Application of a Cheek-All-That-Apply Question to the Characterization of Hibiscus sabdariffa L. drinks with African origin

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Understanding how consumers perceive food products is critical for product development. Preference mapping techniques correlate consumer preference ratings to perceived sensory characteristics of the product in order to determine how the sensory characteristics of the product affect consumer liking. However, there are several limitations being that it assumes that consumers and trained assessors perceive the products in the same way. Also, information about how they perceive the sensory characteristics of the product is not gathered. To overcome some of these restrictions, the use of check-all-that-apply questions (CATA) was evaluated. CATA questions consist of a list of words or phrases from which respondents select all the words they consider appropriate to describe a product. This can result in a simpler and more valid approach to gathering information about consumers’ perception that includes both their sensory and hedonic impression. CATA questions provide a methodology to obtain a sensory map based only on consumer perception of the products and to perform external preference mapping when a trained sensory panel is not available. The aim of the present work was to apply CATA questions to study consumer perception to Hibiscus sabdariffa L. drinks, and to compare results with those achieved using a trained assessors’ panel.

Material and methods

Sensory evaluation

Four different samples (traditional and commercial) were presented to the panelists as the following:

- Traditional ambient temperature Vinto juice (3C)
- Traditional boiled Vinto juice (3H)
- Commercial syrup diluted 1/4 (Syrup)
- Commercial instantannious juice (Instantaneous)

The Bissap samples were evaluated and scored by a trained sensory panel (as described on ISO 11035:1994 Sensory analysis). The panel was composed by university employees and students (n=7) previously selected according their sensory ability and familiarity with juices. Sensory attributes were generated during preliminary focus group sessions guided by a panel leader. A total of 20 sensory attributes were developed, with correspondent references/or anchors, with panel consensus, as represented in Table 1.

<table>
<thead>
<tr>
<th>Table 1 - Bissap &quot;Hibiscus&quot; Drink - Attributes definition</th>
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</thead>
<tbody>
<tr>
<td>Traditional ambient temperature</td>
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<tr>
<td>Traditional boiled Vinto juice</td>
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<tr>
<td>Commercial syrup diluted 1/4</td>
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<tr>
<td>Commercial instantannious juice</td>
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</table>

Consumer Study

Consumers (n=100) were interviewed at two different locations of Porto Catholic University using the central location method: Asprela Campus (n=50) and Foz Campus (n=50).

The samples used for Bissap consumer tasting were the same used for sensory analysis.

Consumers were asked to answer a Check-All-That-Apply (CATA) questionnaire that included 28 sensory and emotional terms (Table 2).

<table>
<thead>
<tr>
<th>Table 2 - List of attributes considered in CATA question</th>
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<tbody>
<tr>
<td>Samples 3H &amp; 3C – floral, hay, cold black tea, raisins, bitter, acid and adstringent attributes</td>
</tr>
<tr>
<td>Syrup – sweet, fruity and fresh herb sensory attributes</td>
</tr>
<tr>
<td>Instantaneous – raspberry attribute</td>
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<tr>
<td>Natural and smooth emotional terms</td>
</tr>
<tr>
<td>Instantaneous – pink colour, clarity and floral sensory attributes</td>
</tr>
<tr>
<td>Fresh, instantaneous, diluted and watery emotional attributes</td>
</tr>
</tbody>
</table>

Data analysis

All statistical analyses were performed using XLSTAT 2012.

A principal component analysis (PCA) was performed on the correlation matrix of the means of the trained assessors’ data.

A multiple factor analysis (MFA) was performed on responses to the CATA question in order to identify relationships between the terms and the samples and to get a sensory map of the samples. This analysis was performed on the frequency table that contained responses for each category of terms of the CATA question, considering consumer overall liking scores as supplementary variable. In this analysis, the different categories of terms from the CATA question were considered as separate groups of data to investigate the relationship between them.

Results and discussion

Highly significant differences (P < 0.001) between the samples were found for all the evaluated sensory attributes.

The first two principal components (PCs) accounted for by 76.95% and 21.30% of the variance of the experimental data, respectively.

![Figure 1 - a) Sensory profiles (QDA) and b) Principal Component Analysis of Bissap samples](image)

- A multiple factor analysis (MFA) was performed on responses to the CATA question in order to identify relationships between the terms and the samples and to get a sensory map of the samples.

- Sample 3H - red colour, viscous, cold black tea and raisins sensory attributes; concentrated and bond emotional terms.
- Sample 3C – acid, bitter and hay sensory attributes; rough and strong emotional terms.
- Syrup – sweet, fruity and fresh herb sensory attributes; natural and smooth emotional terms.
- Instantaneous – pink colour, clarity and floral sensory attributes; fresh, instantaneous, diluted and watery emotional attributes.

- The sensory profile obtained reveals that samples produced from calices are represented by hay, Hibiscus flower and cold black tea descriptors, the syrup by sweet and instantaneous juice by raspberry, attributes.

- Consumers acceptability in terms of global appearance are divided into two groups, the first one with syrup and instantaneous juice samples and the second one with samples obtained by calices, in a decrease order of acceptability (according Tuckey’s test).

- Highly significant differences were found in the frequencies in which CATA terms were used for describing the four samples, suggesting that this methodology was able to detect differences in consumer perception of the drinks.

- Sample configuration from consumers’ CATA counts and trained assessors data were similar, suggesting a good agreement between both evaluations.

- Considering results from the present study, the use of CATA questions could be an interesting and simple methodology to get an insight on consumer perception of a food product. Using this methodology, a map of the samples could be generated taking only consumer perception of the products.

Acknowledgments

This study was performed within the European Seven Framework program (EU FP7) and fits into the project AFTER (African Food Tradition Revisited by Research) under contract nr. 245025. More information about the project can be found on http://www.after-fp7.eu/en/