

Physicochemical analysis and sensory evaluation of different samples of honey collected from northern areas of Pakistan

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Abstract: Twenty samples were studied to determine the sensory evaluation and to identify the physicochemical characteristics of honey samples produced in the northern areas of Pakistan. All the samples were analyzed for moisture %, ash %, and total acidity, reducing sugar %, non reducing sugar %, diastase activity and HMF. Sensory evaluation was performed according to nine point hedonic scales. According to the values of studied quality parameters, samples from Chitral areas judged to be of higher quality. Four samples were found adulterated with sucrose.

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INTRODUCTION

Honey is a sweet, viscous liquid that bees produce from nectar collected from plant nectaries and store as food. Honey is an easily digestible foodstuff that contains a range of nutritionally important compounds¹. The major components of honey include various saccharides, water, amino acids, mineral matter, proteins, vitamins, and unstable compounds such as enzymes². Significant differences exist between honey brands in terms of flavor and aroma profiles³.

Honey undergoes changes during storage, leading to darkening and loss of aroma and flavor. It is therefore important to monitor its quality attributes from time to time. Hydroxymethylfurfural (HMF) is a cyclic aldehyde that is produced by degradation of sugars. HMF and diastase number have been widely used both to predict honey freshness and to evaluate its quality upon treatments such as overheating, storage abuse, and adulteration with syrup⁴.

Honey is regaining recognition for its medicinal effects. Increasing problems related to adulteration and tampering with natural honeys sold on retail markets encouraged us to conduct this evaluation of locally produced honeys available in the Northern areas. This study summarizes the present state of knowledge on the quality of honey brands sold or produced in the northern areas.

MATERIALS AND METHODS

Twenty honey samples were used for sensory evaluation and physicochemical analysis. All the samples were purchased from the markets of Northern areas of Pakistan. Each sample was mixed thoroughly and stored in glass bottle at room temperature till the final analysis. All samples varied in terms of origin and were coded as shown in table 1. The samples were analyzed in the food

chemistry laboratory of PCSIR for quality parameters like moisture %, ash %, acid content, reducing sugars %, non reducing sugar %, diastase activity and HMF. Sensory evaluation of all the samples were also carried out by a panel of trained food scientists according to nine point hedonic scales. The moisture content of the test samples was determined with the help of an oven at a constant temperature of 100⁰C through calculation of weight loss at 100⁰C for three hours. Ash contents was determined through ignition of honey samples in a muffle furnace at 550⁰C to a constant weight. Reducing sugars and non reducing sugars were determined according to the methods described by J.A. Ruck (1963)⁵. HMF was determined by the method of Wrinkler (1955)⁶. Acidity was determined by the method given in A.O.A.C. (2000)⁷. Diastase activity was determined by the method described in Pearson's chemical analysis of food (1981)⁸. All the tests were carried out in triplicate and all the chemicals used were of analytical grade.

RESULTS AND DISCUSSION

Tables 1 and 2 show the results of physicochemical and sensory evaluations of all the twenty samples collected from northern areas of Pakistan. Significant difference was found in the in terms of physicochemical properties ,color, aroma, thickness, mouth feel , taste, and aftertaste .From the results it is very clear that the honey samples collected from Chitral and Gilgit are of superior quality then that of other northern areas mentioned in the research. All the quality parameters of honey samples from these two areas were with in the permissible limits defined by codex alimenatrious commission⁹. Chitral honey samples also show good performance in term of mouth feel and aroma. It is perhaps due to its ideal diastase no. and HMF value that lie between the range 16-23 and 1.15-6.0 respectively as shown in table1.

Table 1: Physicochemical analysis of different samples of honey collected from northern areas of Pakistan.

Sample No.	Moisture %	Ash %	Total acidity meq/kg	Total Sugars	Reducing Sugars	Non Reducing Sugars	Diastase activity No.	HMF mg/kg
1	14.62	0.08	29	77.6	76.55	1.05	27	1.15
2	12.77	0.05	25	79.0	77.0	2.0	23	5.0
3	14.63	0.26	28	76.33	72.0	4.33	16	6.0
4	12.80	0.14	22	79.74	77.37	2.37	16	2.90
5	13.50	0.10	24	78.0	76.0	2.0	18	5.0
6	17.0	0.20	7.20	77.80	72.96	4.84	6	11.0
7	16.13	0.63	6.50	77.87	75.66	2.21	9	9.0
8	15.0	0.55	7.80	79.0	76.80	2.2	11	7.50
9	14.50	0.49	10.50	80.50	77.50	3.0	10	11.60
10	14.80	0.61	12.60	76.50	74.0	2.5	12	12.0
11	14.03	0.95	20.0	81.0	70.0	11.0	3	38.0
12	16.0	0.50	12.50	75.26	70.57	4.69	12	8.50
13	15.0	1.0	16.0	70.0	55.0	15.0	2	28.0
14	18.0	0.30	27.0	76.0	71.0	5.0	20	5.50
15	19.0	0.70	32.0	73.46	71.26	2.2	18	6.0
16	18.50	0.85	38.0	74.70	58.70	16.0	7	20
17	19.50	0.89	25.0	79.30	64.0	15.30	3	18
18	19.0	0.55	16.0	78.3	76.0	2.3	12	2.3
19	16.85	0.40	7.0	73.50	70.0	3.0	14	41
20	18.75	0.53	10.0	71.86	65.0	6.86	13	6

Chitral, S.No.1-5; Gilgit, 6-10; Hunza, 11-15; Skardu, 16-20.

Table 2: Sensory evaluation of different samples of honey collected from northern areas of Pakistan.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Color	7	8	7	8	9	7	6	7	7	7	8	7	7	8	7	8	7	8	9	7
Aroma	8	7	8	8	8	8	8	8	7	8	7	7	7	7	6	7	7	6	7	8
Taste	8	8	7	7	8	7	7	6	7	7	6	8	7	7	7	6	6	7	8	7
Mouth feel	7	8	7	8	8	7	8	6	8	8	6	7	6	7	7	5	7	6	7	7
Aftertaste	9	7	6	8	8	7	7	7	7	7	7	7	6	7	7	6	7	7	7	8
Acceptability	9	8	7	8	9	7	7	6	7	8	6	7	6	7	7	6	7	7	7	8

1=Extremely dislike, 2 = Strong dislike, 3 = Moderate dislike, 4 = Slight dislike, 5 = Neutral, 6 = Slight like, 7 = Moderate like, 8 = Strong Like, 9 = Extremely like

The results of quality parameters of honey samples proved that honey samples collected from Chitral and Gilgit are free from any type of adulteration and after taste. Four samples (S.No.11, 13, 16, 17) out of twenty do not lie with in the permissible limits. Two samples from Hunza and two samples from Skardu were found to be adulterated with non reducing sugars i.e. Sucrose. These samples violated the standards values in term of non reducing sugars. Same samples also gain the low sensory scores as compared to others honey samples but remain still within acceptable range as shown in table 2. HMF values of these samples are also more as compared to that of others samples which is again an indication of adulteration. Rest of all the samples from Hunza and Skardu were found to be following the standards values defined by the codex alimenatrious commission. From the above discussion and tabulated results, we can say that sensory evaluation is not a sole criteria to fit or unfit a product but it helps to decide about the purity and

quality of the product along with physicochemical analysis. All the values of above physicochemical results were also within the reference ranges reported for European and American honeys by Crane 1980¹⁰; Manikis and Thrasivoulou, 2001¹¹; Anonn, 2001-2004¹²; Tchoumboue Joseph, 2007¹³.

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