FROM BEE TO PLATE – A SENSORY FORAY IN HONEY WORLD

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Abstract: Some honey samples from different areas were studied for sensory properties. A panel consisting in 15 trained tasters, identified, defined and evaluated 10 samples of honey, using Quantitative Descriptive Analysis method. The most important sensory parameters, which grouped the samples, were flowery, fruity, body. Two groups of honey consumers one consisting in children aged between 4 and 10 years old the other one in people between 40 and 70 years old were investigated using typical preference scales. The young consumers like the sweet taste, the color and are interested on the package. Another ones appreciate the flowery, fruity notes and the color. Both would like some fruits (nuts, berries…) or pollen in honey.

INTRODUCTION

Taking a walk in the nature, on a green field with many flowers, or on a sunflower (Helianthus annuus) field, or in Danube Delta where are a lot of water lilies (fam. Nymphaceae), or in a place with many acacias (fam. Fabaceae) or linden trees (fam. Malvaceae) you can see the raw material for a delicious and healthy product which is honey. The bees pick up the more or less colored nectar of flowers, carry the precious product to beehive where they use their honey stomachs to ingest and regurgitate the nectar a number of times until is partially digested. After the final regurgitation in the honeycomb, the worker bees take positions on the door way and fan their wings to create a draft necessary to evaporate the moisture from the nectar the field bees have gathered and reduce to honey.

At the end of this seeming simple but very elaborate and rigorous flow, honey can be now collected.

In religion, folk and literature honey is a symbol for sweetness of every kind, for all that is pleasant and desirable, a symbol for new year (in Jewish tradition) – apple slices are dipped into honey and eaten to bring a sweet new year – in Greece the bride to ensure sweetness in her married life (especially the relationship with her mother-in-low), dip her fingers in honey and make the sign of the cross before entering in her new home.

Also the land of Israel is called “a Land flowing with milk and honey” and they say that “even though they bring it into their bodies, it is not a product of their bodies” and finally the honey is Kosher (The Codes of Maimonides).

The honey is a very pleasant, natural and healthy product recommended for it’s sensorial messages, for it’s medical applications and for food preservation (in meat products where can enhance the meat flavors, improve the cook yield in poultry meats, may inhibit the food borne pathogens, reduce the heterocyclic aromatic amine formation and stabilization of lipid emulsion systems such as salad dressings).

In the chain from bee to plate in any using way of honey the man can put his finger print on this product.
Honey is a sweet and viscous fluid produced by honeybees and other insects from the nectar of flowers. The man can act in two ways:

- Indirectly – feeding the bees with sugar or other sweeteners.
- Directly – by adding some substances to enhance the taste (natural sweeteners – sugar, molasses...; synthetic sweeteners – aspartame, saccharine...), the consistency (starch, gelatin, pectins...), the color (caramel, aniline) or substances to correct enzymatic equipment (malt extract or yeast cultures) or substances for neutralizing the acidity (sodium carbonate or bicarbonate or sodium hydroxide). These ones being involved in slight changes in sensory attributes.

Zalewski (1991) studied the authentication of honey via principal component analysis. Krauze and Zalewski (1991), classified different samples of honey by principal component analysis on the basis of physical and chemical parameters. Sanz, Perez, Herrera and Huan (1995), used multivariate statistical technique for honey classification by their geographical origins and on chemical and physical basis. Mateo and Bosch-Reig (1998) made the classification of honey by discriminant analysis of electrical conductivity, color, water content, sugar and pH. Gomez, Garcia, Elvira, Rivas, Gonzales and Sanchez (2000) carried out geographical discrimination of honeys on sugar patterns and common quality parameters basis.

The sensory parameters (color, aroma and taste) of this very complex product are the ones that make us to choose or not the honey from the shelf.

The purpose of the paper is to establish and to evaluate the attributes of 10 honey samples, and to evaluate the preferences of some young and old consumers.

**MATERIAL AND METHODS**

**Honey samples** – Ten types of honey from different geographical regions from Romanian market were analyzed. The samples were less than tree months old from the date of manufacturing. The samples were coded as SC₁, SC₂, FS₁, FS₂, TL₁, TL₂, RP₁, RP₂, PF₁, and PF₂.

**Sensory analysis**

- **Panel and descriptors**

  The panel consisted of 15 people (staff and students of the faculty with a good experience in sensory evaluation of food products) in an age group of 19-23 years, comprising male and female, non smokers.

  First step was to establish the attributes and consisted in a session in which some different samples of honey were presented to the panelist team. The panelists have to describe and establish attributes which characterize the honey samples. This session was made as spontaneous as possible and had as objective the positive attributes as well as those which can be not so pleasant (chemical taste).

  The characteristic attributes of honey establish in this session were:

  - Appearance: brightness, color;
  - Taste: sweet, sour, astringent;
  - Mouthfeel: body;
  - Aroma: flowery, fruity, waxy, acidic, caramelized, chemical, fermented.

  All these attributes were defined and were established reference samples (table 1).
Table 1. The definitions of sensory attributes of honey and the reference samples.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Definition</th>
<th>Reference sample</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Appearance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brightness</td>
<td>The amount of small particles in stable suspension</td>
<td>A amber scale (0.01N iodine solutions)</td>
</tr>
<tr>
<td>Color</td>
<td>Degree of “amber” color</td>
<td></td>
</tr>
<tr>
<td><strong>Taste</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sweet</td>
<td>Fundamental sweet taste</td>
<td>Sucrose solution</td>
</tr>
<tr>
<td>Sour</td>
<td>Fundamental sour taste</td>
<td>Citric acid solution</td>
</tr>
<tr>
<td>Astringent</td>
<td>Chemical sensation associated with the shrinking and puckering of tongue</td>
<td>Tanins, grape juice</td>
</tr>
<tr>
<td><strong>Mouthfeel</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Body</td>
<td>The fluidity perceived in the mouth</td>
<td>Sugar solutions with conc. from 2 % to 64 %</td>
</tr>
<tr>
<td><strong>Aroma</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flowery</td>
<td>Aroma associated with flowers like acacia, linden tree flowers</td>
<td>Phenyl ethyl alcohol, acacia flowers, linden tree flowers</td>
</tr>
<tr>
<td>Fruity</td>
<td>Aroma associated with fruits like apples and citrus fruits</td>
<td>Apples, oranges</td>
</tr>
<tr>
<td>Waxy</td>
<td>Aroma associated with wax</td>
<td>Candle wax</td>
</tr>
<tr>
<td>Acidic</td>
<td>Aroma associated with acidic compounds</td>
<td>Vinegar</td>
</tr>
<tr>
<td>Caramelized</td>
<td>Aroma associated with chemical compounds</td>
<td>Caramelized sugar</td>
</tr>
<tr>
<td>Chemical</td>
<td>Chemical feeling factor associated with milk/fruits decomposition</td>
<td>Phenyl acetylene</td>
</tr>
<tr>
<td>Fermented</td>
<td></td>
<td>Curd</td>
</tr>
</tbody>
</table>

➢ **Panel training**

After a preliminary selection which involved the sweet and sour taste sensibility of panelists, they were familiarized with different odors and flavor notes in four sessions.

The performance was checked by giving duplicate samples in the beginning of each session.

➢ **Scaling method**

The method used for the evaluation of the samples was the Quantitative Descriptive Analysis – QDA method (Meligaard 1999).

The panelists were free to develop their own approach to scoring. The QDA method uses a 15 cm scale anchored at left at 1,25 cm which corresponds to “low” or recognition threshold and 13,75 cm as “high” (figure 1.).

The panelists were asked to mark the perceived intensity of the attribute by drawing a small vertical line on the scale and writing the code of the product.

Fig. 1. The scale for QDA method

Testing was performed in sensory analysis laboratory from Food Science and Engineering Faculty with individual booth under fluorescent light.

The temperature of the product was 25±2 °C (room temperature). The samples were served in beakers of 25 ml. The quantity served was 15 ml in duplicate but one sample at a time. The presentation of the samples was randomized.

There were no significant differences among the duplicates, indicating the good quality of the panel (p≤0,05).
The bakers were labeled with three digit code.

Between the samples (as palate cleaning) were used water at room temperature and puffed rice.

Sensory analysis of 10 samples was made in five sessions with two samples and a duplicate in each session.

**Preference tests**

For preference tests were used two teams one made by 20 children with age between 5 and 10 years old (these ones are “sincere”) and another one made by people between 40 and 70 year old (these ones having experience).

For the children was used a scale (Snoopy scale) especially made for them (fig.2.) (Moskowitz 1985).

![Fig.2. The Snoopy scale used with children group.](image)

For the old group was used a standard hedonic questionnaire with 9 points scale (dislike extremely, dislike very much, dislike moderately, dislike slightly, neither like nor dislike, like slightly, like moderately, like very much, like extremely).

**Data analysis**

The mean scores of intensity were calculated. Identification of differences was made by univariate analysis of variance (ANOVA).

**RESULTS AND DISCUSSIONS**

The sensory analysis of honey showed that the samples present significant differences from amber color, body, flowery, fruity and caramelized notes. The chemical and fermented notes were absent. The waxy notes were present to sample PF$_2$ and SC$_1$. Also the sourness was perceived to sample PF$_2$ and FS$_1$.

Samples SC$_1$, SC$_2$, TL$_1$, TL$_2$, PF$_1$ and PF$_2$ had higher scores for flowery and fruity notes which in the case of this product are indicative of superior quality. RP$_1$, FS$_1$ and TL$_2$ had higher scores for body. Sourness was perceived to be higher in RP$_2$ while the sweetness was perceived to be higher in PF$_2$. TL$_1$, TL$_2$, PF$_1$, PF$_2$ had more of caramelized notes and higher scores for amber color.

Figures 3 and 4 represent the quantification for sweet and sour taste.

The body variation, a very important attribute for honey is presented in figure 5.

Flowery and fruity notes were found to have high positive correlation with each other (r=0.08).

Acceptability depends on the floral types used by the bees.
The preference test for the children emphasized that the very young people are not interested on the body of the product, neither the caramelized or fruity aroma. They look for amber color, the product is already sweet, and they like this aspect and very important is the package which is better to be pretty smiley bear. They also like that the honey have some fruits (apricots, nuts, currants or dried apples) or pollen (there are some products with 5% pollen added). The brightness is another attribute that the children appreciate to honeys.

The brightness is the attribute important for another study group (40 – 70 years old). These ones being more pretentious. All of them were honey consumers. They appreciate to this product first the flowery notes, than the fruity notes, the body and the color. The caramelized and the sour notes are not very important. But the chemical notes must be absent.

Waxy notes may be present but not at very high levels. They also understand and agree the importance of honey consumption.
CONCLUSIONS

The sensory analysis of honey showed that the samples present significant differences from amber color, body, flowery, fruity and caramelized notes. The chemical and fermented notes were absent.

Half of samples had higher scores for flowery and fruity notes which in the case of this product are indicative of superior quality.

The children aged between 4 and 10 years old look for amber color, the sweetness, brightness and very important is the package which is better to be pretty smiley bear.

The group aged between 40 – 70 years old appreciate the brightness, flowery notes, than the fruity notes, the body and the color. The chemical notes must be absent. Waxy notes may be present but not at very high levels.

Both study groups like that the honey have some fruits (apricots, nuts, currants or dried apples) or pollen (there are some products with 5 % pollen added).

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