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RESEARCH ARTICLE

Determination of some heavy metals in honey

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Özet

Temamoğulları F, Yazar S, Başkaya R. Balda bazı ağır metallerin belirlenmesi. **Eurasian J Vet Sci, 2012, 28, 1, 38-40**

Amaç: Şanlıurfa Atatürk Barajı çevresinde bulunan yirmi farklı köyden toplanan bal örneklerinde bazı ağır metallerin varlığını belirlemektir.

Gereç ve Yöntem: Toplanan yüz doğal sıvı bal örneğinde, grafit fırın atomik absorbsiyon spektrometresi ile ağır metal varlığı belirlendi.

Bulgular: Bal örneklerindeki sırasıyla kurşun 0.349±0.147 (0.000-0.642), kadmiyum 0.003±0.007 (0.000-0.038) ppm olarak belirlenirken, bal örneklerinde mangan belirlenemedi. Kadmiyum ve kurşun içeriği açısından köyler arasındaki fark istatistiksel olarak anlamlı bulunmadı (p>0.05).

Öneri: Şanlıurfa'da üretilen balların tüketimi düşünüldüğünde, ağır metal miktarı yönünden sakıncasız olduğunu ifade edilebilir.

Abstract

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Aim: To determine some heavy metal content in honey samples collected from twenty different villages around Ataturk Dam in Sanliurfa.

Materials and Methods: Heavy metal content was determined from hundred natural liquid honey samples with graphite furnace atomic absorption spectrometer.

Results: Lead and Cadmium levels were determined as 0.349±0.147 (0.000-0.642) and 0.003±0.007 (0.000-0.038) ppm, respectively, Manganese was not detected in honey samples. From the point of lead and cadmium contents, the differences between villages were not found statistically significant (p>0.05).

Conclusion: When the consumption of the honey produced in Şanlıurfa is considered, it can be stated that they are harmless from the point of heavy metal content

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► Introduction

Trace metals are important in daily diets, because of their essential nutritious value and possible harmful effect. Metals like iron, copper, zinc and manganese are essential metals since they play an important role in biological systems whereas lead (Pb) and cadmium (Cd) are non-essential metals which can be toxic even in trace amounts (Tüzen et al 2007). Diet is the main route of exposure to trace metals, so information about dietary intake is also important to assess risks to human health for these elements. Since food is one of the main sources of heavy metal ions for human, the analysis of food samples for trace heavy metal contents have been continuously performed (Soylak et al 2008). Honey possesses valuable nourishing, healing and prophylactic properties which are related with its chemical composition. As a major food source or an important agent, honey must be free of objectionable contents (Przybylowski and Wilczynska 2001).

Honeybees may continuously expose to contaminants in the areas surrounding the apiary for the duration of their foraging activity (Conti and Botre 2001). Bees fly intensively in a radius of up to 3 km, and for this reason they and their products can serve as bio-indicators for the contamination of the area (Bogdanov et al 2003). Therefore honeybees and their products can be considered as representative bioindicators of the environmental pollution (Leita et al 1996, Conti and Botre 2001, Yazgan et al 2006).

Cd and Pb levels are reliable indexes of environmental contamination. Cd is a heavy metal and toxic for human. Higher Cd concentrations cause defection of cardiovascular and skeleton systems due to acute toxicities (Demirezen and Aksoy 2005). Pb is another heavy metal and higher Pb concentration leads to brain defection, hypertension, hearing difficulty, anemia, kidney disease and lose of intelligence (Darrell and Van 1991). According to World Health Organization (WHO 1982), the average recommended daily intake of Cd and Pb are 60 µg/d and 210 µg/d, respectively.

Although many different instruments have been used for the simultaneously multielement determination in honey, graphite furnace atomic absorption spectrometry (GFAAS) has been used for determination of trace elements for many years (Frias et al 2008). In recent years, the application of multielement determination methods has increased by using GFAAS instruments.

To our best knowledge, heavy metal contents of honeys obtained from Atatürk Dam area (Şanlıurfa, Turkey) have not been investigated previously. Aim of this research was to determine the levels of some heavy metals (Pb, Cd and Mn) of honeys which are indicators for environmental contamination.

► Materials and Methods

Hundred natural liquid samples of honey (100 g) were collected from different beekeepers from twenty different environmental villages around Atatürk Dam in Şanlıurfa city. Samples were transferred to sterile glass pots and were kept in a dark place at room temperature until analysis. All the natural samples examined were unprocessed honeys of random (mixed) floral type. Honey Pb, Cd and Mn levels were determined previously reported methods (Hyde et al 1977, Tüzen et al 2007) with graphite furnace atomic absorption spectrometer.

Data were analyzed by one-way analysis of variance (ANOVA). When significant treatment effects were detected, Duncan's multiple range tests was used to identify specific differences between treatment means at a probability level of $p<0.05$.

► Results

Mean trace heavy metal contents (ppm wet weight) with the standard deviations and range are shown in Table 1. Although Pb and Cd were determined, Mn was not detected in honey samples. Cd and Pb levels were not significantly different ($p>0.05$) among villages (data not shown).

Table 1. Some trace metals' content (ppm) in honey samples obtained from Şanlıurfa city (n: 100).

	Mean	Range	SD
Cd	0.003	0.0-0.038	0.007
Pb	0.349	0.0-0.642	0.147
Mn	ND	ND	ND

Cd; cadmium, Pb; lead, Mn; manganese, ND; not determined.

► Discussion

There have been many studies about heavy metal contents of honey in Turkey. Moreover, these studies were related to the local areas. Erbilir and Erdoğrul (2005) observed that Cd and Mn levels were 0.32 and 0.03 ppm in honey samples, respectively. Tuzen et al (2007) determined that Mn, Pb and Cd contents in honeys were 0.32-4.56 ppm, 8.4-105 ppb and 0.9-17.9 ppb, respectively. Yılmaz and Yavuz (1999) determined that Mn level was 1.0 ppm in honey obtained from different areas of southeastern Anatolia. Yarsan et al (2007) reported that Mn level of honey was 0.49 ppm. In another study, Uren et al (1998) observed that Pb, Cd and Mn concentrations of Turkish honey were 55.2 ppb, 4.53 ppb and 0.31 ppm respectively. In current study, Cd and Pb levels were 0.003±0.007 and 0.349±0.147 ppm respectively, but Mn did not detect (Table 1). Determined levels of Cd, Pb and Mn in this research were lower than honey samples collected from different regions of Turkey. The residue limit (0.05-0.56%) was within the allowed range by Turkish Alimentarius Codex (Anonymous 2003).

The mean of Cd level of honey was 0.003 ppm in this study (Table 1). Vinas et al (1997) reported that Cd and Pb levels of Spain honey were 1.6 ppb and 0.07

ppm respectively. Cd level of Spain honey was much higher than our result, although Pb level was lower than our samples. Cd contents of some honey samples around the world were 0.020-0.490 mg/kg (Conti and Botre 2001, Przybylowski and Wilczynska 2001, Fredes and Montenegro 2006), and the mean values of Cd (0.003 ppm) of our samples were lower than these researches. The range of Pb in the literature have been reported as 0.048 mg/kg (Przybylowski and Wilczynska 2001), 0.01-0.11 mg/kg (Fredes and Montenegro 2006) and 3.3-45.0 µg/kg (Conti and Botre 2001), respectively.

In a theoretical food basket, an ordinary person should take 20 gram honey daily (Anonymous 2010). On the other hand, according to World Health Organization (1982) the average recommended daily intake of Cd and Pb are 60 µg/d and 210 µg/d, respectively. Our mean Cd and Pb content were 0.003 and 0.349 ppm, respectively. Therefore, consuming 20 g per day of honey from Şanlıurfa provides: 0.06 µg Cd day and 6.98 µg Pb in a day. These results are very low and show the absence of contamination, a fact that is on the other hand logical, given the absence of industrial pollution in the sampling areas.

► Conclusions

It was suggested that mean intake of Cd and Pb due to consumption of these products is much lesser than the acceptable daily doses declared by World Health Organization.

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