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COMPARATIVE STUDY USING LOCAL AND BRANDED HONEYS AND SENSORY EVALUATION OF HONEY BARS

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Abstract:
Honey is a sweet liquid produced by honeybees from the nectar of flowers. The nutritional composition of honey makes it one of the most health beneficial foods for human being. Many different brands of honey are available in the market and are probably processed. The present study was experimental based study. The objective this study was to check the quality of honey through moisture content, ash content, sugar content and pH value of honey and to seek acceptability of consumer on the basis of its sweetness, taste, color and viscosity. Different samples of honey include branded honey (Langnese and Marhaba) and local honey from the markets of Okara and Shiekhupura. Experiments proximate and physiochemical were performed in the PCSIR lab. Hedonic scale was used for sensory evaluation of the product made from these honeys. Honey bars developed from processed or brands of honey were far more accepted and appreciated. It is quite evident that good quality honey should be promoted and marketed to be used as a healthy food instead of junk food.

Key Words: *Honey, Proximate analysis, Physiochemical Analysis, Sensory Evaluation*

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INTRODUCTION:

According to Codex Alimentarius Commission honey is defined as the excretions or eliminations of plant sucking insects on the living fragments of plants, which honey bees gathers, convert by mixing with definite ingredients of their own, deposit, dry out, store and leave in the honey comb for further ripening and maturation process.[1] Honey is a most widely used product originated from the nectar of plants (blossoms) by honeybees. The scientific name of Honeybee is *Apis mellifera*.[2] Due to its exclusive nutritional and medicinal properties it is one of the most commonly sold product and have many health promoting effects. The nutritional composition of honey varies with its botanical resources and geographical backgrounds.[3] Many other factors such as environment bee species, storage conditions and processing methods alter its nutritional content.[4]

It is a supersaturated sugar solution containing about 80 to 85 % of CHO, 15-17 % H_2O, 0.3 % of proteins, 0.2 % of ashes especially high conc. of fructose and glucose, having decreased levels of amino acids mainly proline, phenolic compounds, organic acids, vitamins (Vit C and B complexes), minerals (e.g. Na, K, Ca, Mg, Cu, Fe, Zn, Mn, P), flavonoids, enzymes (glucose oxidase and catalase) and other phytochemicals.[5]

For the honey consumers, the quality of honey is a major concern, irrespective of honey source. This quality is really essential for food processing industry, who particularly use honey as important component in their food items. It is widely used for nutritional, medicinal and industrial purposes and it is an important trade of product in the national and international market.[6]

Moisture, acidity, pH, color, sugar composition and specific conductivity are the Physicochemical parameters of the honey which are used precisely to define each property that represents quality indicators.[7] The sensory properties such as texture, color, appearance and taste of honey differs in different collected samples of honey according to the geographical and the floral source which represents the overall acceptability of different honeys among consumers.[8] Honey, natural cheaper source of essential inorganic elements for consumers which are required for body metabolism.[9]

Apis mellifera, a genetically diverse specie plays a vital role to maintain ecosystems biodiversity and also act as crop pollinator. It has 4 main evolutionary lineages spreading all over the world across, Africa, the Middle East, Western and Northern Europe and Central Europe.[10] It has a widespread distribution throughout southern countries of Asia, including Pakistan, India, Malaysia, Philippines and Indonesia.[11] *Apis florae, Apis dorsata, Apis cerana* and *Apis mellifera* are the four species of honey bees present in Pakistan.[12] Salman's Pak honey, Marhaba honey, Hamdard honey, lifestyle and young's honey are the brands of honey that are available in Pakistan. Aussie, American and Langnese are the international brands of honey[13].

This study was aimed to identify proximate, physiochemical properties of international and national honey collected from different areas, local shops and markets of Lahore, Sheikhupura and Okara. Sensory evaluation of honey candy bars was done to check the consumer acceptability towards the product develop from it.

MATERIAL AND METHODOLOGY:

The proximate analysis and physio chemical analysis of honey was conducted in PCSIR Lab, Lahore. Sensory evaluation was performed in Lahore College for Women University, Lahore by the female respondent. Branded samples of honey were obtained from different areas of Lahore like Hyperstar and Decent store of Lahore. Branded honey includes Langnese (international) and Marhaba (national) which are easily available in Pakistan. Local or artificial honey which they called natural was obtained from different areas of Okara and Shiekhupura. Samples of honey were investigated for proximate, physiochemical tests and were compared with Pakistan Standards and Quality Control Authority (PSQCA) and international honey standards for the Codex Alimentarius to obtain a valuable data for honey consumers[14,15]. For the preparation of honey candy bars raw materials such as sesame seeds, honey, raisins, pistachio, walnuts were procured from the local market.

Product development:

- **Pretreatments of the product**

4 bars were made from different honey samples i.e. branded honey and local honey collect from the market of Okara and Shiekhupura. There was not a significance change in their taste but changes occur with time.

- **Product Development**

Place sesame seeds in hot pan and stir until it got golden brown in color. Took honey in another pan and heat it until it starts to boils. Remove it from the flame may pour it on sesame seeds. Add raisins, pistachios, walnuts in that pan and mix all the ingredients. Mold them into bars shape and packed it in an aluminum foil.

Figure 1.1 Development of honey energy bars

- **Different treatment of honey Candy Bars**

Treatments	Samples
T_0	Preparation of honey candy bar by using Langnese honey.
T_1	Preparation of honey candy bar by using local (Okara) honey.
T_2	Preparation of honey candy bar by using Marhaba honey.
T_3	Preparation of honey candy bar by local (Shiekupura) honey

T0 = Laganese Honey
T1 = Local honey I
T2 = Marhaba Honey
T3 = Local Honey II

Proximate analysis

The proximate analysis of honey such as moisture and ash were done by using their respective methods given by (AOAC, 2000).

- **Determination of moisture content**

According to AOAC (2000) the moisture content was determined. For this purpose, in a flat-bottom dish the samples were taken and kept whole night in an oven at 100-110°C and again weighed.[16]

The weight loss was observed as a amount of moisture content which was calculated by the following formula:

$$\text{Moisture (\%)} = \frac{\text{Weight of fresh sample} - \text{Weight of dry sample}}{\text{Weight of fresh sample}} \times 100$$

- **Determination of ash content**

The method of Association of Official Analytical Chemists (AOAC 2000) was followed for determination of ash content. For this regard, in a silica crucible each sample was weighed 10g. For about 3 to 5 h at 500°C, the crucible was heated in a muffle furnace. In desiccator it was cooled and again weighed. To ensure completion of ashing, it was reheated again in the furnace for half an hour more, cooled and weighed. It was repeated subsequently till the constatnt weight acheived and ash became white or grayish white.[17]

The ash content was calculated by the following formula:

$$\text{Ash (\%)} = \frac{\text{Weight of sample after ashing}}{\text{Weight of fresh sample taken}} \times 100$$

Physicochemical Analysis

Physicochemical analysis of honey such as density, sugar content, pH, insoluble solids, titrate able acidity and refractive index were carried out. All readings were taken in triplicate to avoid error.

- **Determination of pH value of honey**

To determine the pH value of honeys first of all beakers were washed with distilled water and then 10g of each honey were poured in different beaker. Add distilled water in 10g of honey to make its volume up to 100ml. PH meter was dipped in each solution to check the pH value of each honey sample. The acceptable range of pH should be 3.4- 6.1.[17]

- **Determination of Titratable acidity**

According to the method of AOAC (2000) titratable acidity as tartaric acid was determined. For this purpose, using titration kit each sample of the honey was treated with 0.11N NaOH solution and 1 drops of phenolphthalein indicator. Pour NaOH drop wise until pink color appears. The volume of alkali used was noted and calculated by using the following formula.[17]

$$\text{Titratable acidity (\%)} = \frac{1 \times \text{Eq. Wt. of acid} \times \text{Normality of NaOH} \times \text{titer}}{10 \times \text{Wt. of sample (g)}} \times 100$$

- **Determination of sugar content of honey (Brix Method)**

The HI96801 is a digital refractometer designed to report the sugar content of aqueous solutions as Brix percentge. The HI96801 report the results with an accuracy of ±0.2% Brix. The operation of the meter is simplified with only two buttons: one button is to calibrate with distilled or deionized water and the other to take a measurement. All readings are automatically compensated for temperature variations according to the ICUMSA Methods Book standard and displayed within a 1.5 second response time.[18]

- **Determination of refractive index of honey**

Refractive index of honey was measured with the help of Abbe's refractometer. Refractometer was used to check the refractive index of honey. One drop of each honey sample was placed on refractometer to check the refractive index of each honey sample.[19]

- **Determination of insoluble solids**

The gravimetric method was used for the determination of the insoluble solids. Honey samples 2g were diluted with the minimum amount of water

and transferred to previously weighed filter paper. After this, the samples were flushed with more distilled water around 300-400ml to remove all sugars. The filter paper was placed in an oven at 135 ° C for 1 hour and then cooled and weighed.[20]

RESULTS:

Table. 1: Proximate and Physiochemical Analysis

Parameters	T0	T1	T2	T3
Moisture	8.64±0.56	17.02±0.84	9.40±0.55	16.30±0.28
Ash	0.20±0.001	1.1±0.028	0.41±0.020	0.98±0.035
pH	4.26±0.06	3.82±0.10	4.18±0.08	3.90±0.04
Acidity	3.02±0.02	8.25±0.30	3.40±0.01	6.28±0.45
Sugar	69±0.14	80.1±0.22	79.5±0.56	80.5±0.12
Refractive Index	1.422±0.004	1.494±0.0008	1.450±0.0001	1.499±0.0008

Table.2: Sensory Evaluation of Honey Bars

Parameters	T_0	T_1	T_2	T_3
Texture	6.73±76	5.01±85	5.71±87	4.52±69
Taste	6.56±81	4.81±77	5.69±89	4.39±75
Flavor	6.72±70	4.3±62	5.78±83	5.00±76
Color	6.55±88	4.89±82	5.67±93	4.40±63
Appearance	5.78±92	4.93±86	6.49±91	4.32±75
Overall Acceptability	6.67±80	4.99±82	5.94±76	4.34±76

DISCUSSION:

In the current study, the experimentation resulted in the quality analysis of branded and local honey. Different experiments conducted to determine the quality of honey and product (honey candy bars) was also developed through these honeys to check the consumer's acceptance for branded and local honey on the basis of its taste, flavor and appearance, color and texture. The results of different parameters of all the honey samples collected from the markets of Lahore were compared with PSQCA and Codex Alimentarius Standards.[14,15]

The moisture content of the honey samples as shown in Table 1 showed a range between 8.64% to 16.30%. All honey samples have moisture content not more than 21% and lies within the standards limit of PSQA and Codex Alimentarius. The moisture content shows different characteristics of honey including its quality, viscosity, fermentation.[21] It has fabulous hygroscopic property and ultimately increases its moisture levels. Due to location, species, and preparatory techniques, extraction methods of honey also increase the moisture content.[22]

The results of current study indicated that reducing sugar of tested honey samples were between 69% to 80.5 %. All of the samples met the quality criteria of national and international standard. Honey usually consists of glucose and fructose which are two main reducing sugars hiving honey the characteristic similar of invert syrup.[23]

Honey with darker appearance was high in its ash content while a honey with lighter appearance was low in its ash content. According to US Department of Agriculture, the amount of ash content that should be present in honey must be 0.1- 1%. Table 1 showed the

ash range between 0.20% to 1.1%. All the samples of honey did not fall into the acceptable range of ash content i.e. 0.1-1%. Honey which does not met these criteria fall in poor quality. According to the study 10% of honey (collected from open stall market) had ash content exceeding the value of 1.1% and concluded that those honey which exceeded this value is of poor quality.[24]

The pH value of honey should be ranged from 3.4-6.1. The acidity and pH value of honey are inversely proportional to each other. According to US Department of Agriculture values of acidity should be <40 meq which indicates its freshness. The low the pH value of honey the high will be its acidity.[25] Table 1 revealed that the Langnese had the highest pH value i.e. 4.26 so it was less acidic and fresh in quality and while Marhaba had also high pH value i.e. 4.18 so it was also fresh in quality while the Local honey I and Local honey II had the low pH value i.e. 3.82 and 3.90 so they both were more acidic. A study reported pH 5.08 and 5.00–5.48 respectively, showing almost the same range as found in the present research. However, similar results were showed in study conducted in 2017 recorded acidic pH values (4.17 and 4.20) in Algerian and Saudi honeys lower than present pH. [26,27]

The traits of honey candy bars made from four samples were assessed by the sensory evaluation conducted by 40 consumers. The consumers evaluated products made from four samples of honey respectively on a defined hedonic scale for taste, texture, color, flavor and overall acceptability and the results of this analysis was then compared with the experimental results of honey (moisture content, ash content, pH value and sugar content). There was not a high difference in taste among four honeys while the result of sensory evaluation stated that strongest taste, flavor, color and texture was exhibited by the Langnese honey on first number and Marhaba on second number and was accepted by all the consumers. Product for evaluation given to same consumers on different intervals i.e. 0, 15 and 30th day interval to check the shelf life and preference of the consumers. A study reported that good taste of honey depends upon the content of sugar and freshness of honey. Honey with darker appearance was high in its ash content while a honey with lighter appearance was low in its ash content.[28] Present study revealed that Langnese and Marhaba were accepted as better in taste, color, sweetness and texture.

CONCLUSION:

The present study was experimental based study in which processed (national and international brands) and unprocessed (local) honey were analyzed in the Laboratory of PCSIR. The product was developed by these samples of honeys. The consumer acceptance for honey candy bars were evaluated through hedonic scale. The quantitative analysis of honey included the determination of moisture content of honey, ash content of honey, pH value of honey, acidity, the sugar content of honey, refractive index, and insoluble solids. The moisture content should be less than 20%, ash content should be 0.1-1%, pH should be 3.4-6.1, sugar content (Brix) less than 80%, insoluble particles should be 0.1-1%. Langnese honey had the low moisture content i.e. 8.64% and can be preserved for a long time. The results of sensory evaluation showed that honey bars made from Langnese and Marhaba honey were well accepted by the consumers for having good taste, color and aroma. The honey bars are the healthy snack in this world of junk food.

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