Study of Acids in Unifloral Honeys of East Godavari District, A.P., India

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Abstract

Honey is a natural product known to man since ancient time. It can be preserved for a long time without adding any preservatives. It is a colloidal suspension of nearly 300 different compounds. This wonderful tasty product synthesised by honey bees by collecting nectar of various flowers. Honey is acidic in nature. No major change reported in pH even after storage for prolonged periods. Honey is acidic in nature. Acidity of honey results from the presence of Organic Acids. Many acids have been reported to be present in honey. Acidity of honey may be expressed as free acids, loctone acids or tabal acids which account for less than 0.5 g of solids. This small quantity of acids contributes to the flavour and tart taste to the honey and also responsible in part for the stability of honey against Micro Organisms. In this paper we studied the acidity of 3 different unifloral honeys namely Syzygyum, Momardica, Eucalyptus. These honeys were collected or procured in different seasons from different areas of East Godavari District, A.P., India.

Keywords: Meleto Paleonology, Frequency Classes, Pollen Morphotypes, Unifloral, Multifloral, Milli Equivalent, Glucose Oxidase

I. INTRODUCTION

Several acids like glutamic, formic, acetic, tartaric, malic, succinic acids have been reported in honey. Of these acids, gluconic acid predominant. The most important and major being gluconic acid. It arises from the action of glucose oxidase in honey on dextrose (Glucose) gluconic acid in solution in equilibrium with gluconolactone (or) internal ester, often the acids include acetic, butyric, lactic, succinic, tartaric, pyroglutamic and citric acids the free acidity of which is provided by all free acids as a whole while the lactone acidity is due to glucomo lactone.

Since inorganic ions such as Phosphate, Chloride and Sulphate are also present in honey, their corresponding acids may also exist in honey (white 1975; Echigo and Takanaka 1974.)

II. POLLEN ANALYSIS

Honey samples were procured from different areas of East Godavari District, Andhra Pradesh, India in different seasons.[5]. The samples were subjected to qualitative and quantitative pollen analysis following the methodology recommended by the International Commission for Bee Botany (ICBB) (Louveaux et al 1978). The pollen morphotypes were identified with the help of reference slides mentioned in the Central Bee Research Institute (CBRI, Pune) Palynarium.

The pollen types recovered and identified were placed under four frequency classes as mentioned below. The three E.G. samples were investigated for their origin by using pollen analysis of honey is known as Meleto Palionalysis [6].

- Predominant pollen type: More than 45% of the total pollen grains counted.
- Secondary pollen type : Between 16 and 45% of the total pollen grains counted.
- Important minor pollen type: Between 3 and 15% of the total pollen grains counted.
- Minor pollen type: Less than 3% of the pollen grains counted.

The honey sample was treated as Unifloral if the prepared slide contains a predominant pollen morphotype. If several morphotypes are represented, the honey sample was termed as Multiflora [4]. Basing on the above information honey samples were identified. Three are Unifloral.

Table – 1
Frequency Classes and Frequencies of Pollen Morphotypes in the Unifloral Honey Samples of the Present Study

Honey Type	*Frequency Class*	*Pollen Morphotype*	*Frequency (%)*
EGH (1)	*P*	*Syzygium cumini*	*58*
	S	*Flacourtia indica*	*29*
	I	*Borassus flabellifer*	*13*
	M	*-Nil-*	*0*
EGH (2)	*P*	*Eucalyptus globulus*	*60*
	S	*Schleichera oleosa*	*25*

	I	*Ageratum thumb conyzoides*	*14*
	M	*Phoenix Sylvestris*	*1*
EGH (3)	*P*	*Momordica charantia*	*65*
	S	*Sorghum vulgare*	*25*
	I	*Cyanotis sp.*	*8*
	M	*Fabaceae*	*2*

P = Predominant, S = Secondary, I = Important, M = Minor

On the basis of above information, all 3 honey samples were identified as Unifloral.

EGH (1) Syzygium cumini
EGH (2) Eucalyptus globulus
EGH (3) Momordica charantia

Fig. 1: a. Syzygium cumini

Fig. 1: b. Eucalyptus globulus

Fig. 1: c. Momordica charantia

III. METHODS

A. Determination of free acidity, lactone and total acidity (White et al, 1958)

The sample (log) was weighed accurately in a 250 ml beaker and 75 ml of Carbon Dioxide free distilled water added to it. The honey was dissolved and stirred with a magnetic stirrer. The electrodes of a pH meter were placed in the solution and the initial pH recorded. The solution was then titrated with 0.05 N NaOH. The NaOH was added at such a rate that individual drops must tend to merge in to a steady stream (5 ml / min). Addition of NaOH was stopped when the pH was reached 8.5. Immediately 10 ml of 0.05 N NaOH was added using a 10 ml Pipette and the pH was brought back to 8.3 by rapidly adding 0.05 N HCl from a

10 ml burette. The amount of NaOH added from the burette minus the "blank" correction give the measure of free acid present and the amount of HCl subtracted from 10 ml was the measure of free acid present. The sum of the free acid and lactone was the total acidity. All the values were calculated to ml 0.1 N alkali per 100 grams sample or milli-equivalents per Kg. The titration rate given was as rapid as found consistent with acceptable reproducibility. It was found that the titration to pH 8.5 was equivalent to maintenance of Phenol Phthalein Pinic for 10 seconds, since the pH has fallen to 8.3 in that time.

Determinations were made in the following way.

Free acidity = (ml 0.05 N NaOH from burette ml blank) x 50g sample.

Lactone = (10.00 ml 0.05 N HCl from burette) x 50 / g sample.

Total acidity = Free acidity + Lactone

1) Determination of pH:

Digital pH meter was used for the purpose. The instrument was calibrated with standard buffer solutions of pH 4.0 and 7.0 and the readings were taken at 30^0C. Honey sample of 20 g was dissolved in 100 ml CO_2 free water and the pH readings were taken.

The acidity of honey was expressed in different ways by different workers. Total acidity or free acids as percent (%) of total solids (See white, 1975) [8]. But the better expression is milli equivalent per Kilogram of honey. (Fogler, 1975) [7]. The most studies, acidity is expressed as free acidity, whether gluconic acid or formic acid. But more appropriate to measure free acidity and Lactone acidity. Addition of these two gives total acidity to facilitate calculations of percentage of acids in milliequivalent (mequ per Kg of honey) (Fasler, 1975). [7,8].

No major change reported in pH.

Conversions:

1% formic acid = 208 mequ/Kg
1% gluconic acid = 50 mequ/Kg
1% glucolactone = 56 mequ/Kg

IV. DISCUSSION

The present study examined free acidity as well as Lactone acidity and thus total acidity in milli-equivalents / Kg of honey. These data are presented in tables along with comparative reading of pH indicating the Hydrogen ion concentration in honey.

Table – 2
Decreasing order of Acidity in Unifloral honeys of E.G. Dt., A.P., India

Honey Type	*Name of the Sample*	*Acidity*
EGH (1)	*Syzygium*	*Decreasing Order* ↓
EGH (2)	*Eucalyptus*	
EGH (3)	*Momordica*	

Table – 3
Deceasing order of pH in Unifloral honeys of E.G. Dt., A.P., India

Honey Type	*Name of the Sample*	*pH*
EGH (1)	*Eucalyptus*	*Decreasing Order* ↓
EGH (2)	*Syzygium*	
EGH (3)	*Momordica*	

Total acidity order of 3 i.e. EGH (1), EGH (2), EGH (3) different unifloral honeys from East Godavari District as follows.

- Syzygium Highly acidic
- Momordica Low
- Order of acidity : Syzygium > Eucalyptus > Momordica.

This variation is due to the following points.

- Floral type of the plant (inflorescence) influences acidity of the particular plant EI – Sherbiny 1979 given similar conclusions.
- Higher acidity may also be due to the heating of honey before packing (Bath and Singh, 1999).
- Honeys containing honey dew causes more and more acidity in honey sample. (Perez – Arquilleu et al, 1994).
- Honeys derived from nectaries in shallow or open flowers may also show up high acidity. (Padke et al, 1970).

Almost all texa serving of the nectar sources of unifloral honeys. In the present study plants have shallow flowers with open nectaries. Then it may not be surprising to record that the honeys under study contain high acidity.

Glucose oxidase is added during the ripening of honey by the honey bees. This enzyme oxidises small quantities of glucose to glucolactone and gluconic acid. In addition, hydrogen peroxide is produced, which has been shown to be basis of heat sensitive antibacterial activity of honey. Anti bacterial activity of honey also observed even in the absence of this enzyme. Gluconic acid contributes a small to the taste of the honey. Values of pH are affected by the mineral content Calcium, Sodium, Potassium and

other ash contents (White, 1975) [8]. Accordingly relatively high pH values may occur in which honey types are rich in ash content.

pH : Eucalyptus > Syzygium > Momordica

V. CONCLUSIONS

From the above tables of acidity and pH → Syzygium is highly acidic when compared with Eucalyptus. Eucalyptus is more acidic than Momordica. Preservative characters of Syzygium is more when compare with other two floral i.e. Eucalyptus and Momordica. pH values are different from acidity of the floral honeys. Because pH influenced by the elemental composition of the honey.

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