Determination of Cadmium and Arsenic pollution by Bee Honey Based on the study on Ja'far abad area from Saveh city from IRAN

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Abstract: The elemental content of bee honey depends on the geo-botany, biogeochemistry and environmental parameters of the respective area. Content of some heavy metals specially Arsenic, Cadmium and Lead were analyzed in some samples of natural honey from Ja'far Abad area from Saveh city, IRAN by ICP-OES method. The mean values for those toxic elements were (in μg g-1): Cd: 0.0271 and As:4.28 that were more than amount of normal bee honey. The results compared with the ICP-OES and AAS analyzes from Turkey, Pakistan and Argentine and showed the Cadmium and Arsenic geochemical pollution of that region as a result of low distance to polluted area.

Key words: Bee honey, Cadmium, Arsenic, Lead, Geo-botany, heavy metal, Pollution, ICP

1 Introduction

Honey is a natural sweet substance and widely used food that is popular all over the world. It is produced by honeybees from the nectar of blossoms, from secretion of living parts of plants. Honey is composed mainly from carbohydrates, lesser amounts of water and a great number of minor components.

Honeybees collect this material transform and combine it with specific substances of their own, store and leave in the honey comb to ripen and mature. Honey bees readily fly up to 4 km in all directions from their apiary and thus have access to an area of about 50 km2. They are such a best small sampler that can be used in geochemical exploration.

The bee honey has been used as monitors of a variety of environmental contaminants, including heavy metals [9] low level radioactivity and pesticides [10, 11, and 12]. Heavy metals have an important function for environmental pollution.

The concentration of the elements in the bee honey depends on the Geo-botany aspects. Even the colors of the bee honey have the same condition.
This study is trying to determine Cadmium, Zinc, Lead, Iron, Copper and Arsenic content of the bee honey to find the geochemical halos of these elements and the effect of environmental pollution on the bee honeys.

2 Materials and Methods

All the bee honey samples collected from Ja'far Abad area of Saveh city from Markazy province and kept in cool and dry places in standard condition in addition to the studied project on Argentine, Pakistan and Turkey. The samples analyzed within 2 months by ICP-OES and AAS Methods.

2.1 ICP OES

Inductively coupled plasma optical emission spectrometry (ICP-OES) is widely recognized as a suitable technique for the determination of heavy metals.
Concentrations of heavy metals have been determined by the ash of this method after solving in necessity liquids and heating.

2.2 AAS (Atomic Absorption Spectrometry)

Atomic absorption spectrophotometer (AAS) Model VARIAN spectra AA240 was used to determine heavy metals concentration. The instrument was calibrated and standardized with different working standards. After making sure that the instrument was properly calibrated and results of standards were in the confidence limit, concentration of metals in each sample was measured individually.[3]

3 Result

The mean toxic element concentrations of bee honey samples are presented in Table 2.
According to the table 1 The different geographical location of each sample cause the variation of trace element in the table 2

Table 1.Name of region from where bee honey samples were collected and distance to different places.

Name of region	Distance to road	Distance to residential area Nearest place	Distance to residential area Biggest City	Distance to Industrial Zone
Ja'far Abad-Saveh	600m	1Km	12Km	8Km

Table 2. Concentration of toxic elements in different types of bee honey.

Element	Mean value (µg/g)				Average of Normal Honey (µg/g)
	Studied project on Argentine	Studied Project on Turkey	Studied Project on Pakistan	Saveh-IRAN	
Cd	-	0.11-0.18	-	0.0271	0.01
As	1.08	2.2-11.0	0.1368-0.4717	4.28	0.020
Pb	-	0,14- 0,85	0.02-1.81	-	15.29

4 Conclusion

The result of this study shows that the amount of the trace elements in collected bee honey sample depends on the geology, geo-botany and biogeochemistry of the area. But the artificial effects play the most significant role on the amount of toxic metals (ptm).

Metal ion oxides are often important in minimizing the solubility of arsenic in the environment in general and more specifically for localizing the impact of arsenic contamination near contaminated sites, especially old mines (La Force et al., 2000; Roussel et al., 2000b; Webster et al., 1994). Organic arsenic species tend to be less strongly absorbed by minerals than inorganic species. The adsorption of arsenic species depends on the PH, Redox and competition from other anions[1]. The transport of arsenic, as that of many other chemicals, is closely related to adsorption–desorption reactions (Appelo

andPostma, 1993).Fig 1 shows the amount of arsenic in the Saveh sample that shows the pollution of the area and high amount of As in the crust of that region.

The most important sources of Cd pollution are metal industry and plastics. The high amount of Cd in the Saveh shows the pollution of the area because of low distance of the hive with Road, resident areas and industrial zones.

High lead, Arsenic and Cadmium concentration cause to hypertension, hearing difficulty, kidney disease, heart attack, suffocation and lose of intelligence

.fig.1: Amount of Cd in different honey samples and the crust

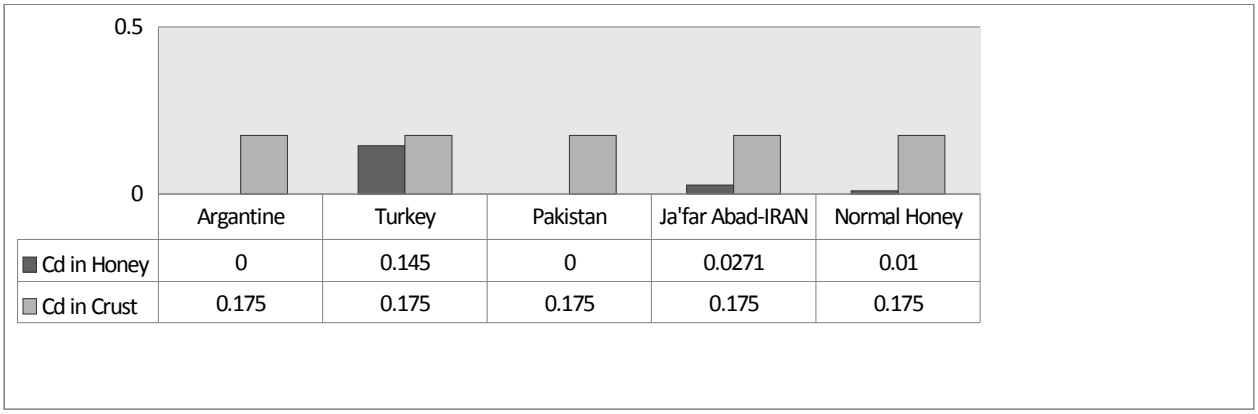
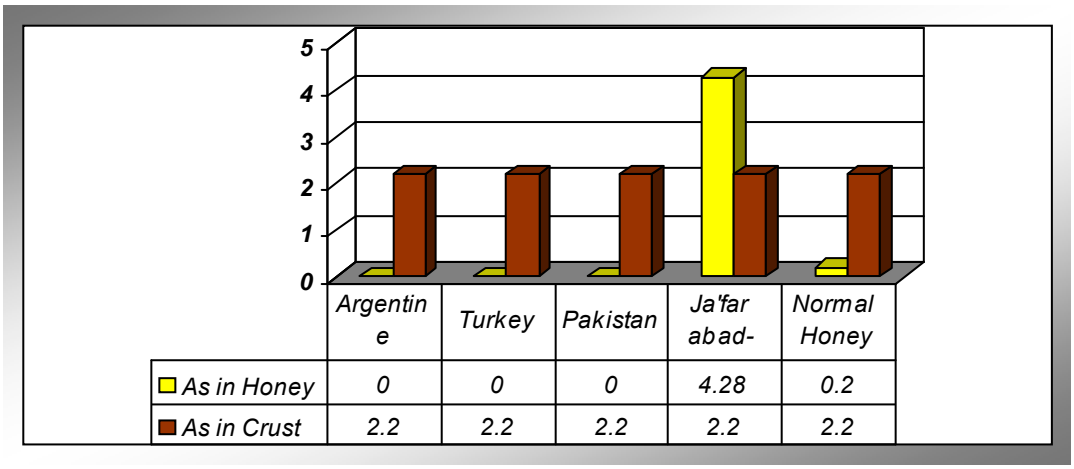


Fig 2. Amount of As in different honey samples and the crust.



According to Stefan Bogdanov in August 2009, it determines that honey bees collected from different areas contain 0-0.001 mg/100g for Cd; 0.001-0.03 mg/100g for Pb and 0.014-0.026 mg/100g for As (fig 3,4). These mean results for Pb, As and cadmium given by these authors are lower than results obtained from present study.

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