

# Physico-Chemical Analysis of Some Commercial Honey Samples from Telangana

## Research Article

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**Article Information:** Submission: 16/01/2017; Accepted: 10/02/2017; Published: 14/02/2017

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### Abstract

The present work encompasses a critical physico-chemical characterization of 5 commercial honey samples available in India. The analysis includes moisture content, pH, electrical conductivity, acidity, total sugars, reducing and non-reducing sugars. The absolute pollen count of the honey samples was also determined and graded.

The objective was to compare the honey samples based on sensorial, physical and chemical parameters. Four commercially available honey samples were obtained from the local market of Hyderabad, Telangana State and one from Bangalore, Karnataka State India. These constitute the principle material of the present study. Of the 5 samples, four - Lio, Apo, Dab & Fet are available throughout the country while 1 sample - Pra (Figure 1a) is exclusive to Bangalore.

**Keywords:** Honey; Acidity; Reducing and non- Reducing sugars; pollen

## Introduction

Melissopalynology or Mellitopalynology is a branch of Palynology that deals with pollen analysis of honey. The analysis helps to determine the geographical and botanical origin of the honey samples. It provides an index of the bee foraging plants - the plants preferred by the honeybees for nectar and pollen. The information obtained can be effectively used in the apiary industry as well as to determine the quality of the honey sample.

The methods of Melissopalynology were provided by the ICBB (International Commission for Bee Botany) [1]. Honey is characterized based on its physico-chemical and biological properties [2]. Thus, the quality of honey can be determined by its sensorial, physical, chemical and microbiological characteristics. However, it is influenced by a number of factors such as bee species, flora, environmental factors like climate and seasonal conditions etc., and treatment of honey during extraction and storage [3]. Honey is the only naturally occurring sweet available commercially, consisting approximately 35-40% of Levulose, 30-35% of Dextrose, 18-20%

of Moisture, 4% of Maltose. They also include vitamins, carotenes, xanthophylls, anthocyanin, tannin and colloidal particles.

The current work was undertaken to characterize 5 commercial honey samples available in India based on their physico-chemical properties. The analysis includes moisture content, pH, electrical conductivity, acidity, total sugars, reducing and non-reducing sugars. The absolute pollen count of the honey samples was also determined and graded as per the Indian Standard specifications [4].

The objective was to compare the honey samples based on sensorial, physical and chemical parameters as well as the absolute pollen count.

## Materials and Methods

Four commercially available honey samples were obtained from the local market of Hyderabad, Telangana State and one from Bangalore, Karnataka State India. These constitute the principle material of the present study. Of the 5 samples, four - Lio (Figure 1e), Apo (Figure 1d), Dab (Figure 1c) & Fet (Figure 1b) are available



Figure 1: Honey samples.

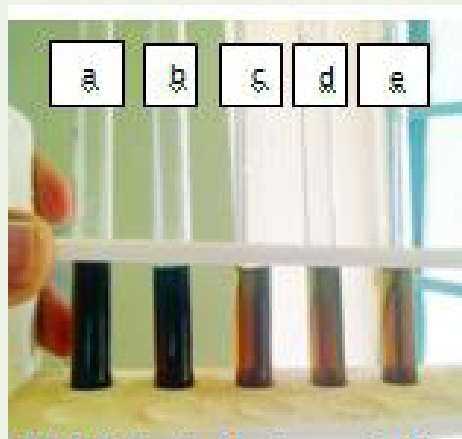


Figure 2: Estimation of total sugars in honey samples by anthrone method.

throughout the country while 1 sample - Pra (Figure 1a) is exclusive to Bangalore.

The colour of the samples was based on sensory (visual) character. The physical properties studied were moisture content, pH and electrical conductivity, while the chemical characters include acidity, total sugars, reducing and non-reducing sugars. The honey samples were graded based on the absolute pollen count.

#### Absolute pollen counts (APC)

The absolute pollen counts (APC) were determined as per the method recommended by the Indian Standard specification [4].

#### Physico-chemical analysis

**Moisture content:** 5 g of each of the honey samples was taken separately in a clean and dried porcelain dish and weighed. It was then placed in the oven at 110 °C for overnight drying. After weighing the samples it was again placed in the oven for every half hour till a constant weight was obtained.

Moisture content in percentage was calculated using the formula:

$$\text{Moisture Content (\%)} = \frac{W_1 - W_2}{W_1} \times 100$$

Where,  $W_1$  = Weight of porcelain dish + fresh weight of sample and  $W_2$  = Weight of porcelain dish + dry weight of the sample.

**pH:** 10 g each of the honey samples was diluted in 75 ml of distilled water and the pH was measured using a pH meter. The pH meter (Elico pH meter) was calibrated using standard buffers of pH 4 and pH 9 before measuring the pH of the samples.

**Electrical conductivity:** It was determined using conductivity meter (Elico Conductivity meter) for the solution containing 5 g of each of the honey samples dissolved in 37.5 ml distilled water.

**Acidity:** 1 g of each of the honey samples were dissolved in 7.5 ml of distilled water. It was then titrated against standard sodium hydroxide (0.05 N) solution using 1-2 drops of phenolphthalein indicator till pink colour appears and persists at least for 10 sec.

Acidity % = (0.23 x volume of sodium hydroxide required for titration)/mass in grams of the honey sample taken for the test (1 g).

#### Total Sugars

The total sugars in the honey samples were estimated using anthrone method (Figure 2) [5].

Sugar in the presence of sulphuric acid gets dehydrated to furfural or hydroxymethylfurfural, which later react with anthrone (dihydro oxanthracene) to yield a bluish-green color complex that has an absorption maximum at 620 nm.

#### Reducing sugars

It was estimated using Dinitrosalicylate (DNS) method [5].

#### Non-reducing sugars

It was calculated as -

Amount of Total Sugars - Amount of Reducing sugars.

#### Results and Discussion

The colour of the honey samples ranges from amber to dark amber. Colour depends on various parameters such as the mineral content, phenolic compounds and the pollen content in the honey sample as well as its origin and floral varieties. Colour change may also result due to storage temperature & the duration of storage (Figure-1, Table1).

Based on the absolute pollen count (APC), Apo sample is included

Table 1: Physical parameters of honey.

S.NO.	HONEY	COLOUR	GROUP (APC)
1.	Pra	Dark Amber	V
2.	Lio	Amber	III
3.	Apo	Dark Amber	II
4.	Dab	Light Amber	IV
5.	Fet	Amber	III

**Table 2:** Physico-chemical parameters of honey.

Honey	Moisture (%)	Ph	Conductivity (mS/cm)	Acidity (meq/kg)	Total sugar (g/100 g of honey)	Reducing Sugars (g/100 g of honey)	Non-reducing Sugars (g/100 g of honey)
Pra	1.98	3.97	0.45	11.5	82	79	27
Lio	2.31	3.82	0.46	16.1	78	72	23
Apo	1.96	3.92	0.46	41.4	81	73	31
Dab	1.79	3.95	0.55	9.2	83	80	16
Fet	2.72	3.72	0.45	34.5	88	71	15

in group II with APC of 1,00,000/10 g, Lio and Fet are in group III with APC of 4,00,000/10 g and 2,00,000/10 g respectively, Dab in group IV APC of 10,00,000/10 g and Pra in group V APC of 11,00,000/10 g (Table 1).

### Physico-chemical analysis

**Moisture content:** The moisture content of all the honey samples were much below 20% maximum value allowed by Codex standards, (Table 2) [6]. Such results were also observed by [7].

Of the five honey samples, 3 samples (Pra, Apo and Dab) had moisture content below 2%, while Lio and Fet had above 2% moisture content.

This low moisture content is indicative of the time of extraction of honey with respect to the maturity/ripening process of the honey, climatic factors, and storage conditions.

The low moisture content also prevents fermentation of honey and attack by microorganisms. This helps in its preservation and storage and increases the shelf life of the honey [7].

**pH:** The pH values of all the samples studied were similar ranging between 3.7 and 3.9 (Table 2), which falls within the limits of the international standards. This low pH inhibits the growth of microorganisms and influences the texture and stability of the honey sample [8]. The acidity of the honey sample may be due to the presence of organic acids such as gluconic acid and also due to phosphate and chloride ions [9].

**Electrical conductivity:** It depends on the concentration of mineral salts, organic acids and proteins. All the honey samples in the present study showed electrical conductivity values of 0.45 mS/cm or 0.46 mS/cm except Dab which showed 0.55 mS/cm (Table 2). This is indicative that all the honey samples have a similar floral origin.

**Acidity:** The free acidity of the sample studied ranged from 9.2 meq/kg in Dab sample to 41.4 meq/kg in Apo sample (Table 2) which is less than 50 meq/kg allowed by Council Directive of the European Union [10]. The variation in the acidity among the honey samples studied may be due to the difference in their harvest season [11]. Low acidity value is indicative the freshness of honey sample while high acidity indicates fermentation of sugars into organic acids.

**Sugars:** Sugars represent the carbohydrate content of the honey samples. With respect to reducing sugars, the values ranged from 71 g/100 g of honey in Fet sample to 80 g/100 g of honey in Dab sample (Table 2). The values obtained are above the minimum value (60 g/100 g) recommended by Council Directive of the European Union [10]. However, the values of non-reducing sugars for all the honey samples

in the current study were much higher (Table 2) than the stipulated  $\leq 5$  g/100 g by Council Directive of the European Union [10]. High sucrose content in the samples may be due to early harvesting as sucrose is not converted to fructose and glucose [12].

The current study showed that all the 5 commercial honey samples had similar physico-chemical properties. Variation was observed only in case of acidity where three samples had low acidity value - Dab 9.2 meq/kg, Pra 11.5 meq/kg & Lio 16.1 meq/kg indicating the freshness of the samples or early harvesting. However, Fet with 34.5 meq/kg and Apo with 41.4 meq/kg showed higher values. Variation was also observed in the values of non-reducing sugars ranging from a low of 15 g/100 g of honey in Fet to a high value of 31 g/100 g of honey in Apo.

### Conclusion

The study also showed that all the honey samples could have a good shelf life due to their low moisture content. Similar pH values are indicative of similar texture and stability of the honey samples under study. Based on their electrical conductivity values, it can be concluded that all the honey samples had similar floral origin. However botanical studies of the samples could give the exact floral varieties in the honey samples.

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