

SENSORIAL CHARACTERISTICS AND COMPOSITION OF BULGARIAN'S CORIANDER (*CORIANDRUM SATIVUM L.*) HONEY

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ABSTRACT

In the study were investigated sensorial (Piana et al., 2004) and physicochemical quality parameters (Bogdanov et al., 1997) of coriander (*Coriandrum sativum L.*) honey (n=10), harvested from the local area in region of Stara Zagora, Bulgaria. From the first time were presented data for odor and aroma (fresh – refreshing/citrus fruit – aniseed/lemon), taste (sweet with high acidity), pH ($4,71 \pm 0,03$), free acidity ($35 \pm 0,5 \text{ meq.kg}^{-1}$), invertase activity ($15,9 \pm 0,04 \text{ IN}$), electrical conductivity ($0,3564 \pm 0,0004 \text{ mS.cm}^{-1}$) and specific optical rotation - (-) $14,5 \pm 0,1 []_D^{20}$. Pollen analysis, diastase activity, content of sugars, water and hydroxymethylfurfural (HMF), were also discussed.

Key words: bee honey, types, coriander (*Coriandrum sativum L.*)

1. INTRODUCTION

Coriander (*Coriandrum sativum L.*) is an annual herb in the family Apiaceae. It is also known as cilantro, particularly in the Americas. The word derives from Latin "coriandrum" in turn from Greek "κόριανδρον" ("Coriander", Oxford English Dictionary, 2nd Edition, 1989. Oxford University Press). The Mycenaean Greek form of the word, koriadnon is "similar to the name of Minos' daughter Ariadne, and it is plain how this might be corrupted later to koriannon or koriandron." (John Chadwick, The Mycenaean World (Cambridge: University Press, 1976), p. 119).

Coriandrum sativum L. is native to southern Europe and North Africa to southwestern Asia. It is a soft, hairless plant growing to 50 cm (20 in.) tall (**fig. 1 and fig.2**). The leaves are variable in shape, broadly lobed at the base of the plant, and slender and feathery higher on the flowering stems. The flowers are borne in small umbels, white or very pale pink, asymmetrical, with the petals pointing away from the centre of the umbel longer (5-6 mm) than those pointing towards it (only 1-3 mm long), (**Fig. 2**). The fruit is a globular dry schizocarp 3-5 mm diameter. *Coriandrum sativum L.* is an annual herb and, according to the climatic conditions, is cultivated as a summer or winter annual crop, with high using as spice in Asian, American and European kitchens. The color of the petals is pale pink or sometimes whites. In general the flowering and pollination biology of coriander is typical of that for umbelliferous plants (<http://en.wikipedia.org/wiki/Coriander>).

All parts from the plant could be used for medical and technical purposes, but use to use as spice in kitchen coriander leafs and seeds (**fig. 3**). The plant has a major role also in cosmetics and for technical purposes. Leafs of coriander have specific taste different from these of seeds with gently taste similar to this of lemon. Coriander has been used as a folk medicine for the relief of anxiety and insomnia in Iranian folk medicine. Coriander seeds are used in traditional Indian medicine as a diuretic by boiling equal amounts of coriander seeds and cumin seeds, then cooling and consuming the resulting liquid (<http://en.wikipedia.org/wiki/Coriander> - Dawakhana, H. 2007). In holistic and traditional medicine, it is used as a carminative and as a digestive aid (

<http://en.wikipedia.org/wiki/Coriander>"Coriander".PDRHealth.http://www.pdrhealth.com/drug_info/nmdrugprofiles/herbaldrugs/100860.shtml. Retrieved on 2007-07-18. ; "Herbs for the Prairies:Coriander".Saskatchewan Herb and Spice Association.http://paridss.usask.ca/specialcrop/commodity/herb_spice/tour/coriander.html. Retrieved on 2007-07-18). Experiments in mice support its use as an anxiolytic (<http://en.wikipedia.org/wiki/Coriander> - Emamghoreishi et al., 2005).

Coriandrum sativum L. has major role as nectarous plant for bees. In last years this plant has meddle spreading from South-East Europe - rare in Germany and in some areas in Bulgaria (Oddo et al., 2004). In Bulgaria Stojanov and Kitanov (1960) and Petkov (1973), had pointed out that *Coriandrum sativum* L. is a very good and important for the bees nectariferous plant, predominantly planted in South Bulgaria.

From recent data coriander honey could have arising role for humans and also for bee's health. In this type of honey found immunoprophylactic properties, hence it is likely to increase the efficiency of the humoral immune response. It was also proved that coriander honey could be used as antioxidant (Maghraby and Hassan, 2005). From some authors this type of honey has specific fungistatic activity against *Ascosphaera apis* and from this could have positive effect for bees health (Larran et al., 2001).

In general, all over the world a few data for quality characteristics of coriander honey have available. To this time not found detail sensorial and chemical-physical studies for Bulgarian's coriander honey. Thus, the aim of our study was to increase knowledge for sensorial characteristics and physicochemical quality parameters for Bulgarian's coriander (*Coriandrum sativum* L.), honey.

2. MATERIALS AND METHODS

Investigated samples coriander honey (n=10), were collected from apiary (50 hives), near the village Daskal Atanasovo, region of Stara Zagora, Bulgaria. Honey was harvested from the bees in period May-July 2009. Samples were identified by the beekeeper as unifloral coriander honey on the basis of organoleptic features and information of region of foraging. The samples were from bee families not treated with sugars or antibiotics. Prior to analyses samples were stored in the dark at 16–20 °C.

The water content, pH, free acidity, electrical conductivity, diastase and invertase activities, specific optical rotation and content of hydroxymethylfurfurol (HMF), were applied by the Harmonized Methods of the European Honey Commission (Bogdanov et al., 1997). The botanical origin of the samples (tab. 1) was established by their melissopalynological, organoleptic, physical and chemical characteristics (Louveaux et al., 1978; Oddo et al., 1995; Bogdanov et al., 1997; Piana et al., 2004). For sensorial characteristics of samples were used harmonized terminologies of IHC (Piana et al., 2004)

All results for physical and chemical parameters were statistically processed with the Student's t-test and were presented by mean and standard deviations (Table 1.). Analyses were performed in laboratory of "Department of. Hygiene and Technology of Animal Foodstuffs, Veterinary Legislation and Management" in Trakia University, Stara Zagora, Bulgaria.

3. RESULTS AND DISCUSSION

In the table 1 were presented data for investigated quality parameters of Bulgarian's coriander honey.

Sensorial characteristics showed that in investigated honey not found crystallization, The colour was light brown, typical for most Bulgarian's multifloral honeys (fig. 4).

**Table 1. Quality parameters of Bulgarian's
 Coriander (*Coriandrum sativum* L.), honey (n = 10; mean ± SD).**

Quality parameters	References		
	Ivanov, 1973	Atanasova and Kondova, 2004	New data, 2009
Organoleptic features	-	- rapid and very fine crystallization beige in colour; - strong delicious aroma, identified by the beekeeper as <i>Thymus</i> honey.	- without crystallization, light brown in colour (fig. 4); - odor and aroma (fresh-refreshing/citrus fruit – aniseed/lemon); - taste (sweet with high acidity)
Pollen analysis	-	- predominance of <i>Apiaceae</i> (<i>Bifora/ Coriandrum</i> type – 95 %).	- pollen grains from plant (<i>Coriandrum sativum</i> L.), (fig. 5); - pollen grains from coriander honey (fig. 6); - above 45% pollen in honey.
Water content (%)	-	15,5	14,95 ± 0,05
Reducing sugars (%)	-	77,4	-
Total sugars (%)	-	79,0	-
Sucrose (%)	-	1,5	-
pH	-	-	4,71 ± 0,03
Free acidity (meq.kg ⁻¹)	-	-	35 ± 0,5
Conductivity (mS.cm ⁻¹)	-	-	0,3564 ± 0,0004
Diastase activity (Ghote)	13,5 ± 1,2	16,8	16,75 ± 1,15
Invertase activity (IN)	-	-	15,9 ± 0,04
Specific rotation, [α] _D ²⁰	-	-	(-) 14,5 ± 0,1
Hydroxymethylfurfural (HMF), (mg.kg ⁻¹)	2,73 ± 0,6	3	2,97 ± 0,1

By sensory analysis we made conclusion that in coriander honey found a fresh odor and aroma with additional mixed characteristics (refreshing/citrus fruit – aniseed/lemon). The taste of this type of honey was sweet with detected high acidity. This could be put in touch with relatively high free acidity ($35 \pm 0,5 \text{ meq.kg}^{-1}$) and pH ($4,71 \pm 0,03$), (table1). In this reason we could point that the coriander honey showed 3,4-dimethoxybenzoic acid and 3,4-dimethoxybenzene acetic acid, 2,3-dimethoxybenzaldehyde and vanillyl alcohol (Hegazi and Abd El-Hady, 2009). Possible these substances could have additional role for determination of odor, aroma and taste of this type of honey.

Other studies for pollen analysis in Bulgarian's coriander honey were made in 2004 (Atanasova and Kondova, 2004). Samples from this study came in crystallized form from the beekeeper and were from Yambol (Toundzha Hilly Country), about 80 km from our sampling region. Rapid and very fine crystallization was characteristic from first Bulgarian's study. The honey was beige in colour, with strong delicious aroma, identified by the beekeeper as *Thymus* honey. No pollen grains of *Thymus* were identified in this sample. Pollen analysis has shown predominance of *Apiaceae* (*Bifora/ Coriandrum* type – 95 %), with the highest pollen concentration of all investigated samples (13807 pollen grains in 1 cc of honey and 13187 for the dominant pollen type). The samples for pollen analysis previously reported in Bulgaria (Atanasova and Kondova, 2004), were prepared following the method for non-acetolyzed honey described by Louveaux et al. (1978), and the Bulgarian State Standard (BSS) for Bee Honey (1990). Our data for pollen analysis were prepared by harmonized methods of melissopalynology (von der Ohe et al., 2004).

4. CONCLUSIONS

Investigated honey samples (n=10), collected in period May-July 2009 near the village Daskal Atanasovo, region of Stara Zagora (Bulgaria), with their specific sensorial characteristics and physicochemical composition belonging to the coriander (*Coriandrum sativum* L.) honey. In the study were presented from the first time a new data of Bulgarian's coriander (*Coriandrum sativum* L.), honey:

- fresh odor and aroma with additional mixed characteristics (refreshing/citrus fruit – aniseed/lemon);
- taste (sweet with high acidity);
- pH ($4,71 \pm 0,03$);
- free acidity ($35 \pm 0,5 \text{ meq.kg}^{-1}$);
- invertase activity ($15,9 \pm 0,04 \text{ IN}$);
- electrical conductivity ($0,3564 \pm 0,0004 \text{ mS.cm}^{-1}$) and
- specific rotation - (-) $14,5 \pm 0,1 []_D^{20}$.

REFERENCES

1. Atanasova, J., V. Kondova, 2004, Pollen and chemical-physical analysis of unifloral honey from different regions of Bulgaria, *Phytologia Balkanica*, 10(1): 45-50, Sofia, Bulgaria.).
2. Bogdanov, S., P. Martin, C. Lüllman, 1997. Harmonized Methods of the European Honey Commission, *Apidologie*, Elsevier/INRA/DIB/AGIB. Extra Issue, 1-59.
3. Bulgarian State Standard 2673-89. 1990. Bee Honey. Committee of Quality with the Bulgarian Council of Ministers, 7.
4. Chadwick J., *The Mycenaean World* (Cambridge: University Press, 1976, p. 119.
5. Hegazi A.G., F.K. Abd El-Hady, 2009, Influence of Honey on the Suppression of Human Low Density Lipoprotein (LDL) Peroxidation (In vitro), *Evid. Based Complement. Altern. Med.*, Vol. 6, Number 1, 113 - 121.
6. <http://en.wikipedia.org/wiki/Coriander>
7. <http://en.wikipedia.org/wiki/Coriander> - Dawakhana, H., 2007. "Coriander: Cure from the Kitchen". hashmi.com. <http://www.hashmi.com/coriander.html>. Retrieved on 2007-07-18.
8. <http://en.wikipedia.org/wiki/Coriander> - "Coriander".PDRHealth. http://www.pdrhealth.com/drug_info/nmdrugprofiles/herbaldrugs/100860.shtml. Retrieved on 2007-07-18.
9. <http://en.wikipedia.org/wiki/Coriander> - "Herbs for the Prairies:Coriander". Saskatchewan Herb and Spice Association. http://paridss.usask.ca/specialcrop/commodity/herb_spice/tour/coriander.html. Retrieved on 2007-07-18.
10. <http://en.wikipedia.org/wiki/Coriander> – Emamghoreishi, M, Khasaki, M., Aazam, M,F., 2005. "Coriandrum sativum: evaluation of its anxiolytic effect in the elevated plus-maze". *Journal of Ethnopharmacology* 96 (3): 365–370.
11. Ivanov, T. 1973. Diastase activity and 5-hidroxymethylfurfurol in bee honey. – *Zhivotnov. Nauki*, 10(5), 117-122 (in Bulgarian).
12. Karabournioti, S., Zorvalaki, P., 2001. The effect of heating on honey HMF and invertase. – *Apiacta*, 36(4), 177-181
13. Larran, S., J. A. Ringuelet, M. R. Carranza, C. P. Henning, M. S. Re, E. L. Cerimele, M. Urrutia. 2001. In vitro fungistatic effect of essential oils against *Ascosphaera apis*. *Journal of Essential Oil Research* 13 (2), 122-124.
14. Louveaux, J., Maurizio A., Vorwohl G. (1978) *Methods of Melissopalynology*, *Bee World* 59(4), 139–157.
15. Maghraby, A.S., Hassan S.A., 2005, Effect of antioxidative properties of honey on *Schistosoma mansoni*-infected mice, *Pol. J. Food Nutr. Sci.*, Vol. 14/55, Number 3, 323–326.
16. Oddo, L. P., Piazza M.G., Sabatini A.G., Accorti M., 1995. Characterization of unifloral honeys, *Apidologie* 26, 453–465.
17. Oddo, L.P., Piana L., Bogdanov, S., Bentabol, A., Gotsiou, P., Kerkvied, J., Martin, P., Morlot, M., Valbuena, A.O., Ruoff, K., von der Ohe, K., 2004, Botanical species giving unifloral honey in Europe, *Apidologie*. 35, 82–93.
18. Oxford English Dictionary, 1989. "Coriander", 2nd Edition, Oxford University Press.
19. Petkov, V. 1973. *Melliferous Plants*. Zemizdat, Sofia (in Bulgarian).
20. Piana, M. L., Persano Oddo L., Bentabol A., Bruneau E., Bogdanov S., Guyot Declerck C. 2004. Sensory analysis applied to honey: state of the art. *Apidologie* 35, Extra issue 26-37.
21. Stojanov, N., Kitanov, B., 1960. *Wilde Nutzpflanzen Bulgariens*. Bulg. Acad. Wiss., Sofia (in Bulgarian).
22. von der Ohe, W., Piana, M.L., Morlot, M., Martin, P., 2004, Harmonized methods of melissopalynology, *Apidologie*. 35, 18–25.

Fig. 1. *Coriandrum sativum* L.



Fig. 2. Flowers of *Coriandrum sativum* L.



Fig. 3. Seeds from *Coriandrum sativum* L.



Fig. 4. Jar with coriander (*Coriandrum sativum* L.), bee honey.



Fig. 5. Pollen grains from *Coriandrum sativum* L. (x 100).



Fig. 6. Pollen grains in coriander (*Coriandrum sativum* L.), bee honey (x 100).

