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Quality Evaluation of Different Honey Samples Produced in Peshawar Valley

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Abstract: The present study was designed to evaluate different honey samples obtained from local market for their quality parameters for assessment of their feasibility for foreign export by comparing it with international standards. The study was conducted at PCSIR laboratories complex, Peshawar, during 2006. The tested samples were evaluated for moisture content, Ash percentage, acid content, HMF and reducing sugars percentage. The moisture content of locally produced honey was in the range of 14.5 to 18.23%. The ash content of locally produced honey samples ranged between 0.047-0.35 which is within the standard limits. The acid content of the honey samples ranged between 19.5 and 38.0 meq kg⁻¹. The HMF contents of locally produced honeys ranged from 5.3 to 23.20 mg kg⁻¹. The content of reducing sugar of the tested samples ranged between 43.14 and 81.40% for the tested samples of locally produced honey. All of the samples were found to be in acceptable range of international standards for all of the tested parameters except for only one sample with lower reducing sugars. These samples were marked to be according to the international standards and are healthy for human consumption.

Key words: Honey, Peshawar, moisture content, HMF

INTRODUCTION

Honey export is an important trade in the World market. The leading honey-producing countries are the USA, Canada, Australia, Argentina, Mexico and China. The contribution of Pakistan is highly insignificant. NWFP has good global position and climate conditions for producing the honey and exporting it to Western countries and Middle East. In order to have a respectable place in the world market of honey, our local honey must fulfill international quality standards.

Different kinds of honey differ for their color, flavor and density. However, the quality of honey produced, matters to a great extent (Krell *et al.*, 1989). Only slight deviation in the color, flavor and aroma from the usual quality associated with the brand can cause the product to be rejected by the consumer. In order to have uniform standard of honey, an International Honey Commission (IHC) was found in 1990. Its main objective was to revise the methods and standards for honey.

International honey standards are specified in a European Honey Directive and in Codex Alimentarius Standard for honey. According to the definition of Codex Alimentarius Commission Standards (2001), honey shall not have added any food ingredient other than honey to

it, nor shall any particular constituent be removed from it. Honey shall not have any objectionable matter, flavor aroma or taint from foreign matter during its processing and storage with no fermentation or effervescence. No pollen or constituent particular to honey may be removed except where this is unavoidable in the removal of foreign or organic matter. Honey shall not be heated or processed to such an extent that its essential composition is changed and/or its quality impaired.

Certain quality parameters are used to determinate honey quality. Countries strictly following certain these quality standards earn an appreciable amount of foreign exchange through honey export. The most important is the water-sugar relationship due to its effect on silty against fermentation and granulation (White, 1978). Sugars are the principal constituents of honey, which aside from determining its nutritious and energetic value, also influences some of its important physical characteristics such as crystallization, hygroscopicity and viscosity. Ash value indicates the botanical origin; the blossom honey has lower mineral content than honeydew honey. Temperature effect is recognized by the production of 5-hydroxymethyl furfural (HMF). The HMF is inversely proportional to the quality of honey, which depends on pH and moisture value of honey, heat

process after harvesting and storage time temperature. Since Hydroxyl Methyl Furfural (HMF) is formed during acid hydrolysis of sucrose, the presence of high levels of this compound suggests the possibility that the honey has been adulterated with invert syrup (Swallow and Low, 1994).

The present study was conducted to assess quality of different honey samples produced in Peshawar valley, using for quality parameters for assessment of their feasibility for foreign export through comparison with international standards.

MATERIALS AND METHODS

The present internship was designed to evaluate different honey samples obtained from local market for their quality parameters so that to assess their feasibility for foreign export by comparing it with international standards. The study was conducted at Pakistan Council for Scientific and Industrial Research laboratories complex, Peshawar, during 2006.

Sample collection and preparation: Honey samples were obtained directly from producers in Peshawar valley. Ten samples of locally produced honey were collected from the market and were named as HS-1 through HS-10, where HS refers to Honey Sample and the number shows the sample number. Each sample was mixed thoroughly and kept in glass containers at room temperature till final analysis was carried out.

Sample analysis: The collected samples were analyzed in the Food Chemistry lab of PCSIR for quality parameters i.e., moisture content, Ash percentage, acid content, HMF and reducing sugars percentage. Samples were analyzed for the above parameters according to the standard methods mentioned in Codex Alimentarius Commission Standards (2001).

The moisture content of the test samples was determined with the help of Oven at a constant temperature of 100°C through calculation of weight loss at 100°C for 3 h. Ash content was determined through ignition of honey samples in a muffle furnace at 550°C to a constant weight. Reducing sugars and non-reducing sugars were determined according to the standard method of Codex Alimentarius Commission Standards (2001). HMF was determined by the method of Winkler (1955). Acidity was following standard method of Codex Alimentarius Commission Standards (2001). The data was determined in triplicate for each sample and was then analyzed for differences using F-test appropriate for Completely Randomized Design.

RESULTS AND DISCUSSION

The results of moisture, ash, acidity, reducing sugar and Hydroxyl Methyl Furfural (HMF) contents of locally produced honey are discussed here:

Moisture (%): The moisture content of honey is related to its degree of fermentation. The control of the water content is an important requirement of proposed Codex Alimentarius Commission Standards for honey (2001), which sets an upper limit for moisture of 21% for honey in general. All of the samples examined contained moisture content within the standard limits. The moisture content of locally produced honey was in the range of 14.5 to 18.23% (Fig. 1). According to the present results the differences between moisture content of different locally produced honey brands were non-significant. Present results are similar with those of Latif *et al.* (1956) who have reported the moisture content of Pakistani honey to be within the range of 14.3 and 18.6%. Similarly, Duthil (1983) has also assessed different honey samples for their moisture content and reported their moisture content to be within the standard limits.

Ash (%): Certain nitrogen compounds, minerals, vitamins, pigments and aromatic substances contribute to the ash content of honey. The ash content of honey averages about 0.2122% of its weight, but varies widely from 0.02 to over 1.0%. Codex Alimentarius Commission Standards (2001) for honey, proposed ash content not more than 0.6% for normal honey. The ash content of locally produced honey samples ranged between 0.047-0.35 which is within the standard limits (Fig. 2). These results are in line with those of Cranel (1976) who reported ash content of honey samples to be within the range of 0.1-1.0%. Similarly, Mclellan (1975) evaluated honey samples for their ash content and different minerals.

Acidity (meq kg⁻¹): The flavor of honey results from the blending of many notes, not the least being a slight

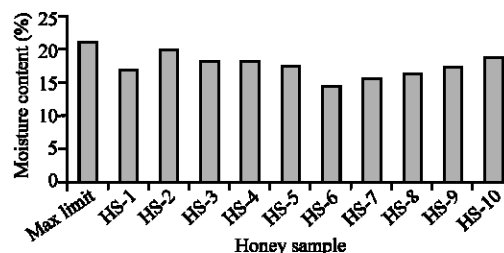


Fig. 1: Moisture content (%) of different honey samples locally produced in Peshawar valley

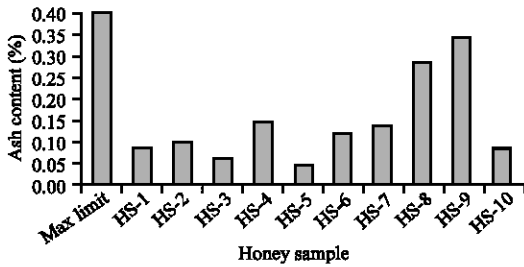


Fig. 2: Ash content (%) of different honey samples locally produced in Peshawar valley

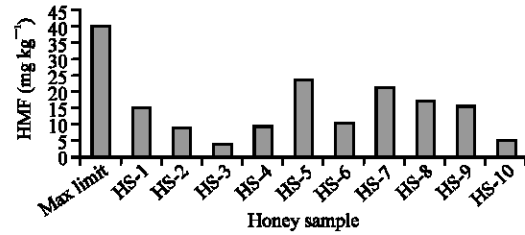


Fig. 4: HMF (mg kg⁻¹) of different honey samples locally produced in Peshawar valley

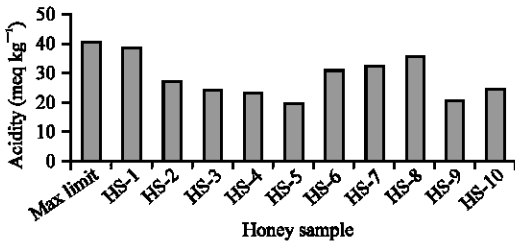


Fig. 3: Acidity (meq kg⁻¹) of different honey samples locally produced in Peshawar valley

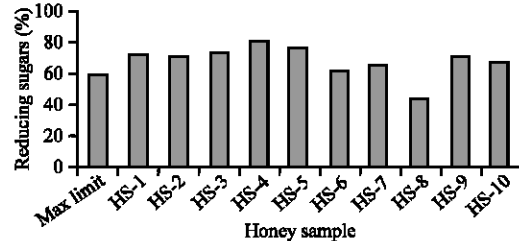


Fig. 5: Reducing sugars (%) of different honey samples locally produced in Peshawar valley

tartness or acidity. It also gives some history of the sample. 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 regulations for acidity is not more than 40 meq. acid per 1000 of honey as determined by direct titration. The acid content of locally produced honey is shown in the les, which ranged between 19.5 and 38.0 meq kg⁻¹ (Fig. 3). None of the samples examined had titrable acidity more than the proposed limits. Our results are endorsed by those of Latif *et al.* (1956) who also reported formic acid content of Pakistani honey to be within the permissible limits of international standards. Similarly, Stinson *et al.* (1960) evaluated honey samples for their acid components and found these to contain butyric, acetic, formic, lactic, succinic, pyroglutamic, malic and citric acids.

HMF (mg kg⁻¹): This compound is formed by the decomposition of fructose in the presence of acid. Small amount of HMF (0.06-0.2 mg kg⁻¹) is present naturally even in fresh honeys. Codex Alimentarius Commission Standards (2001) of honey proposed a limit of 40 mg kg⁻¹ as an indication of heated honeys and content more than 150 mg kg⁻¹ is taken to indicate adulteration with invert sugar. The HMF contents of locally produced honeys ranged between 5.3 and 23.20 mg kg⁻¹ (Fig. 4). None of the examined samples had HMF contents

more than 40 mg kg⁻¹ and hence all of the samples meet the HMF standard for quality. Previously Bricage (1908) analyzed 118 samples of honey for HMF content and reported that 32 samples had an HMF content below 15 mg kg⁻¹. Similarly, Duthil (1983) have also reported that mean HMF content of different honey samples ranged from 5.47 to 5.95 mg kg⁻¹.

Reducing sugars (%): In nearly all honey samples, two important monosaccharide glucose and fructose predominate, which are defined as reducing sugars and accounts for around 75% of honey. According to proposed Codex Alimentarius Commission Standards (2001), a minimum reducing sugar content of 65% is required for flower honey and 60% for honey dew honey. The results of the analysis showed that the reducing sugar content of honey ranged between 43.14-81.40% for the tested samples of locally produced honey (Fig. 5). Comparison between honey samples showed that all of the locally produced honeys met the quality standard for reducing sugar except the one having 43.14%, which was lower than the standard permissible limit. These results are in agreement with that of Nauta(1983) who also reported that reducing sugars in honey were in the range of 60 to 65%. Similarly, Walton (1942) reported that a general sample of honey contained moisture as 19%, levulose 40%, dextrose 35%, sucrose about 2%, acidic substances 0.1%, ash or mineral 0.1% and undetermined as 4%.

CONCLUSION AND RECOMMENDATIONS

During the present internship different honey samples were evaluated for their quality parameters for assessment of their feasibility for foreign export by comparing it with international standards. All of the samples were found to be in acceptable range of international standards for all of the tested parameters except for reducing sugars which was lower in only one sample. These samples were marked to be according to the international standards and are safe for human consumption. These may be allowed for marketing and if possible for foreign export.

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