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## QUALITATIVE ANALYSIS OF SUMMER HONEY OF APIS FLOREA FROM NAGPUR REGION.

KULKARNI SULBHA, MAHAKALKAR ANJALI AND GODGHATE SAPNA

Department of Botany  
Department of Chemistry  
Sevadal Mahila Mahavidyalaya, Nagpur.

### Abstract:

*Honey is a sweet and flavorful product which has been consumed as a high nutritive value food. It is composed of complex mixture of carbohydrates and other minor substances. The quality of honey is mainly determined by its sensorial, chemical, physical and microbiological characteristics. The aim of the present investigation was to study the physico-chemical properties of eleven samples of summer honey of A. florea collected from Nagpur region. This investigation was analyzed for quality of honey according to Bureau of Indian Standards (BIS). Various parameters like pH, free acidity, EC, ash, moisture, total reducing sugar, sucrose, glucose, fructose, fructose-glucose ratio, HMF, viscosity, surface tension, optical density and colour were studied. An experimental value of all parameters indicates that quality of honey is good. This study also recommends that quality of raw honey should be maintained not only by following the Standards but by taking care and precautions for mishandling, improper storage condition and temperature factors which are responsible for the loss of genuineness of honey and poor quality.*

### KEYWORDS:

Honey, HMF, EC, physico-chemical parameters.

### INTRODUCTION:

Honey is an easily digestible food stuff containing a range of nutritionally important complementary elements. Besides a high content of a range of saccharides, there are also organic acids, amino acids, mineral matters, aromatic substances, colours and trace amount of fats (Redtke and Hadtke, 1998; Bogdanov et al. 1998). Besides these, honey contains very valuable but unstable compounds such as enzymes, substances of hormonal characters, some vitamins and few minor compounds (Yilmaz and Yavuz, 1999; Qiu et. al. 1999). It has also been used in vital alternative medicines of Ayurveda and daily consumption of honey is encouraged to promote good health. Taking into account the traditional and contemporary uses of honey, we can interpret that there is an increasing demand and interest by consumers for high quality honey and honey products.

Honey of A. florea have been collected from different regions of Nagpur. It varies significantly in colour, aroma and taste. There are also differences in the chemical composition which are reflected in many physico-chemical properties such as pH, free acidity, EC, ash, moisture, total reducing sugar, sucrose, glucose, fructose, fructose-glucose ratio, HMF, viscosity, surface tension, colour and optical density (Bogdanov et al. 1987, 1999; Golob and Plestenjak, 1999). The aim of the present work was to evaluate the quality of A. florea summer honey from the point of view of physico-chemical properties and find out whether they meet national standards of honey specification.

**MATERIALS AND METHODS**

Eleven honey samples were collected in air tight container from Ramtek, Kuhi of Nagpur region and different areas of Nagpur city during summer 2011-12 (Map of Nagpur District). These samples were serially numbered and labeled (Appendix -I). The physico-chemical properties were determined according to the methods of IS honey standards. The individual constituents were determined as follows:

- PH- pH meter
- Free acidity - by titration
- EC- by conductometer
- Ash- by burning in muffle furnace
- Moisture- by refractometer
- Total reducing sugar-by titration
- Sucrose, glucose, fructose and fructose-glucose ratio - by titration
- Viscosity- by viscometer
- Surface tension-by stalagmometer
- Optical density- by refractometer
- Colour - by refractometer

The study of quality analysis of physico-chemical properties of honey has increased in recent years because these parameters are important for certification process that determines the quality of honey.

**Appendix-I**

**Map of Nagpur District**

S No.	Local (LH)	Honey	Region
1.	LH-1		Ramtek
2.	LH-2		Kuhi
3.	LH-3		Malviyanagar
4.	LH-4		Pande layout
5.	LH-5		Sakkaradara
6.	LH-6		Pande layout
7.	LH-7		Jaiprakashnagar
8.	LH-8		Ramnagar
9.	LH-9		Shrukrawari garden
10.	LH-10		Sadabhavananagar
11.	LH-11		Dhantoli



**RESULT AND DISCUSSION**

In the present study eleven honey samples of *A. florea* were investigated with an objective to analyze the physical and chemical properties. Evaluation of their quality was based on the Bureau of Indian Standards (BIS). Honey was characterized according to parameters, which indicates its origin, authenticity and freshness. All types of honey had significant differences as regards their concentration of elements. The result of physico-chemical properties of summer honey samples of *A. florea* are presented in table-I. Overall most of the honey samples were of acceptable quality while few of the honey samples were of unacceptable quality. Pure honey is characterized by conductance near zero. In the Codex Alimentarius (2001), the maximum electrical conductivity for pure floral honey is 0.8Mscm-1. The tested honey samples had different viscosity, refractive index and pH values which can be attributed to the fact that the percentage

of different elements in honey varies during growing season and across geographical areas.

Although not being legislated meet the values reported by other authors for honey of different sources (Azeredo et al., 2003 and Terrab et al. 2002) pH of the summer honey samples in present investigation was lie between 3.83-6.02. Except LH-2 sample, experimental values of remaining samples are within range. This parameter has great importance during extraction and storage of honey, as it influence the texture, stability and shelf life of honey (Terrab et al. 2002).

The free acidity of honey may be explained by taking into account the presence of organic acid in equilibrium with their corresponding lactones or internal esters and some inorganic ions. However in the present investigation the values of free acidity in eight samples lie within range (54-110meq/kg) while three samples values are less than standard values (16-45meq/kg). High acidity can be indicative of fermentation of sugars into organic acid. In the present study most of the honey samples may be taken as indicative of freshness.

Electrical conductivity of 18.2% samples is within limit while the values of 81.8% honey samples are exceed the limit (Finola et al. 2007).

Ash content values in the eighty two percent summer honey samples are within limit (.15-.6mS/cm) where as eighteen percent honey samples exceeded the limit allowed (Purcărea et. al. 2011). It plays most important role in detecting the colour of the honey.

Moisture contents in honey depend on the environmental condition and the harvest period. It can vary from year to year (Acquarone et al. 2007). High moisture content could accelerate crystallization in certain types of honey and it increases its water activity where certain micro-organisms could grow. It also leads to the fermentation during storage. In the summer honey samples values of moisture content ranges from 18.60-19.20 which are well below to the imposed limit of  $20/100\text{gm}$  (BIS, 1994; Eu, 2001, Kakade et. al. 2011, Purcărea et. al. 2011). There were no significant differences observed between the moisture content values of summer honey samples. This result is indicative of good storage ability of these honeys.

Values of total reducing sugars in the present study lie between 71.07-85.92. These values meet the standards but it corresponds to the levels observed in other studies (Rodriquez et al. 2004; Küçük et al. 2007; Kakade et. al 2011). All these values are within limit. The values of fructose (39.92-64.02), glucose (16.12-33.27) and fructose-glucose ratio (0.12-3.97) are also within limit. In the present work, values of fructose-glucose ratio are more than one in ninety percent samples which clearly indicates that these honey seldom granulate under storage. This fructose glucose ratio is used for the assessment of crystallization tendency of honey where higher ratio indicates its liquid form. Higher values of fructose are more in squeezed honey.

Non reducing sugar sucrose are set to  $5\text{g}/100\text{gm}$ . for all summer honey samples (EC directive 2001/110). Values of sucrose in the present study are within range (1.21-3.39).

HMF is a breakdown product of fructose which is formed slowly during storage and very quickly when honey is heated. Its content is widely recognized as a parameter of honey samples freshness, because it is absent in fresh honeys and tends to increase during processing and/or aging of the product. Several factors such as temperature, time of heating, storage condition, pH and floral source provided an indication of overheating and storage in poor conditions (Fallico et al., 2006, Kakade et. al. 2011). In the present study, all samples of summer honey except LH-01 (79.34mg/kg) are within limits (10.47-51.64mg/kg). Higher values are indicative of bad storage.

Colour of the honey is also an important which depends on various parameters but mineral contents are one of them. Light coloured honeys have low ash contents while dark coloured honeys have high ash contents (Al et al., 2009). In the present work, colour of the A. florea honey ranges from light amber, amber to golden which shows close relationship with ash contents.

Viscosity is the most important technical parameter as it reduces honey flow during extraction, pumping, settling, mixing and bottling. In the present work, values of viscosity of summer honey are 52.10-84.69. Variations in viscosity of honey are due to non sugar materials, particularly 'dextrin' and those colloidal materials also helps to determine viscosity. Temperature and water contents are the main determinants of viscosity. As temperature rises viscosity of honey decreases. Viscosity is largely depends on variety of substances and therefore varies with its composition and particularly with its water content (Krell, 1996).

Surface tension (dyne/cm) of honey is an important factor. Values of surface tension for summer honey are 50.75-74.86 dyne/cm. whereas values of optical density are 1-1.92. A low value lead to excessive foaming and scum formation where as higher values accompanying decrease in foaming.

## CONCLUSION

From the present work of summer honey samples of *A. florea*, it is concluded that quality of honey is good in most of the honey samples. It also indicates its freshness and authenticity.

Granulation in honey samples are due to the more than one percent of fructose-glucose ratio and ash contents in honey plays most important role for detection of colour of honey.

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Electric Conductivity	Ash content	Total reducing Sugar	Glucose %	Fructose %	Sucrose %	Fructose /Glucose Ratio	Viscosity	Surface tension/ Cm	Optical density	Moisture %	HMF /Kg	Colour
1.143 mS.cm <sup>-1</sup>	1.0 mS.cm <sup>-1</sup>	85.92%	26.68%	59.24%	2.54%	2.22	60.71	68.79 dyne	1.36	18.60%	79.34 mg	Light amber
1.072 mS.cm <sup>-1</sup>	0.6 mS.cm <sup>-1</sup>	71.74%	31.82%	39.92%	1.98%	1.25	54.51	74.67 dyne	1.75	18.60%	51.64 mg	Light amber
1.01 mS.cm <sup>-1</sup>	1.0 mS.cm <sup>-1</sup>	70.37%	20.79%	49.58%	1.57%	2.38	74.86	69.36 dyne	1.59	18.60%	11.22 mg	Light amber
0.687 mS.cm <sup>-1</sup>	0.6mS.cm <sup>-1</sup>	71.07%	28.76%	42.31%	1.21%	1.47	57.16	63.34 dyne	1.65	18.60%	19.46 mg	Light amber
1.567 mS.cm <sup>-1</sup>	0.2 mS.cm <sup>-1</sup>	72.62%	32.61%	40.01%	1.27%	1.23	61.57	63.04 dyne	1.51	19.20%	46.40 mg	Light amber
1.891 mS.cm <sup>-1</sup>	1.0 mS.cm <sup>-1</sup>	78.07%	14.85%	42.22%	1.27%	2.84	52.64	63.04 dyne	1.92	18.60%	32.93mg	Light amber
1.568 mS.cm <sup>-1</sup>	0.2 mS.cm <sup>-1</sup>	74.51%	33.27%	41.24%	1.34%	1.24	61.36	67.7 dyne	1.73	18.60%	11.97 mg	Light amber
1.597 mS.cm <sup>-1</sup>	0.15mS.cm <sup>-1</sup>	73.22%	31.00%	42.22%	2.64%	1.36	57.00	59.32 dyne	1.65	18.60%	11.97 mg	Light amber
1.081 mS.cm <sup>-1</sup>	0.6 mS.cm <sup>-1</sup>	71.07%	32.61%	42.31%	1.90%	1.30	59.26	64.66 dyne	1.57	18.60%	11.97 mg	Light amber
1.01 mS.cm <sup>-1</sup>	0.4mS.cm <sup>-1</sup>	83.22%	28.61%	54.16%	3.39%	1.89	52.10	61.35 dyne	1.92	19.00%	10.47 mg	Amber
0.567mS.cm <sup>-1</sup>	0.6 mS.cm <sup>-1</sup>	80.14%	16.12%	64.02%	3.06%	3.97	84.69	50.75 dyne	1.00	18.60%	14.22 mg	Golden

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