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INVESTIGATION OF PHYSICO-CHEMICAL AND BIOACTIVE PROPERTIES OF HONEY FROM THE RAIGAD DISTRICT OF MAHARASHTRA STATE

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ABSTRACT

Honey is defined as the natural sweet substance produced by honey bees from the nectars of plant flowers and honey dew. The present paper deals with the investigation of physic-chemical and bioactive properties of different honey samples collected from different parts of the district. Raigad district shows presence of 15 tehsils. Honey samples from the wild were collected from all the 15 tehsils and investigation of parameters such as viscosity, specific gravity, electrical conductivity, glucose, sucrose, fructose, pH, colour intensity, moisture, ash, total protein content was done. The present study reveals that all the honey samples collected from 15 tehsils in the Raigad district of the Maharashtra State are of good quality and hence suitable for consumption. This type of study will definitely be helpful in understanding the characteristics of local honey and thus would help in commercialization of honey in the local market. Commercialization will lead to the skill development program among the individuals and thus will help in generating income thus contributing the economy of the country.

KEYWORDS: Honey, Physical properties, Chemical analysis, Wild sample.

INTRODUCTION

Honey is defined as the natural sweet substance produced by honey bees, from the nectars of plant flowers and honey dew (Codex Alimentations, 2001). Properties and compositions of bee honey depend on its geographical floral origin, season, environmental factors and treatment of beekeepers (Da Costa Leite *et al*., 2000; Kaškonienė *et al*., 2010 ; EL-Metwally, 2015). Bee honey is one of the few virtually totally non-allergic foods that body easily

assimilates. It contains nutrients especially as energy provider Rahman et al. (2010), it is a high-energy carbohydrate food (80–85%) and the honey sugars are easily digestible as those in many fruits (White and Doner, 1980). Bogdanov et al. (2004) found more than 22 sugars in honey; however, fructose and glucose are the major sugar content. Primary sugars existed in honey are fructose and glucose, and in nectar honey the fructose content should exceed that of glucose Zafar et al. (2008). Furthermore, the sum of fructose, glucose, fructose/glucose ratio and glucose/water ratio are other important factors related to honey quality. Fructose/glucose ratio indicates the ability of honey to crystallize (White and Doner, 1980; Manikis and Thrasivoulou, 2001; Kaškonienė *et al*., 2010 ; Buba *et al*., 2013). Honey contains more than 180 substances, including amino acids, enzymes, protein, vitamins, minerals, ash, organic acids and phenol compounds Ouchemoukh et al. (2007). Moisture content of bee honey represents a major importance to its stability against fermentation and granulation. The low moisture content protects honey from microbiological activity and thus it can be preserved for longer periods (AL-Naji and Hujazy, 1982; Cantarelli *et al*., 2008; Bogdanov, 2009; Buba *et al*., 2013 ; Akhtar *et al*., 2014 and El-Metwally, 2015).

Raigad district in the state of Maharashtra lies between 17°51′ - 19°80′ N latitude and 72°51′ - 73°40′ E longitude. It covers an area of 7162 sq. km. The district is bounded on the west by Arabian sea, Thane district lies to the north, Pune district to the east, Ratnagiri district to the south while Satara district shares a boundary in south-east. Raigad district forms an important part of the traditional Konkan region. There are several hill ranges stretching out from the main Sahyadri range which runs almost parallel to the west coast. On the north-east boundary of the district, the Sahyadri range is crossed by several passes or ghats. Interesting forest vegetation is reflected due to varied physiological, geological, edaphic and climatic conditions. Number of rivers and streams originate in the Sahyadri and flow towards the Arabian sea. The major rivers in the district are Ulhas, Patalganga and Amba in the northern part, Kundalika in central part and Savitri and Kal in the southern part. River Ulhasflows 21 kms in the district and enters in the region of Thane district. The district has 240 km long sea coast and has Bagmandala, Dighi (Shreevardhan), Revdanda and Revas (Alibag), Mora and Nhava-sheva (Uran) ports. Nhava-sheva is the most advanced port in India. Varied physiographical, geological, climatic and edaphic conditions are reflected in diverse vegetation types. A total of 2864 sq. km. area in the district is under forests. Raigad district consist of dark coloured volcanic lava flows and laterites. On plateau, basalt lava forms dominant ‘Basaltic composition’. Next to that is a little softer, purple to grayish, usually

showing rounded or elongated or tubular cavities and geode with infillings of secondary mineral occupying the portion of slopes and valleys. Soil in the district is Murum, grayish to dirty green in colour which on decomposition gives reddish-brown to black soil. Rice soil and coastal alluvial soils are also present. Raigad district has varied physiographical, geological, edaphic and climatic conditions and hence has developed interesting vegetation.

MATERIALS AND METHODS

Honey samples were collected from the wild from all the 15 tehsils of the Raigad district. For the collection of original wild honey localities with an adequate honey comb were finalized with the help of tribal people. All the samples were raw and unprocessed and collected from wall hives of *Apis dorsata*. The samples were collected in sterilized polythene bottles from the place of honey extraction. Honey was filtered through single thickness fine cloth for the removal of suspended particlessuch as dirt,beewax, and other impurities. Later on it was stored in airtight containers at room temperature. The collected samples were analyzed for physico-chemical and bioactive properties like pH, electrical conductivity, colour intensity, moisture, ash content, total protein content, glucose, fructose, sucrose, viscosity and specific gravity.

RESULTS AND DISCUSSION

pH: pH of all the samples from the district shows a range between 4.34±0.01 to 6.10±0.04. The pH values of all the 15 samples were measured and it has been found that the pH values are within the standard limits (pH 3.40 to 6.10) (Codex Alimentations, 2001). This within the limit result ensures the honey samples freshness. (Table number 1).

Electrical Conductivity (EC): EC of all the samples ranges between 0.36±0.03 to 3.05±0.01. The electrical conductivity of seven samples is within the limits (not more than 0.8ms/cm). (Table number 1).

Colour Intensity: Highest colour intensity is 632±1.14 and 268±1.19 is the lowest. Result shows that there is no significant difference in all the 15 samples. (Table number 1).

Moisture Content: The range of the moisture in all the 15 samples is between 12.14±0.28 to 19.54±0.24. The higher the moisture content is the higher probability of honey fermentation during storage. Lower moisture limits (<20%), elongates honey shelf life which would be met by a large majority of the commercial honeys (Codex Alimentations 2001). Moisture content

depends on the temperature and relative humidity in the geographical origin during honey producing in honey colonies (Crane 1979). (Table number 1).

Ash: Ash content for all the samples is within the acceptable limit (1.02±0.03 to 1.20±0.02) except sample number 14 collected from the Shreevardhan tehsil which is 1.32±0.01. (Table number 1).

Total Protein Content: Total protein content of all the samples ranges between 1.12±0.0172 to 1.98±1.28. There is no any significant difference between all the honey samples. (Table number 1).

Sugar Composition: Glucose content ranges between 11.43±0.36 to 32.44±0.63; Fructose content ranges between 12.39±0.71 to 61.23±0.92 and Sucrose content ranges between 1.19±0.85 to 4.12±0.99. The result proves that Glucose and Fructose are the dominant sugars in honey samples. (Table number 2).

Specific Gravity: Specific gravity of the honey is always greater than the water. The range is between1.3259 to 1.4067. (Table number 2).

Viscosity: The range of viscosity is between 10 to 30 poise. (Table number 2).

Table no. 1: Physico-chemical characteristics of honey samples.

Sr. No.	Sample ID	pH	EC (ms/cm)	Colour intensity	Moisture (g/100g)	Ash (g/100gm)	Total protein (mg/g)
1	RGDSUD01	4.34±0.01	1.92±0.02	412±1.03	16.31±0.34	1.17±0.01	1.12±0.0172
2	RGDKHA01	5.12±0.03	0.67±0.03	356±1.12	15.44±0.36	1.02±0.03	1.69±0.034
3	RGDPAN01	4.93±0.02	0.98±0.02	527±1.32	13.66±0.42	1.14±0.04	1.84±0.069
4	RGDKJT01	5.34±0.06	0.73±0.03	632±1.14	16.32±0.24	1.06±0.02	1.23±0.125
5	RGDURN01	6.10±0.04	1.65±0.06	439±1.62	16.96±0.68	1.06±0.02	1.52±0.534
6	RGDPEN01	5.91±0.03	0.68±0.05	489±1.98	15.63±0.14	1.09±0.01	1.64±0.231
7	RGDROH01	5.68±0.05	0.77±0.06	532±1.14	18.34±0.63	1.05±0.02	1.23±0.069
8	RGDMUR01	5.36±0.05	0.75±0.04	631±2.03	12.61±0.25	1.12±0.01	1.86±0.128
9	RGDALI01	5.13±0.03	1.26±0.09	523±1.12	12.36±0.24	1.07±0.03	1.32±0.137
10	RGDMNG01	5.34±0.05	1.98±0.02	498±1.16	14.63±0.32	1.20±0.02	1.45±0.136
11	RGDTLA01	6.01±0.04	3.05±0.01	268±1.19	18.21±0.12	1.11±0.02	1.24±0.127
12	RGDMHD01	5.99±0.07	0.36±0.03	365±1.58	16.31±0.32	1.12±0.02	1.63±0.099
13	RGDPLD01	4.91±0.08	2.34±0.06	469±2.31	19.54±0.24	1.12±0.01	1.25±0.096
14	RGDSHR01	5.65±0.06	2.63±0.08	621±2.65	12.14±0.28	1.32±0.01	1.29±1.02
15	RGDMHS01	5.69±0.09	1.25±0.02	631±1.69	12.32±0.19	1.14±0.03	1.98±1.28

Table no. 2: Sugar composition, specific gravity and viscosityof honey samples.

Sr. No.	Sample ID	Glucose g/100g	Fructose g/100g	Sucrose g/100g	Specific gravity	Viscosity
1	RGDSUD01	26.32±0.69	53.21±0.78	2.96±0.93	1.3651	25
2	RGDKHA01	11.43±0.36	61.23±0.92	2.67±0.08	1.3987	16
3	RGDPAN01	19.63±0.73	21.36±0.68	3.31±0.26	1.3289	10
4	RGDKJT01	22.34±0.21	25.44±0.34	4.12±0.99	1.3264	10
5	RGDURN01	24.52±0.63	42.69±0.99	1.19±0.85	1.3975	16
6	RGDPEN01	13.11±0.98	51.36±0.97	2.25±0.75	1.3742	10
7	RGDROH01	21.96±0.31	12.39±0.71	3.39±0.63	1.3693	16
8	RGDMUR01	18.16±0.52	19.81±0.63	3.87±0.85	1.3259	16
9	RGDALI01	32.44±0.63	47.75±0.52	3.64±0.64	1.3658	16
10	RGDMNG01	25.32±0.12	52.36±0.62	2.98±0.29	1.3398	30
11	RGDTLA01	21.52±0.09	46.28±0.23	2.34±0.87	1.3759	25
12	RGDMHD01	13.68±0.52	26.51±0.58	3.89±0.64	1.3496	10
13	RGDPLD01	16.37±0.42	13.02±0.82	3.85±0.54	1.3289	10
14	RGDSHR01	26.31±0.61	14.65±0.77	3.25±0.63	1.4167	30
15	RGDMHS01	27.41±0.67	59.35±0.29	3.67±0.52	1.3956	16

CONCLUSION

The present study reveals that all the honey samples collected from 15 tehsils in the Raigad district of the Maharashtra State are of good quality and hence suitable for consumption. This type of study will definitely be helpful in understanding the characteristics of local honey and thus would help in commercialization of honey in the local market. Commercialization will lead to the skill development program among the individuals and thus will help in generating income thus contributing the economy of the country.

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REFERENCES

1. Akhtar et al., 2014. S. Akhtar, J. Ali, B. Javed, S. Hassan, S. Abbas, M. Siddique. Comparative physiochemical analysis of imported and locally produced Khyber Pakhtunkhwa honey. Global J. Biotechnol. Biochem., 2014; 9(3): 55–59.
2. AL-Naji and Hujazy, 1982. L.K. AL-Naji, I.M. Hujazy. Microorganisms of ripe honey produced in northern Iraq and their effects on its physical properties. Zanco (Iraq), 1982; 8: 3–16.

3. Bogdanov et al., 2004. S. Bogdanov, K. Rouff, L.P. Oddo. Physico-chemical methods for the characterization of unifloral honey: a reviewApidologie, 2004; 35(4): 275–282.
4. Codex Alimentations, 2001.Draft revised standard for standard for honey (at step 10 of the Codex procedure) Alinorm, 2001; 01(25): 19–26.
5. Crane, 1979. Honey: A Comprehensive Survey. Heinemann, London (1979) pp. 608
6. Da Costa Leite et al., 2000. J.M. Da Costa Leite, L.C. Trugo, L.S.M. Costa, L.M.C. Quinteiro, O.M. Barth, V.M.L. Dutra. Determination of oligosaccharides in Brazilian honeys of different botanical origin. Food Chem., 2000; 70: 93–98.
7. EL-Metwally, 2015. EL-Metwally, A.A.E., 2015. Factors Affecting the Physical and Chemical Characteristics of Egyptian Beehoney. Ph. D. Thesis, Fac. Agric. Cairo Univ., 2015; 320.
8. Kaškonienė et al., 2010. V. Kaškonienė, P.R. Venskutonis, V. Čeksterytė. Carbohydrate composition and electrical conductivity of different origin honeys from Lithuania LWT – Food Sci. Technol., 2010; 43: 801–807.
9. Manikis and Thrasivoulou, 2001Manikis, A. Thrasivoulou. Relation of physicochemical characteristics of honey and the crystallization sensitive parameters.Apiacta, 2001; 36: 106–112.
10. Ouchemoukh et al., 2007. S. Ouchemoukh, H. Louaileche, P. Schweitzer. Physicochemical characteristics and pollen spectrum of some Algerian honeys.Food Control, 2007; 18: 52–58.
11. Rahman et al., 2010. M.M. Rahman, R. Allan, M.S. Azirun. Antibacterial activity of propolis and honey against *Staphylococcaureus* and *Escherichia Coli*.Afr. J. Microbiol. Res., 2010; 4: 1872–1878.
12. White and Doner, 1980. White, J.W., Doner, L.W., 1980. Honey Composition and Properties: Beekeeping in the United States. Agriculture Handbook No. 335: 82–91.
13. Zafar et al., A. Zafar, M. Safdar, N. Siddiqui, A. Mumtaz, T. Hameed, M.U. Sial, 2008.
14. Chemical analysis and sensory evaluation of branded honey collected from Islamabad and Rawalpindi market. J. Agric. Res., 2008; 2: 86–91.