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Pollen spectra of honeys produced in Algeria

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The objective of this study was to evaluate the quality of 10 honey samples produced in Algeria. The samples were prepared using the methodology described by Louveaux and co-workers. Honeys were considered to be monofloral whenever the dominant pollen was found to be over 45% of total pollen. The results obtained in the present study show the variability of the honey samples. The botanical families Myrtaceae, Rutaceae and Lamiaceae are most frequently found. The identified pollen spectrum of honey confirmed their botanical origin.

Key words: Honey, Algeria, pollen spectrum, botanical origin.

INTRODUCTION

Codex Alimentarius Commission (2001) defines honey as "the natural sweet substance produced by honey bees from nectar of blossoms or from secretions of living parts of plants or excretions of plant sucking insects on the living part of plants, which honey bees collect, transform and combine with specific substances of their own, store and leave in the honey comb to ripen and mature".

Diversity of vegetation in Algeria makes possible diversification of apicultural production. Beekeeping is practiced mainly in the north of the country, where the floral diversity is ensured almost all the year (Hussein, 2001).

The botanical origin of honey is one of the most important parameters of honey quality (Tucak et al. 1998, 2000, 2004). The quality of honey depends on the multifarious plants that bees use in their nourishment. The honey obtained from different multifarious plants has different characteristics and applications, both in medicine and in food industry. Melissopalynology is an important tool in determining the floral sources upon which the bees foraged to produce honey (Ohe et al.,2004; Lieux 1975, 1977; Louveaux et al. 1970; Sawyer 1988). Each flower species has a unique pollen grain which, using proper techniques, may be studied to determine the geographical origin and major floral sources of the honey (Lieux, 1972; Jones et al., 2001).

Pollen analysis provides some important information about honey extraction and filtration, fermentation (Russmann, 1998), some kinds of adulteration (Kerkvliet et al., 1995) and hygienic aspects such as contamination with mineral dust, soot, or starch grains (Louveaux et al., 1978).

The present study was carried out to determine the critical analysis of different honey samples to identify the pollen types in honey samples of Algeria.

MATERIALS AND METHODS

Sample collection

Ten samples of honeys produced in various regions of Algerian North were collected from beekeepers in 2006. The samples were stored in a refrigerator in airtight plastic containers until analysis.

Pollen analysis

A microscopic pollen analysis of the honey samples was performed according to the method described previously (Louveaux et al., 1978) and (Ohe et al., 2004). Ten grams of honey were dissolved in

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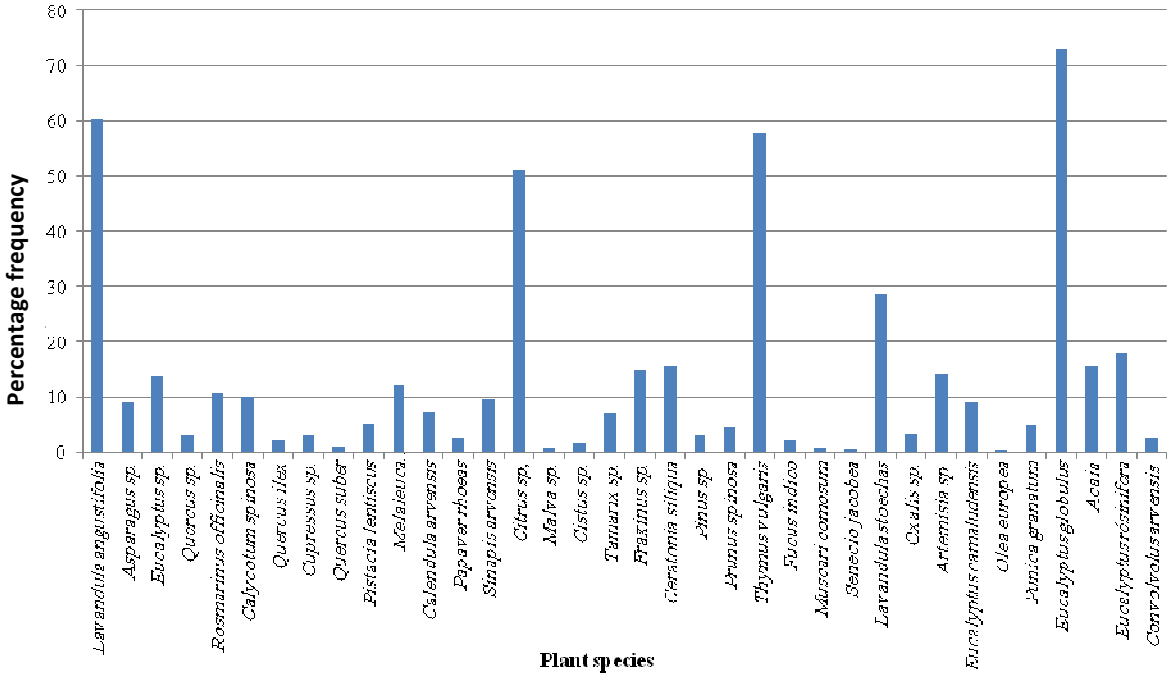

Figure 1. Pollen spectrum of Algerian honey samples honeys.

20 ml of distilled water. This mixture was divided into two centrifuge tubes of 15 ml, and centrifuged for about 5 min, at low speed. Distilled water was again added to the sediment, repeating the previous operation. Approximately 5 ml of glycerine–water 1:1 were added to the sediment, and it was left to rest for 30 min. After this time, the sample was centrifuged. The sediment was removed with aid of a stylet, embedded in glycerine jelley and deposited on a microscopic slide, sealing with paraffin wax.

For the identification of pollen types and the interpretation of pollen spectra, specific training and extensive experience are required. A collection of reference pollen slides and photographic atlas are very helpful (Sawyer, 1988; Maurizio and Louveaux, 1965; Ricciardelli, 1998).

Statistical analysis

To classify honeys, statistical method such as cluster analysis was applied. This method is frequently used to screen data for clustering of samples. The main goal of the hierarchical agglomerative cluster analysis was to spontaneously classify the data into groups of similarity (clusters), searching objects in the n-dimensional space located in the closest neighborhood and to separate a stable cluster from other clusters (Simeonov et al., 2007).

Cluster analysis was displayed in order to find similarities between the honey samples. In order to do that, Ward's hierarchical cluster method for pattern recognition was used.

RESULTS AND DISCUSSION

For the identification of pollen types and the interpretation of pollen spectra, specific training and extensive experience are required. A collection of reference pollen slides and photographic atlas are very helpful (Maurizio and Louveaux, 1965; Sawyer, 1988; Ricciardelli d'Albore, 1997, 1998).

The results of microscopical analysis of the sediment from the honeys used in this work are briefly summarized. Percentages are always referred to pollen from nectar plants.

A total of 36 pollen taxa were discovered and identified in the analyzed honey samples, from the 10 studied samples, 70% were unifloral honeys from *Eucalyptus globulus, Thymus vulgaris, Citrus* sp. and *Lavandula angustifolia,* 30% multifloral honeys with a high percentage of *Lavandula stoechas* (28,49%) (Figure 1). Predominant pollen is found in 7 samples and honey samples of Makda (S3), Hacine (S4) and Ain faress (S6) are polyfloral honeys. More than 9 pollen types are found in honey samples of Ménaouer (S1), 8 in samples of Makda (S3) and Freguig (S5) and 5 to 7 in the others (Table 1).

Quantitative analysis has shown low pollen concentrations in the studied honey samples, 5 samples belonged to the class I of representatives (under-represented honeys, with less than 20,000 pollen grains in 10 g honey, 5 to the II class (normal honeys, with 20,000 to 100,000 PG/10 g). Our results are quite in agreement with Ouchemoukh et al. (2007), these authors found in their study of 11 Algerian samples lower PG/10 g values, ranging from 20×10^3 till 40×10^3. Their samples were collected in various regions of the province Bejaia. The results of a study of Makhloufi et al. (2010) on the pollen richness of 66 Algerian honeys in which the values for the PG/10 g for the classes I, II, III and V were 33, 40.9, 22.7 and 3%, respectively.

The results of qualitative pollen analysis indicate the

Table 1. Pollen content in the honey samples (%).

Pollen taxa	Samples									
	S1	**S2**	**S3**	**S4**	**S5**	**S6**	**S7**	**S8**	**S9**	**S10**
Lavandula angustifolia					60.33					
Asparagus sp.			9.37			8.99				
Eucalyptus sp.	15			20		22.96	9.88	0.57		
Quercus sp.						3.02				
Rosmarinus officinalis						18.95			2.51	
Calycotum spinosa						10.1				
Quercus ilex					2.05					
Cupressus sp.					3.08					
Quercus suber					1.02					
Pistacia lentiscus	5.98				9.26			0.14		
Melaleuca Leucadendron	11.98			15	15			5.97		7.78
Calendula arvensis				7.02	7.5					
Papaver rhoeas				2.26	1.76					3.5
Sinapis arvensis		9		9.52			10.44			
Citrus sp,		46		45			62.5			
Malva sp.	0.43			1.19						
Cistus sp.			1.5							
Tamarix sp.			7.03							
Fraxinus sp.			14.84							
Ceratonia siliqua			15.62							
Pinus sp.		6.5	1.95					0.11		
Prunus spinosa	4.44									
Thymus vulgaris	57.91									
Fucus indico	1.98									
Muscari comosum	0.78									
Senecio jacobea	0.59									
Lavandula stoechas		21				35.98				
Oxalis sp.		3.5								
Artemisia sp.		14								
Eucalyptus camaludensis							12	6.98	12	5
Olea europea							0.18			
Punica granatum							5			
Eucalyptus globulus								86.2	52.39	80.22
Acaia									15.61	
Eucalyptus résinifera									18	
Convolvolus arvensis										2.5

diversity of resources utilized by honeybees in the region of investigation. The botanical families Myrtaceae, Rutaceae and Lamiaceae were most frequently found in the samples. Out of 66 Algerian honey analyzed by Makhloufi et al. (2007) showed that the main botanical species for honey production in Algeria are found to be *Eucalyptus* spp., Umbelliferae (above all *Pimpinella*), *Hedysarum*, Cruciferae, Compositae (mainly *Carduus*), *Trifolium* spp. and, to a lesser extent, *Echium, Rubus* and *Citrus.*

Cluster analysis is comprised of a series of multivariate methods that are used to find true groups of data orstations. In clustering, the objects are grouped such that similar objects fall into the same class.

Figure 2 shows the dendrogram that corresponds to clusters of the observations corresponding to each geographical origin of the honey samples. It was possible to distinguish two different groups. The first group is composed of honey produced in Ain fares; the second cluster clearly creates two separate subgroups; The first subgroup includes the stations: Guetna, Hacine and Bouguirat; however the most common plant species pollen in the samples of these stations was *Citrus* sp. The second includes the stations Sidi Ali, Hadjadj and Sirat, a representative of the Eucalyptus golobulus occurred in these samples.

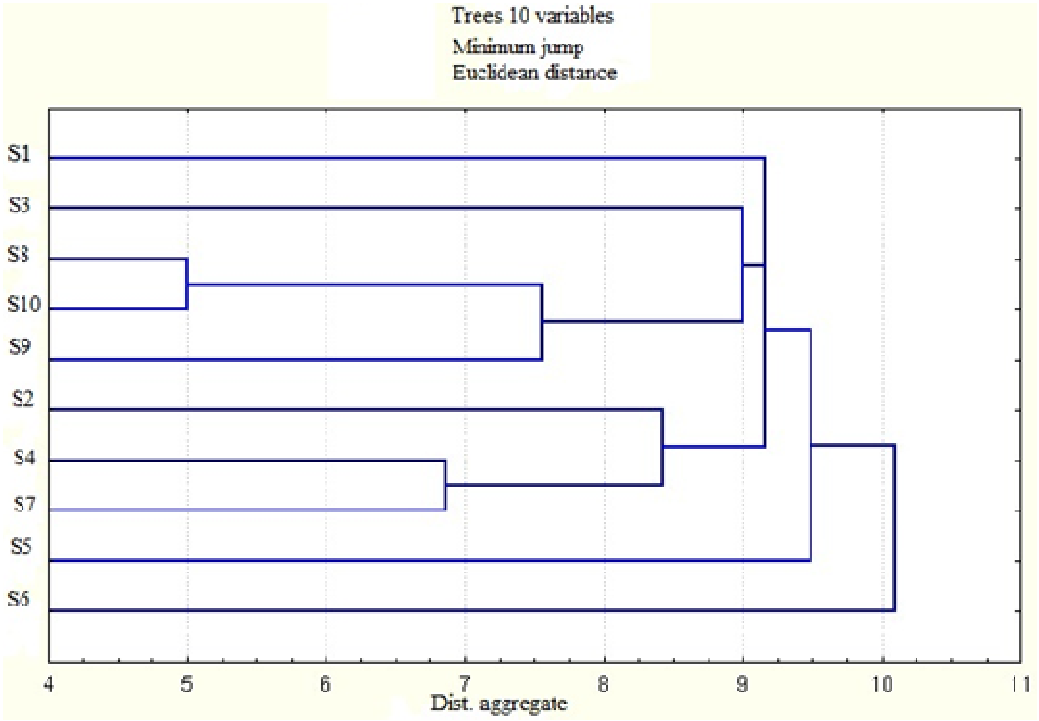

Figure 2. Dendrogram of cluster analysis.

The botanical composition of regional honey depends on the climatic conditions during the apicultural period. Based on the vegetation of each of the areas that the ten samples were obtained, it could be said that these samples were actually produced from beehives around that region because they showed pollen indicative of species indigenous and characteristic of those areas.

Conclusion

Algerian North is characterized by diversified flora which constitutes a valuable source of nectar flow for honeybees. In total, 36 pollen species were identified and the main pollen forms were Eucalyptus globulus, Thymus vulgaris, Citrus sp. and Lavandula angustifolia. Multifloral honeys comprised 30% of the honey samples.

Based on cluster analysis, two different groups of honey were observed according to different pollen types found in the samples. The identified pollen spectrum of honey confirmed their botanical origin.

REFERENCES

Codex Alimentarius Commission (2001). Codex standard 12, Revised Codex Standard

Hussein MH (2001). Beekeeping in Africa. 1- North, East, North-East and West African countries. Apiacta. 36(1-2):32-48, and 81-92.

Jones GD, Bryant B, Goodman DK, Clarke RT (2001). Alcohol dilution of honey. 9th, Inter. Palynol. Cong. Houston. 1996. pp. 453-458.

Kerkvliet JD, Shrestha M, Tuladhar K, Manandhar H (1995). Microscopic detection of adulteration of honey with cane sugar and cane sugar products, Apidologie 26:131-139.

Lieux MH (1972). A melissopalynological study of 54 Louisiana (U.S.A.) honeys. Rev. Palaebot. Palynol. 13:95-124.

Lieux MH (1975). Dominant pollen types recovered from commercial Louisiana honeys. Econ. Botany 29:78-96.

Lieux MH (1977). Secondary pollen types characteristic of Louisiana honeys. Econ. Botany 31:111-119.

Louveaux J, Maurizio A, Vorwohl G (1970). Methods of melissopalynology. Bee World. 51:125-131.

Louveaux J, Maurizio A, Vorwohl G (1978). Methods of Melissopalynology. Bee World. 59:139-153.

Makhloufi C, Kerkvliet D, Ricciardelli D'albore G, Choukri A, Samar R (2010). Characterization of Algerian honeys by palynological and physico-chemical methods. Apidologie 41:509-521.

Makhloufi C, Schweizer P, Azouzi C, Persano OL, Choukri A, Hocine L, Ricciardelli D'Albore G (2007). Some properties of Algerian honey, Apiacta 42:73-80.

Maurizio A, Louveaux J (1965). Pollens de plantes mellifères d'Europe, Union des groupements apicoles français, Paris.

Ohe von der W, Persano oddo L, Piana M, Morlot M, Martin P (2004). Harmonized methods of melissopalynology. Apidologie 35:18-25.

Ouchemoukh S, Louaileche H, Schweizer P (2007). Physicochemical characteristics and pollen spectrum of some Algerian honeys, Food Control. 18:52-58.

Ricciardelli d'Albore G (1997). Textbook of Melissopalynology, Apimondia, Bucharest. Apimondia Publishing House, 1997. 308 pp.

Ricciardelli D'Albore G (1998). Mediterranean Melissopalynology. Perugia: Institute of Agricultural Entomology, University of Perugia.

Russmann H (1998). Hefen und Glycerin in Blütenhonigen – Nachweis einer Gärung oder einer abgestoppten Gärung. Lebensmittelchemie. 52:116-117.

Sawyer R (1988). Honey identification. Cardiff Academic. Press, Cardiff. p. 350.

Simeonov V, Wolska L, Kuczynska A, Gurwin J, Tsakovski S, Protasowicki M, Namiesnik J (2007). Sediment-quality assessment by intelligent data analysis Trends in Analytical Chemistry. 26(4):323-

331.
Stawiarz E, Wroblewska A (2010). Melissopalynological analysis of multifloral honeys from the sandomierska upland aera of Poland. J. Agric. Sci. 54(1).
Tucak Z, Periškić M, Bešlo D, Tucak I (2004). Influence of the Beehive Type on the Quality of Honey. Coll Antropol. 28(1):463-467.
Tucak Z, Puškadija Z, Bešlo D, Bukvić Ž, Milanković Z (1998). Chemical organicleptic honey determination in honey-herbs in The Region Slavonia and Baranja. Sup. 30, Biotehniške fak., Univ. u Ljubljani. pp. 299-302.
Tucak Z, Tucak A, Puškadija Z, Tucak M (2000). Nutritious healing composition of some kinds of honey in Eastern Croatia. Agriculture 6(1):129-132.