Sabatini, & Accorti, 1995; Yilmaz & Yavuz, 1999).

Pollen analysis has been the traditional method to determine the floral origin of the honey, but this technique is tedious and has some limitations (Hermosin et al., 2003; Von der Ohe, 1994). Usually, honey is considered unifloral, if the pollen frequency of that plant is >45%. Some pollen grains, such as *Citrus* and members of the Lamiaceae family, are under-represented in the honey spectra, while others (*Eucalyptus*, *Castanea* and *Myosotis*) are over-represented

* Corresponding author.
E-mail address: haylouaileche@yahoo.fr (H. Louaileche).

0956-7135/$ - see front matter © 2005 Elsevier Ltd. All rights reserved.
doi:10.1016/j.foodcont.2005.08.007

(Terrab, Diez, & Heredia, 2003c). A minimum of 10% *Citrus* sp. pollen is enough to consider a honey as unifloral (Terrab, Diez, & Heredia, 2003b). Mateo and Bosch-Reig (1998) suggested the use of physico-chemical criteria such as electrical conductivity and pH analyses complemented by pollen analysis for characterisation of unifloral honeys. Electrical conductivity, specific rotation, ash content and pH are widely used for discrimination between honeydew and blossom honeys. Electrical conductivity is a good criterion of the botanical origin of honey. Blossom honeys and mixtures of blossom and honeydew honeys should have less than 0.8 mS/cm and honeydew and chestnut honeys should have more than 0.8 mS/cm. The measurement of specific rotation is currently used in Greece, Italy and UK to distinguish between blossom and honeydew honeys. Most of the honeydew honeys have positive values of specific rotation whereas nectar honeys have negative one. This is a consequence of the normal preponderance of fructose in floral honey, which shows a negative specific rotation over glucose (Bogdanov et al., 1999).

Bejaïa is among the important honey producer in Algeria, since it is suitable for apiculture. In 2003, the local production is estimated at 85 tons. Therefore, the present study was undertaken to characterise the physico-chemical properties and the botanical origin (blossom and/or honeydew honeys) of Bejaïa samples honey.

2. Materials and methods

2.1. Honey samples

Eleven samples of honeys produced in various regions of Bejaïa (Algeria) (Fig. 1) were collected from beekeepers in 2002. The samples were stored in a refrigerator in airtight plastic containers until analysis. The regions from which the samples of honey were collected are indicated in Table 1. Analyses were carried out at least in duplicate.

2.2. Pollen analysis

Pollen analysis was carried out using the methods established by the International Commission of Bee Botany described by Louveaux, Maurizio, and Vorwohl (1978).

2.3. Physico-chemical parameters

Water content (moisture) was determined by refractometry (Journal Officiel Français, 1977) using Abbe-typ refractometer (RF 490, Euromexholland).

Density and dynamic viscosity were determined according to Bogdanov et al. (1995). Density gravity was determined by dividing the weight of specific gravity bottle (10 ml) filled with honey to the weight of the same bottle,

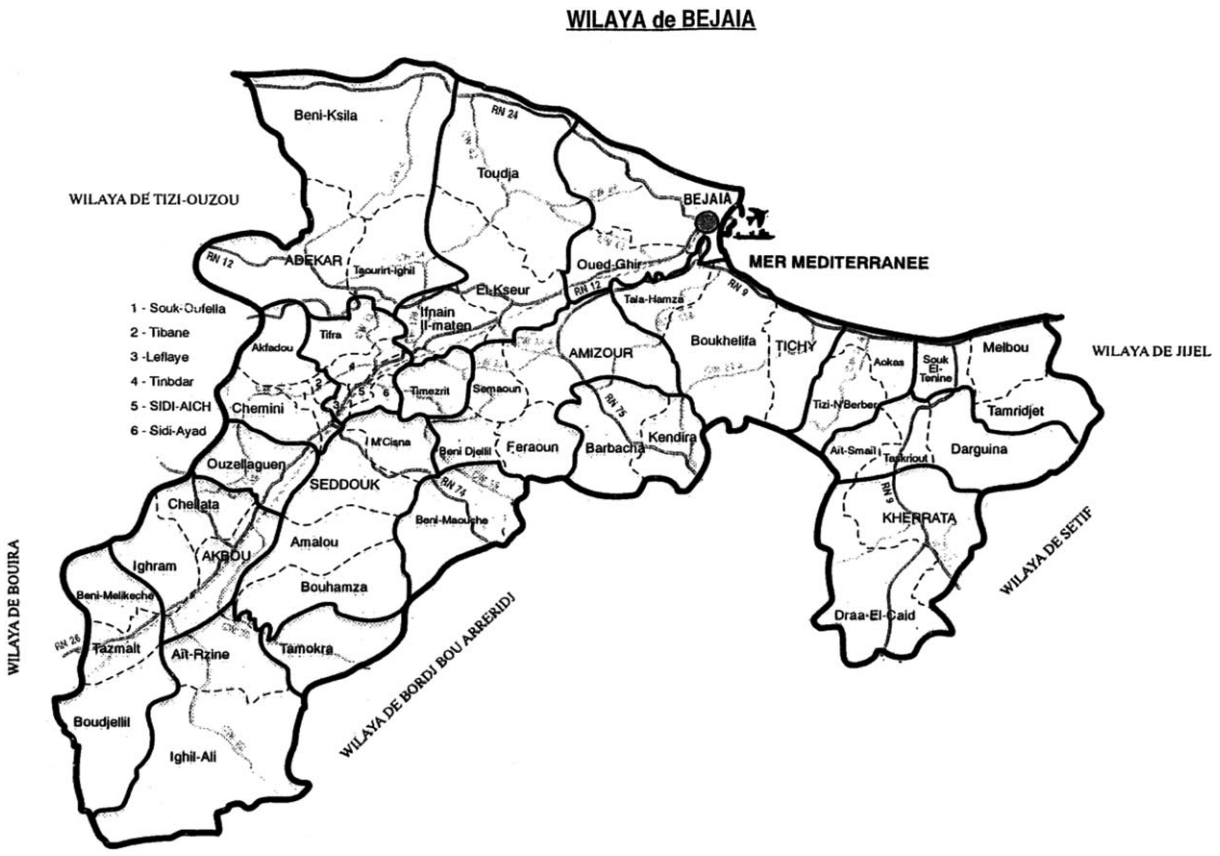

Fig. 1. Distribution of the samples in the Bejaïa region (northeast Algeria).