

Quality evaluation of different honey samples produced in NWFP

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Abstract: The present study was carried out to determine different honeys available in different areas of NWFP for their quality evaluation. Physicochemical, microbiological and sensory evaluation analysis were carried out and compared with Codex Alimentarius Commission and European Union Council Directive. The ranges of different parameters are 66.27%-81.10% total sugar, 60.30%-76.60% reducing sugar, 05.78%-09.90% non-reducing sugar, 12.00% -19.55% moisture, 0.65%-1.99% ash, 08.52m.eq/kg-20.22m.eq/kg acidity and 09.42 mg/kg-23.21mg/kg hydro-oxy-methyl furfural. Total Coliform bacteria were absent in all the analyzed samples. Total plate counts were present in Chitral (2cfu/g), Tarnab (1cfu/g) and Rehman (3cfu/g). All the honey samples indicate that a good Sensory evaluation and Karak honey showed the highest sensory quality. The results indicate that all the samples satisfy the standards limits for all the parameters, but proper handling and storage was advised. The overall results show that the honeys available and consumed in different areas of NWFP are of good quality.

Key words: Chemical analysis, honey quality, microbiological analysis, sensory evaluation.

Received: November 10, 2009 **Accepted:** January 13, 2010

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INTRODUCTION

Honey, one of the major bee products, is made from the nectar of plants. It contains amino acids, minerals, vitamins, sugar, etc. Honey is widely used in food, sweetening, medicine, etc¹. Honey is produced in almost every country of the world and it is very important energy food. Honey cannot be considered a complete food by human nutritional standards, but it does offer potential as a dietary supplement. For infants, senior citizens and invalids, honey can be more easily digested and a more palatable carbohydrate food than saccharose by itself². Food processors are known to use honey in many different food products thus: sweetness, functional advantages (viscosity, flavour hygroscopic miscibility spread ability and colour) and as natural appeal³. Many scientists have reported physical and chemical properties of different types of honey. Effects of principal chemical constituents on the quality of honey have been reviewed⁴. In another study⁵ found that viscosity, red component, percent acidity and sucrose content were the major physicochemical variables contributing to the grouping of honey samples.

The primary sources of microbial contamination are likely to include pollen, the digestive tracts of honeybees, dust, air, dirt and flowers. Secondary sources of microbes in honey are likely to be the same as for other foods⁶. Many microorganisms are associated with specific foods or components of the ecosystem⁷. Recently, there is a worldwide increasing demand by consumers to natural foods and foods claimed to enhance human health. Honey has a priority in this concern as it contains oligosaccharides (known as a bifidogenic factor) beside a wide range of other valuable nutrients. Its use to formulate both probiotic dairy

and other food products is a subject for current research work. Therefore, the present investigation was planned to study the chemical composition, microbiological qualities and provide a useful data to the honey exporter.

MATERIALS AND METHODS

Collection and preparation of samples

Most of the samples were obtained directly from producers in different areas of NWFP. Five samples of locally produced honey collected from the market. Each sample was mixed thoroughly and kept in glass containers at room temperature till final analysis was carried out.

Physicochemical analysis

pH was assessed by means of a potentiometric WTW 315 I Set Sentix 41 Electrode pH meter. Moisture in honey was determined with a Refractometer reading at 20°C and obtaining corresponding % moisture⁹. Ash percentage was measured by calcinations, overnight in a furnace at 550°C, to constant mass⁹. Hydroxymethylfurfural (HMF) was determined after clarifying samples with Carrez reagents (I and II) and the addition of sodium bisulphate⁸. The absorbance was determined at 284 and 336nm in a 1cm quartz cuvette in a spectrophotometer (Milton Roy UV-Vis Spectronic 3000 Array). Total sugar, reducing sugar, sucrose, acidity TSS and Refractive index were determined according to the methods¹⁰.

Microbiological analysis

Moulds-yeasts, total bacteria and Coliform bacterial content were determined according to the methods¹¹ with potato dextrose agar, plate count agar and violets red bile agar (Merck). The results were calculated as cfu/g.

Table 1: Chemical analysis of honey samples produced in NWFP.

Chemical analysis	Karak	Chitral	Tarnab	Samarat	Rehman
Moisture%	*18.61±**1.2	13.53±2.1	15.61±	19.55±	12.01±
Ash%	0.99±0.01	0.66±0.08	0.66±0.09	0.65±0.01	1.99±0.11
Total Sugar%	80.85±3.2	71.11±1.5	81.12±3.65	72.42±3.2	66.27±3.3
Reducing Sugar%	73.13±1.4	65.12±2.3	76.61±3.2	62.51±3.2	60.31±4.3
Sucrose%	7.92±3.6	5.78±2.2	4.51±0.9	9.91±1.09	6.14±1.76
Acidity (m.eq/Kg)	10.51±4.1	12.11±3.8	12.97±2.1	8.52±1.3	20.22±1.7
HMF (mg/Kg)	9.98±1.6	23.21±1.9	9.4±0.5	9.51±1.7	19.22±1.8
TSS	72.41±1.5	75.92±1.7	74.41±6.4	78.51±1.7	81.82±5.2
Refractive Index	1.478±0.3	1.498±0.12	1.491±0.1	1.493±0.4	1.497±0.1
pH	4.81±2.3	3.81±1.43	5.32±1.1	6.76±0.5	3.82±0.7

*Arithmetic mean of triplicate determination

**SD of triplicate results

Sensorial evaluation

The sensorial evaluation was done by untrained panelists (n=35). A 9-point hedonic scale was employed, ranging from 1 (most disliked) to 9 (most liked), for the parameters color, odor, taste and consistency^{12,13}.

RESULTS AND DISCUSSION

Moisture content of honey is related to its degree of fermentation. The control of water content is an important requirement of proposed Codex Alimentarius standards for honey¹⁴. Which sets up upper limits for moisture of 21% for honey in general all of the samples examined contained moisture content within the standards limits. The moisture content of locally produced honey was in the range of 12.00% to 19.55%. According to the present results the difference between moisture content of different locally produced honey brands were non-significance. Our results are similarly with those of reported¹⁵ the moisture content of Pakistani honey to be range of 12.76%-18.90%. Certain nitrogen compounds, minerals, vitamins, pigments and aromatic substances contribute to the ash content of honey. The ash content of honey averages about 0.212% of its weight, but varies widely from 0.22% to over 1.0%. Codex Alimentarius standards for honey¹⁴, Proposed ash content not more than 0.6% for normal honey. The ash content of locally produced honey samples ranged between 0.65%-1.99%. These results are in line with those¹⁶ who reported ash content of honey samples to be within the range of 0.1-1.2%. The flavor of honey results from the blending of many notes, not the least being a slight tarness or acidity. It also gives some history of the samples. It is thought that high acidity figure may mean that honey had fermented sometimes and the resulting alcohol had been changed to acetic acid by bacterial action. The limit quoted in the proposed codex regulation for acidity is not more than 40 mill equivalent acid per 1000 of honey as determined by

Statistical analyses

The data reported are averages of triplicate observations. The data were subjected to statistical analyses using Minitab statistical software (10.00).

direct titration. The acid content of locally produced honey were in the ranged between 08.52 m.eq kg⁻¹-20.22 m.eq kg⁻¹.

HMF compound is formed by the decomposition of fructose in the presence of acid. Small amount of HMF (0.06-0.2 mg/kg) is present naturally even in fresh honeys. Codex Alimentarius Standards 2001 of honey proposed a limit of 40 mg/kg as an indication of heated honeys and content more than 100 mg/kg is taken to indicate adulteration with invert sugar. The HMF contents of locally produced honeys ranged between 09.42-23.21 mg/kg. All of the samples meet the HMF standards for quality. Previously¹⁷ analyzed 118 honey samples for HMF content and reported that 32 samples had HMF content below 15 mg/kg.

Table 2: International standards for honey.

Quality parameters	Codex	EU
Ash (%)	<1.0	<1.2
Moisture content%	<21g/100g	<21g/100g
Acidity (m.eq/Kg)	<50m.eq./kg	<40 m.eq./kg
HMF (mg/kg)	<80mg/kg	<40mg/kg
Diastase Activity	>8	>8
Reducing Sugar (%)	>60%	>60%
Sucrose (%)	<5%	<5%

Codex= Codex Alimentarius Standards for Honey

EU=European Union Council Directive

In nearly all honey samples two important monosacharides glucose and fructose predominate, which are defined as reducing sugar and accounts for around 75% of honey. According to Codex Alimenatrius 2001 a minimum reducing sugar content of 65% is required for flower honey and 60% for honeydew honey.

Table 3: Microbiological analysis of honey samples produced in NWFP.

Microbiological analysis	Karak	Chitral	Tarnab	Samarat	Rehman
Total Plate Count *(CFU/g)	Nil	2	1	Nil	3
Total Coliform Bacteria	Nil	Nil	Nil	Nil	Nil
Yeast and Mould * (CFU/g)	Nil	Nil	2	Nil	2

*CFU= colony forming unite

Table 4: Sensorial evaluation of honey samples produced in NWFP.

Sensorial Quality	Karak	Chitral	Tarnab	Samarat	Rehman
Color	7.2	6.5	6.8	6.6	6.7
Odor	7.1	6.7	6.9	6.5	6.8
Taste	7.5	7.2	7.1	6.8	6.4
Consistency	7.4	6.7	6.8	6.1	6.4

The results of the analysis showed that the reducing sugar content of honey ranged between 60.31% to 66.61% for the tests samples of locally produced honeys met the quality standards for reducing sugar. These results are a close agreement with that of¹⁸ who also reported that reducing sugar in honey were in the ranged of 60% to 65%. The Karak sample was found a higher content of total sugar (80.85%), the lowest total sugar content was found in Rehman honey sample 66.27%. The other value for Chitral, Tarnab and Samarat were 71.11%, 81.12% and 72.42% respectively.

The sucrose cont of the analyzed honey samples showed that Samarat were found the higher content of sucrose as compared the rest of the analyzed samples. Tharnab sample showed the lowest content of sucrose 4.51%. The results of Total Soluble Solids (TSS) showed that high TSS was found in Rehman 81.82, followed the samples Samarat, Chitral, Tarnab and Karak were 78.51%, 75.92%, 74.415 and 72.41% respectively. No significance difference was found in all the analyzed samples for the results of Refractive index.

The pH value of honey samples produced in NWFP are in the ranged of 3.81-6.76 as it shown in Table 1. The results of microbiological analysis of honey samples were shown in table 3. No total Coliform was found in any analyzed samples. The results of total plate count showed that Chitral samples were found 2cfu/g, Tarnab was 1cfu/g and Rahman was 3cfu/g and nil results in samples Karak and Samarat calculated.

The results of Sensorial evaluation of honey samples were shown in Table 4 and observed that Karak sample was found the best, followed by Tarnab, Chitral, Rahman and Samarat.

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