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Influence of floral source on chemical properties of honey

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Honey is a natural sweet substance produced by honey bees from the nectar of blossoms or from secretions of living parts of plants or excretions which bees collect, transform and combine with specific substances of their own stored and leave in the comb to ripen and mature. Anonim, 1990. Honey is produced either from many flowers or from single flower. A single flower origin should assume a better quality of the product, it has a specific and well defined flavour and aroma indicating the presence of various components mainly dependent on the original sources of nectar. Besides this the honey is not 100 % unifloral because it contains various other floral sources in combination. The chemical composition of the honey shows differences depending on many factors. The most important of these is floral origin and also climatic conditions, capability of bees in making honey are the effective factors on the composition. Keskin, 1982, and the ability of the beekeepers White 1978.The diversity of the physical and chemical properties of honey like colour, flavour, moisture, protein and sugars etc. depends on the nectars and pollen of plants (Barth, 1989; White and Maker, 1980). Carbohydrates form nearly 95 % of honey. It mainly contains glucose and fructose Siddiqui and Furgula 1976. A number of investigations have been done related to physical and chemical composition of honey Anupama *et al.*, 2003; Mendes 1998; Terrab and Heredia, 2002. Melittopalynological studies are used to identify the plant source for the bees which provides the pollen and nectar source which provide the information needed in bee management and help in promoting the beekeeping development. Significant work has been reported by Suryanarayana 1992; Reddy and Reddy 2008; Tiwari *et al*. 2010.

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Material and Methods

For the present investigations seven honey samples were collected from the domesticated bee colony of *Apis cerana indica* from Nagpur region in 2009 and following parameters were studied.

Melittopalynological analysis: -10 gm of extracted honey was dissolved in 25 ml distilled water and centrifuged. The recovered sediment was treated with 5 ml of Glacial Acetic Acid and the mixture was subjected to

Acetolysis Erdtman, (1960). Three Pollen slides were prepared from each sample. The recovered pollen types were identified with the help of reference slides prepared from the local flora and relevant literature. The pollen types were identified to generic and specific levels. On the basis of presence of the pollens in the honey sample, the honey were designated as unifloral (exclusively with pollen grains of one taxa, and multifloral or mixed (with pollen grains of two or more than two taxa), Mithilesh Sharma, (1970).

Physicochemical Analysis

The water content of the sample was determined by the Digital Refractometer IHC, Bogdanov, (2002).The measurement of pH and determination of free acidity were performed at 20 ± 0.1°c on stirred solution (obtained after dissolving 10 gm of sample in the 75 ml distilled water by potentiometric titration with a 0.1M NaoH solution until pH reach 8.3 Bogdanov, (2002). Sugars was determined by using Titrematic method given by AOAC, (1990) and Indian Standards for extracted honey (1977). HMF concentration were determined according to the IHC methods.

S.No.	Sample	Moisture %	pH	Free acidity	Glucose %	Fructose %	HMF
1	*Azadiracta* honey	19.90%	4.1	22.9 meq/kg	24.50%	30.12 %	2.55mg/kg
2	*Eucalyptus* honey	19.50%	3.7	23.5meq/kg	31.50%	32.23%	-
3	*Mangifera* honey	19.80%	3.8	15meq/kg	23.80%	32.32 %	2.6 mg/kg
4	*Citrus* (Orange) honey	19.10%	3.4	22.6 meq/kg	31.70%	34.50%	5.98 mg/kg
5	*Schygium* (Jamun) honey	19.70%	3.7	30 meq/kg	29.10%	30.80%	4.50mg/kg
6	*Coriandrum* honey	19.60%	4.2	18 meq/kg	33.50%	42.52%	10.70 mg/kg
7	*Cajanus* honey	19.80%	4.1	25meq/kg	29.60%	32.50%	15.32 mg/kg

S.No.	Sample	Moisture %	pH	Free acidity	Glucose %	Fructose %	HMF
1	*Azadiracta* honey	19.70%	3.1	44.3meq/kg	21.30%	27.30%	180.6mg/kg
2	*Eucalyptus* honey	19.50%	3.4	87meq/kg	26.60%	29.20%	219mg/kg
3	*Mangifera* honey	19.70%	3.6	31.1meq/kg	21.07%	28.08%	82mg/kg
4	*Citrus* (Orange) honey	18.90%	3.2	55.5meq/kg	29.06%	30.80%	221mg/kg
5	*Schyzygium* (Jamun) honey	19.60%	3.5	55.2meq/kg	27.50%	29.80%	132.7mg/kg
6	*Coriandrum* honey	19.40%	3.9	24.2meq/kg	30.12%	40.10%	306mg/kg
7	*Cajanus* honey	19.70%	3.8	29.2meq/kg	27.30%	30.10%	420mg/kg

Pollen analysis of honey

Pollen contents of honey samples shows that the pollen types varies with the season. The

pollens of *Azadiracta indica, Eucalyptus sp., Mangifera indica, Citrus sinesis, Schyzygium cumini, Coriandrum indica and Cajanus cajan are* found to be predominant pollen and constitute the frequency more than 48 % in honey samples, so the honey samples are catagorised as unifloral honey and named after the predominant pollen type. The Cajanus honey was collected in January 09 while Coriandrum and Mangifera honey was obtained in February 09. The honey collected in March 09 showed Eucalyptus pollen predominance while that of April and May showed Citrus and Azadiracta predominance respectively.

Moisture

In the present study moisture content in the fresh honey sample ranges from 19.10-19.90 %. After storage the moisture % of honey ranges from 18.9 – 19.70 %. This result shows that there is a marginal decrease in the moisture percentage after storage. Moisture depends on the botanical origin of the sample, the degree of ripeness, processing techniques and storage conditions Instituto zooprofilalattica *et al*. (1991). All the value comes under the permitted values of IHC 2002.

PH

In the fresh honey sample pH value fell within the normal range i.e. 3.4 to 4.2 and after storage the pH ranges from 3.1 -3.9 which shows that the pH decreases after storage . The pH is of great importance during honey extraction and storage due its influence on texture, stability (Terrab *et al.*, 2003).

Free acidity

Free acidity of all fresh honey sample fell within the permitted ranges proposed by IHC (2002), with none one of them more than 50 meq/kg. The free acidity of honey samples in this study ranged from 15 to 30 meq/kg respectively (Table I) and after storage the free acidity of all samples were higher and ranges from 24.2 – 87 meq/kg (Table II).out of seven samples three samples shows the higher range which more than the 50 meq/kg. Free acidity values may indicate the fermentation of honey sugar by yeasts.

Sugars

Honey consists of mostly glucose and fructose. The actual proportion of fructose to glucose, in any particular honey, depends largely on the source of the nectar Anklam, (1998).The glucose level in seven fresh honey samples ranges from 23.80 – 33.50 % (Table-I) and after storage the value ranges from 21.07- 30.12 %. The fructose ranges from 30.12- 42.52% in fresh honey sample and after storage the values ranges from 27.30-40.10%, after storage the percentage of glucose and fructose reduces in all the samples and contained more fructose than glucose (Table-I&II); this indicates that Nagpur honeys would be less prone to granulation. Honey with high fructose to glucose ratios would remain liquid for longer periods White *et al*, (1962). The fructose/glucose ratios may have an impact on honey flavor, since fructose is much sweeter than glucose (Mead-chen, 1977).

HMF

The Hydroxymethyl furfural concentration is an important indicator of the freshness of honey .It is one of the chief products of carbohydrate degradation in food known as non-enzymatic browning. In all the seven

samples it was observed that the HMF values ranges from 1.01 to 13.5 mg/kg, this values was found to be well within the range allowed by IHC, 2002 for fresh honey sample. According to the IHC the HMF in honey sample should not be more than 40 mg/kg to 80mg/kg. After storage over a period of one year the samples shows, striking results for most of the samples where the values ranged between 82 to 420 mg/kg. The HMF formed slowly during storage and very quickly when heated.

Conclusion

The sugars i.e. glucose and fructose in the honey show a marginal decrease during the storage. The decrease in the fructose results in the reduction of texture and sweetness of stored honey. Maximum decrease in glucose was observed in *Azadiracta* honey while that of fructose decrease in Orange and Jamun honey.

The different types of honey showed difference in the increase of HMF. The increase was too high and much above the permitted level by IHC 2002, i.e. 40-80 mg/kg. *Cajanus* honey showed the greatest increased that is from 15.32-420 mg/kg. It is followed by *Coriandrum* honey that is from 10.7-306 mg/kg. The quality of honey decreases as the storage period increases. It may give negative impact in uses of honey.

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