



ORIGINAL RESEARCH PAPER

Biotechnology

EVALUATION OF VITAL NUTRIENTS IN APIS HONEY FROM COORG, KARNATAKA

KEY WORDS: *Apis* honey, honey quality, micronutrients, total ash content.

M. Bhushanam	Department of Zoology, Maharani's Science College for Women, Bengaluru, India – 560 001.
Madhusudan S	Department of Biotechnology, Maharani's Science College for Women, Bengaluru, India – 560 001.
Abhinandini Innocentia David	Department of Zoology, Maharani's Science College for Women, Bengaluru, India – 560 001. Department of Zoology, GFGC, Channapatna, Karnataka

ABSTRACT

Honey is one of the precious nature's golden wonder and treasured commodity from centuries. It has delicate aroma and entice fragrance, which can be attributed to the presence of minor constituents. Honey is an easily digestible food stuff that contains a range of nutritionally important compounds. It is a rich source of minerals that includes both micro and macronutrients. The mineral content is highly variable with the species of honeybee, the geographical area and botanical origin. The most medicinal properties of honey along with its flavour depend on its mineral content. The major components of honey include various saccharides, water, amino acids, minerals, proteins, vitamins and unstable compounds such as enzymes. In the present study, honey samples of *Apis florea*, *Apis mellifera*, *Apis dorsata* and *Apis cerana* were collected from Coorg district of Karnataka. The total ash content ranged between 0.11 to 0.35 per cent. The F-test and analysis of variance values of total ash content parameter of honey samples were significant at 5% levels. The micronutrients with high frequency were; Copper 0.05 ± 0.004 , Iron 0.09 ± 0.03 , Manganese 0.16 ± 0.03 , Sodium 4.3 ± 0.01 and Zinc 0.09 ± 0.001 ppm. All the micronutrient contents were within range and varied significantly at $p < 0.05$ levels. The investigations showed that the Indian honey is good in its quality.

INTRODUCTION

Honey is derived from nectar gathered and modified by the honeybee. Honey is one of the oldest and best loved sweetening agents for foods and over the centuries, it has still retained a "natural" image (Aparna and Rajalakshmi, 1999). It is carbohydrate-rich syrup derived from floral and other plants nectars and secretions. Honey is an easily digestible food stuff that contains a range of nutritionally important compounds (Celechovoska and Vorlova, 2001). The raw material for the production of "Floral" honey is nectar, a dilute solution of sugars found in the nectaries of flowering plants. The major components of honey include various saccharides, water, amino acids, minerals, proteins, vitamins and unstable compounds such as enzymes (Qiu *et al.*, 1999). Thus, honey is generally considered as a natural and healthy product (Reybroeck, 2003).

The characteristics of honey from different floral sources influence the commercial value and the consumer preferences (Shripad and Rangaswamy, 2001). The major minerals are mainly derived from the soil and nectar-producing plants, but they may also come from anthropogenic sources, such as environmental pollution (Hernandez *et al.*, 2005; Pohl 2009). Honey has also been used as an indicator for a variety of environmental contaminants, including heavy metals, low-level radioactivity, and pesticides (Nalda *et al.*, 2005). Several different surveys have been compiled on the nutritional and health aspects of honey (Molan and Rhodes, 2015). The records of honey as functional health food and uses of other honey-bee products are still incipient. Thus, the need to review some relevant materials on natural honey becomes imperative. This present study reveals that the natural honey values as a nutrient food and encourage the economic importance of natural honey production and other apicultural practices. Thus, the present investigation was to determine essential micronutrients such as copper, iron, manganese, sodium and zinc in *Apis* honey samples collected from various regions of Coorg, Karnataka, India.

MATERIALS AND METHODS

Procurement of *Apis* honey samples

Forty honey samples from *Apis florea*, *Apis mellifera*, *Apis cerana* *Apis dorsata*, were collected from various geographical areas of Coorg district of Karnataka during

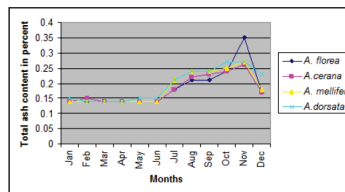
spring season of 2019. The collected samples were stored at 4°C in quality air tight plastic containers with authentic labels (Nzeako and Hamdi, 2000).

The total ash content of honey was determined by Ivanov and Chevanakova (1984) method. The results were expressed as mg/Kg.

The mineral content was estimated by atomic absorption spectroscopy method (Rodriguez-otero *et al.*, 1994). The data of all mineral contents of honey samples were analyzed by Analysis of Variance (ANOVA) along with F test, highly significant values were determined by using F table ($p \leq .005$).

RESULTS

The nutrient mineral composition of *Apis* honey showed significant variations. The total ash content of honey of Coorg varied between 0.15 and 0.35 percent. The honey samples of *Apis florea* ranged from 0.15 to 0.35 percent, *Apis cerana* between 0.14 and 0.26 percent, *Apis mellifera* from 0.14 to 0.26 percent and *Apis dorsata* from 0.15 to 0.26 percent.



Significant at $p < 0.05$

Fig. 1. Total ash content of *Apis* honey samples from Coorg during 2019.

The F-test and analysis of variance values of total ash content of honey samples from Coorg were significant at 5% levels.

Table. 1 – Micronutrients of *Apis* honey of Coorg during spring season in 2019.

Micronutrient	Honey Samples			
	<i>Apis florea</i> (ppm±S.E)	<i>Apis cerana</i> (ppm±S.E)	<i>Apis mellifera</i> (ppm±S.E)	<i>Apis dorsata</i> (ppm±S.E)

Copper	0.01±0.008	0.02±0.004	0.03±0.004	0.05±0.004
Iron	0.7±0.01	0.7±0.03	0.8±0.04	0.09±0.03
Manganese	0.13±0.001	0.13±0.002	0.14±0.003	0.16±0.003
Sodium	2.65±0.06	3.91±0.01	4.2±0.01	4.3±0.01
Zinc	0.07±0.008	0.09±0.002	0.09±0.001	0.09±0.002

Significant at $p < 0.05$

Micronutrients of various *Apis* honey samples of Coorg during investigation period showed highest ppm values for Sodium of *Apis* honey and the least recorded value was of Copper. However, the values were significant at 5 percent levels (Table 1).

DISCUSSION

In the present analysis of total ash content in *Apis* honey ranged from 0.11 and 0.35 percent (Fig. 1). Similar findings were reported by Bonvehi and Coll (1993) reported 0.06 to 0.39 percent of average ash content in French lavender honey of Spain. Anass *et al* (2003) analysed average ash content with 0.16 to 0.44 percent in Eucalyptus honey. Joseph *et al* (2007) reported 0.66 percent of ash content in Sudano Guinean honey.

The major micronutrients of *Apis* honey recorded were Iron, Manganese, Sodium, Zinc and Copper. The highest content being Sodium with 4.3 ± 0.01 ppm for honey samples of Coorg. Least range was recorded for Copper 0.01 ± 0.008 ppm for honey samples of Coorg (Table.1).

The mineral iron content is highest in *Apis dorsata* honey of Coorg with 0.09 ± 0.03 ppm and 0.7 ± 0.01 ppm was recorded least in *Apis florea* honey. In our study the values of iron recorded were lower than those values of 13.5 and 3.37 ppm reported earlier in Zulia and Tenerife (Frias *et al.*, 2008), Mudasar Manzoor *et al.*, 2013 and closer to values reported earlier by A. Mbiri,*et al* 2011, ranging between 0.08 and 0.59 ppm. The mineral manganese content is highest in *Apis dorsata* honey of Coorg with 0.16 ± 0.003 ppm and 0.13 ± 0.002 ppm was recorded least in *Apis cerana* honey samples. Mahmood Ahmed *et al.*, (2016) reported 0.73 to 0.97 ppm Mn in the Pakistan honey samples. The highest concentration of Mn was found in *Apis dorsata* from Western Ghats of Tamil Nadu with a value of 1.126 ppm reported by Mudasar Manzoor *et al.*, 2013. The mineral sodium content is highest in *Apis dorsata* honey of Coorg with 4.3 ± 0.01 ppm and 2.65 ± 0.06 ppm was recorded least in *Apis florea* honey samples. 122.8 to 181.7 ppm was reported by Mahmood Ahmed *et al.*, (2016) in the Pakistan honey samples. Mudasar Manzoor *et al.*, (2013) reported 25.17 ppm of Na in *Apis cerana* honey samples from Tamilnadu and Kashmir. The mineral copper content is highest in *Apis dorsata* honey of Coorg with 0.05 ± 0.004 ppm and 0.01 ± 0.008 ppm was recorded least in *Apis florea* honey. The concentration of Cu in present samples were lower, compared to the values recorded in Swiss and Tenerife honey which were 0.88 and 1.28 ppm (Stefan *et al.*, 2007) and has a closer values reported by A. Mbiri,*et al* (2011) ranging between 0.02 and 0.03. The highest concentration of Cu was recorded in honey sample *Apis dorsata* from Western Ghats of Tamil Nadu with a value of 0.624 ppm while the lowest concentration of Cu was recorded from honey sample *Apis mellifera* from Jammu and Kashmir with value of 0.275 ppm (Mudasar Manzoor *et al.*, 2013). The mineral zinc content is highest in *Apis mellifera* honey of Coorg with 0.09 ± 0.001 ppm and 0.07 ± 0.008 ppm in *Apis florea* honey samples. In *Apis* honey samples, Ciobanu Raducescu (2016) reported 0.987 mg/kg of Zn. Bhushanam and Madhusudan (2017) analyzed honey from Coorg and Kolar reported that dark colored honey have more minerals than light colored honey of *Apis*. Though, the quantity of minerals was less, they play a vital role in determining the color, medicinal and nutritional value of honey. From present study, it is observed that the Indian honey is good in quality.

CONCLUSIONS

The present study concludes that the micronutrients of *Apis* honey are essential for nutritional quality and safety of honey. Of all the micronutrients tested in the honey samples, *Apis dorsata* honey from Coorg have high contents of iron, manganese, copper, sodium and zinc as compared to other *Apis* honey samples. The results of the present study reveal that honey quality with respect to the concentration of these micronutrients is good for human consumption and medicinal applications.

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