J. Plant Prot. and Path., Mansoura Univ., Vol. 2 (2): 189 - 194, 2011

HEAVY METALS CONTENT IN EGYPTIAN HONEYS

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ABSTRACT

Content of copper (Cu), lead (Pb) and zinc (Zn), was determined (mg/100 gm honey and p.p.m.) in 33 bee honey samples rom north, middle and south of Egypt. These samples were compared with respect to botanical and geographical origin and time of collection from 2004 to 2010 years. More (Cu) and (Pb) were found in honey samples from north of Egypt, while more (Zn), and least content of (Cu and Pb) were detected in middle of Egypt. Least content of (Zn) and medium content of (Cu and Pb) were detected in samples from south of Egypt and Rea Sea. Higher content (p.p.m.) of tested heavy metals were found in north and middle of Egypt, while minimum content was found in south. Significant differences in heavy metals content (in p.p.m.) were detected between middle Egypt from one sie and each of north and south of Egypt from the another side. In general, more (Zn) was detected in samples, followed by (Cu), and (Pb). In citrus honey maximum content (mg/100 gm honey) of (Pb) and minimum content of (Zn) were observed. In eucalyptus honey, maximum content of (Cu) was detected, while maximum content of (Zn) was found in sesame honey. Minimum content of (Cu and Pb) were determined in medicinal and aromatic plants honey. Minimum content (mg/100 gm) of (Cu), or 0.119 mg and (Pb), or 0.009 mg were detected in honey collected during 2004, while maximum content, or 0.338 mg and 0.0256 mg, respectively were found in 2010 honeys. Higher content of (Zn) was noticed in 2005 honeys, then decreased, and afterwards increased from 2008 to 2010, however no significant differences were noticed between years or honey types, with respect to heavy metals content. Relation between heavy metals content in Egyptian honey and environmental pollution was discussed, and is of special merits.

INTRODUCTION

Contamination of honey bees and hive with heavy metals: Svoboda, 1961; Crane, 1984; Jones, 1984; Zalawiski *et al.*, 1989; Colombo *et al.*, 1990; Rowarth, 1990; Raes *et al.*, 1992; Traterjak *et al.*, 1994; Barbattini *et al.*, 1994; Leita *et al.*, 1996; Hattoum and Nechev, 1996; Franco *et al.*, 1997; 1998;; Uren *et al.*, 1997; Vinas *et al.*, 1997; Nour, 1998; Caroli *et al.*, 1999; Fakhimzadeh and Lodenius, 1999; Porrini *et al.*, 2000; Belechovesk and Vorlov, 2001; Hussein *et al.*, 2010 and Hussein (2010).

This work aimed to study the content of three heavy metals in Egyptian honeys from different regions, in order to know if we have "Organic honey" in Egypt, or not?.

MATERIALS AND METHODS

Thirty three bee honey samples which collected from 2004 to 2010 years from different localities in north, middle, south of Egypt and Red Sea Region, were analyzed for the presence of three heavy metals: copper (Cu), lead (Pb), and zinc (Zn). Bee honey samples from north of Egypt were

obtained from Prof. Dr. M.E. Nour, Cairo University, and a sample of Red Sea Region from Dr. K. Mohana, South Valley University.

Chemical analysis was conducted in Elements Laboratory, Campus of Research laboratories, FARP, Faculty of Agriculture, Cairo University. Digestion of honey samples from different geographical and botanical origin, was conducted using Advanced Microwave Digestion System-ETHOS1. Measuring of heavy metals content (mg/100 gm honey and in p.p.m.) was carried out on ICP Spectrometer (ICAP 6000 Series, Thermo Scientific).

Relation was studied between tested heavy metals, Cu, Pb, and Zn, from one side and each of: locality of geographical origin, botanical origin or honey type and year of honey harvesting, from the another side.

RESULTS AND DISCUSSION

Relation between locality of honey production or geographical origin and content of tested heavy metals is summarized in (Table 1).

In all tested honey samples from different localities in north, middle and south of Egypt, and Red Sea region, maximum content of copper (Cu), or 0.492 mg/100 gm honey, was found in sample No. 2 (clover honey, Fac. of Agric., Cairo Univ.), while maximum record of lead (Pb), or 0.074 mg, and zinc (Zn), or 2.050 mg/100 gm honey, was noticed in sample No. 22 (citrus honey, desert road, Alexandria), and sample No. 19 (sesame honey from Suez region), respectively. Higher content of tested heavy metals, was observed with (Zn), in another three samples (No. 3, 26, and 32).

Minimum content of (Cu), or 0.025 mg, and of (Pb), or 0.004 mg/100 gm honey, was detected in sample No. 13 (medicinal and aromatic plants honey, from Assiut). Minimum content of (Pb), was also noticed in sample No. 18 (clover honey from Gharbia), while minimum record of (Zn) was observed in sample No. 11 (citrus honey from Kalubia). This minimum content of (Zn), or 0.284 mg, was higher than minimum content of other tested trace elements (Cu or Pb).

Taking mean of tested heavy metals content of north, middle and south of Egypt, in consideration, maximum mean content of (Cu), or 0.3049 mg/100 gm honey, and of (Pb), or 0.0254 mg was found in north of Egypt, while for (Zn), or 0.8335 mg, it was detected in middle of Egypt. Minimum mean content of (Cu) or (Pb), was found in middle of Egypt, while for (Zn) it was detected in south of Egypt. In general more content of (Zn) was noticed, followed by Cu and Pb. It is possible to conclude that less contamination of honey with trace elements (in p.p.m.) was found in south of Egypt. Significant differences were noticed between heavy metals content (in p.p.m.) between samples from middle Egypt from one side, and each of north and south of Egypt (Table 1).

Relation between honey types, or botanical origin of honey and mean heavy metals content, is summarized in (Table 2).

Maximum mean of: (Cu), or 0.468 mg/100 gm honey; (Pb) or 0.040 mg; and (Zn), or 1.357 mg/100 gm honey, was detected in eucalyptus, citrus and sesame honeys, respectively.

Table 1: Relation between honey production localities in Egypt and content of tested heavy metals.

	In (mg/100 gm)			In (p.p.m.)		
	Cu	Pb	Zn	Cu	Pb	Zn
North	0.3049±0.075107	0.0254±0.017885	0.6904±0.294381	0.01646±0.004027	0.00136±0.000937	0.0386±0.025876
Middle	0.2453±0.090765	0.0145±0.011930	0.8335±0.334928	0.0166±0.002467	0.0037±0.0031005	0.05838±0.028323
South	0.2925±0.106847	0.0181±0.016747	0.6483±0.247676	0.01545±0.003667	0.00096±0.0008107	0.03798±0.018297
Mean	0.2932	0.0214	0.6924	0.0161	0.00150	0.0407

Table 2: Relation between honeys type and their content of heavy metals.

Type of honey	In (mg/100 gm)			In (p.p.m.)		
	Cu	Pb	Zn	Cu	Pb	Zn
1- Clover	0.3182±0.091621	0.0207±0.021	0.7362±0.21494	0.0167±0.26757	0.00136±0.0011907	0.0421±0.023480
2- Citrus	0.2987±0.036350	0.040±0.029597	0.330±0.050478	0.0149±0.0018175	0.0020±0.0014799	0.0165±0.002523
3- Cotton	0.2533±0.0511599	0.0213±0.019732	0.564±0.145712	0.0127±0.002558	0.0011±0.0009866	0.0282±0.0072856
4- Eucalyptus	0.351±0.025219	0.0185±0.0136992	0.671±0.4026264	0.01755±0.001261	0.00093±0.000685	0.03355±0.0201313
5- Sugar beet	0.264±	0.026±	0.427±	0.0264±	0.0026±	0.0427±
6- Acacia	0.302±	0.022±	0.920±	0.0151±	0.0011±	0.0460±
7- Mangroves	0.316±	0.014±	0.534±	0.0158±	0.0007±	0.0267±
8- Med. Plants	0.1743±0.13388	0.0125±0.0131022	0.5938±0.293794	0.01435±0.006305	0.00298±0.0036096	0.0544±0.03495493
9- Sunflower	0.2075±0.125158	0.0195±0.014849	0.805±0.156978	0.01355±0.002051	0.0012±0.000424	0.05775±0.0168999
10- Sesame	0.336±0.019799	0.023±0.0127279	1.357±0.98005	0.0168±0.0009899	0.00115±0.0006364	0.06735±0.0497096
11- Multiflora	0.3533±0.003059	0.022±0.005292	0.7593±0.355581	0.01767±0.0001528	0.0011±0.000265	0.03797±0.0177790

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Minimum mean of (Cu), or 0.1743 mg; and (Pb) or 0.0125 mg/100 gm honey was determined in medicinal and aromatic plants honey, while minimum mean of (Zn) content was found in citrus honey. This reflects the merits of honeys of medicinal and aromatic plants in Egypt. Also, less contamination with tested trace elements (in p.p.m.) was noticed in mangroves honey from Red Sea region.

Relation between years of honey production and heavy metals content in honey is summarized in (Table 3).

Minimum mean content of (Cu), or 0.119 mg, and (Pb), or 0.009 mg was detected in 2004-honey, while maximum mean or 0.338 mg and 0.0256 mg, respectively, was recorded in 2010-honey samples. This reflects more environmental pollution from 2004 to 2010, in Egypt.

Maximum mean content of (Zn) was noticed in 2005-honey, then decreased in 2007-honey, and afterwards gradually increased till 2010 year.

No significant differences were noticed in heavy metals content from different honey types of years of honey production.

During this work, heavy metals (Cu, Pb, Zn) were found in all Egyptian honey samples. Thus it is possible to say that no organic honey is found in Egypt.

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محتوي العناصر الثقيلة في الأعسال المصرية

مصطفي حسن حسين[1]، صلاح حفني راتب[1] ، أحمد سالمان[2] وأشرف أبوزيد[2]
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تم تقدير محتوي ثلاثة من العناصر الثقيلة (مجم/١٠٠ جم عسل وبالجزء في المليون) وذلك في ٣٣ عينة عسل نحل من شمال ووسط وجنوب مصر ومنطقة البحر الأحمر. تمت مقارنة هذه العينات من الناحية الجغرافية والنباتية وكذلك سنة الحصول علي عينات العسل من ٢٠٠٤م وحتي ٢٠١٠م. لوحظت أكبر كميات من النحاس أو الرصاص في عينات العسل من شمال مصر، بينما كانت أكبر كمية من الزنك وأقل كمية من النحاس أو الرصاص في عينات العسل من وسط مصر. كانت أقل كمية من الزنك وكمية متوسطة من النحاس أو الرصاص موجود في أعسال جنوب مصر ومنطقة البحر الأحمر. لوحظت أكبر كميات (بالجزء في المليون) من العناصر الثقيلة موضع الدراسة في أعسال شمال ووسط مصر ، بينما كانت أقل كميات منها في أعسال جنوب مصر. لوحظت فروق معنوية في محتوي العناصر الثقيلة (بالجزء في المليون) بين مصر الوسطي وكل من شمال أو جنوب مصر. عموماً ، كان محتوي الزنك في الأعسال هو الأعلي ويليه النحاس ثم الرصاص. لوحظ في عسل الموالح أعلي متحتوي من الرصاص وأقل محتوي من الزنك ، وكان أعلي محتوي للنحاس في عسل الكافور وللزنك في عسل السمسم ، بينما كان أقل محتوي من النحاس أو الرصاص في عسل النباتات الطبية والعطرية. كان أقل محتوي من النحاس (٠.١١٩ مجم/١٠٠ جم عسل) ومن الرصاص (٠.٠٠٩ مج/١٠٠ جم عسل) في العسل المفروز عام ٢٠٠٤م ، بينما كان أعلي محتوي لهما في عسل عام ٢٠١٠م . لوحظت أكبر كمية من الزنك في عسل عام ٢٠٠٥م ، ثم نقصت في العام التالي وزادت تدريجياً مرة أخري وحتي عام ٢٠١٠م. لم تتم ملاحظة فروق معنوية بين السنين أو أنواع العسل من ناحية محتوي المواد الثقيلة موضع الدراسة. نوقشت العلاقة بين محتوي العناصر الثقيلة موضع الدراسة وموضوع تلوث البيئة في مصر والذي يحظي بأهمية كبري.

قام بتحكيم البحث

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