Note. Consumer Awareness of the Main Sensory Attributes of Tepache, a Traditional Fermented Fruit Beverage

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Four tepache samples (a traditional fermented fruit beverage) from four different sources obtained by different fermentation processes were sensory evaluated. A paired comparison test between the samples was carried out in a monadic sequential fashion in six sessions with 70 consumers each. A sample processed by double fermentation received the highest mean scores for the first impression and overall acceptance and in the sensory attributes of appearance, consistency, odor, flavor and sweetness/sourness ratio. Principal component analysis indicated that appearance, odor, flavor, first impression and overall acceptance are highly intercorrelated. That sample was also the most preferred beverage in the comparative test. Flavor intensity was significantly different in all of the paired comparisons. No significant differences were found in the overall acceptance evaluations between genders. A fairly good correlation was found between overall acceptance and consumers who drank the beverage once a week.

Key Words: tepache, fermented fruit beverage, sensory analysis, attributes, consumers, acceptance

INTRODUCTION

Tepache is a very refreshing traditional fermented fruit beverage, usually made from pineapple, but can also be made from a blend of different fruits, such as apple, orange, guava and tamarind (Ulloa and Herrera, 1982). The fermentation takes place in wood casks called tepacherı́as, in which the macerated fruit or fruits are put together with water sweetened with molasses. The tepacherı́as are covered with a fine webbed cloth and fermented. After one or two days, a refreshing, pleasant, sweet beverage with low alcohol content (less than 1%) is obtained. The drink is available in small shops called tepacherı́as or from peddlers (Santamarı́a, 1942, 1959).

If the beverage is fermented for longer periods, it becomes unsuitable for consumption, as it develops an unpleasant sour flavor originated by vinegar formation and by high alcohol levels (Ulloa and Herrera, 1979; Ulloa et al., 1987).

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Because the manufacturing process is completely empirical, no information is available concerning its controlled production. Consumer research offers information on desirable characteristics that better satisfy them and the attributes they expect from a specific product. This will be useful later during the development of the product (Muñoz and Chambers, 1993; Moskowitz, 1995; Muñoz, 1999) and during its marketing (Martens, 1999).

Thus, this work aimed to establish the sensory attributes of four tepache samples, from different sources and produced through two different processes, that the consumer considered relevant.

**MATERIAL AND METHODS**

**Consumers**

Trained personnel in questionnaire application through personal interview applied a nonprobabilistic by quota sampling method (ASTM, 1979) to persons intercepted near establishments where tepache is retailed in Northern Mexico City. The intercepted persons were applied a filter questionnaire, and asked their annual income, if they liked tepache and their frequency of consumption. People belonging to a socioeconomic level D (annual income less than $5,000) (INEGI, 1997, 2000) who liked tepache and consumed it at least once a month were preselected. The selected consumers totaled 420, of which 70% were males and 30% were females.

**Samples**

Four commercial tepache samples were acquired from establishments that were in the business for at least 30 years and that could provide information concerning the beverage manufacturing process. Tepache samples were grouped according to manufacturing processes in A and B, prepared in three fermentation steps, and C and D, prepared in two fermentation steps (Figure 1).

**Sensory Evaluation**

The consumers were given fresh samples that were kept in cold storage between 5–10°C until the end of the test. Each sample (approximately 70mL) was offered in odorless, tasteless, disposable plastic cups identified with three random numbers.

The study was conducted in six sessions with 70 consumers each. In each session, a paired comparison between two samples (AB, AC, AD, BC, BD, CD) was performed. Sample evaluation was done in a monadic fashion in which the first sample was presented to each consumer who was asked to give his level of acceptance during the first impression, using a structured hedonic scale of nine points, where nine indicated “I like extremely” and one indicated “I dislike extremely.” Then, the consumer was asked to evaluate the sensory attributes of appearance, consistency, odor, flavor, sweetness/sourness ratio and flavor intensity, on a structured hedonic scale of five points, where five indicated “I like very much” and one indicated “I dislike very much.” Finally, consumers were asked to score their overall acceptance on a hedonic scale of 11 points, where ten meant “excellent” and zero meant “totally unacceptable”. This procedure was then repeated with the second sample (sequential test). Once the evaluation of the second sample was finished, the consumer was presented with both samples and asked to compare them in order to establish his preference for one or the other, including comments regarding what he liked or disliked most (Meiselman, 1994; Shutz, 1994).

Use of hedonic scales with different points minimizes the error of habituation caused by employing the same scale that induced the same response to stimuli (Pedrero and Pangborn, 1989; Moskowitz, 1994).

**Statistical Analyses**

A factorial of consumers (70) by sample was carried out. Three repetitions of each beverage were done for each factorial combination. The analysis was a type III ANOVA, in which the interactions were included in the error estimation. In the F test, a least significant difference (LSD) test was applied to the data that gave significant differences, followed by a principal component analysis (PCA) on a covariance matrix with varimax rotation of the first two components (Pastor et al., 1996; Lawless and Heymann, 1998; Siret and Issanchou, 2000).
Differences between the paired samples in the sequential test and differences in the acceptance between males and females were established through a one-way ANOVA. The influence of the frequency of consumption on the overall acceptance was established by quadratic regression (Shutz, 1994). Statgraphics 7 software was used for data analysis.

RESULTS AND DISCUSSION

A great diversity in age was found among the consumers, ranging from eight to 67 years old, with 72% under 32 years of age. The frequency of consumption indicated that 34% of the interviewed consumed tepache at least once a week, 19% every fortnight and 47% once a month. Most consumers expressed that they would continue drinking tepache and that they would even increase its consumption if it was more readily available. The beverage is consumed by a wide age spectrum and is quite well appreciated by young people; therefore, there exists the probability of market expansion.

Acceptance Monadic Sequential Test

Analysis of variance of the four samples revealed that no significant differences \( (p < 0.05) \) existed between replicates or consumers. However, consumers noticed significant differences between the tepache samples \( (p < 0.05) \). Sample D had the highest mean rating, and C had the lowest (Figure 2). These results were consistent with the mean scores of the different hedonic scales, in which sample D obtained the highest evaluation for the first impression \( (6.92 \pm 1.50) \), overall acceptance \( (8.12 \pm 1.33) \) and for the attributes of appearance \( (3.94 \pm 0.73) \), odor \( (3.64 \pm 0.80) \), flavor \( (3.79 \pm 0.83) \) and sweetness/sourness ratio \( (3.35 \pm 0.77) \). The only attribute of sample D that did not receive the highest score was flavor intensity \( (2.94 \pm 0.78) \).

Application of the LSD test to the sensory attributes indicated that only the attribute of flavor intensity allowed discrimination in the manufacturing process. Samples A and B, obtained from a three-step fermentation process, were perceived as having a stronger, more fermented flavor than samples C and D obtained from a double-step fermentation process.

Against all expectations, the sweetness/sourness ratio between samples showed little variation. This situation probably arises from the custom of producers adding sugar to compensate for a high degree of fermentation in order to lower acidity sensation (Stampanoni, 1993; Durán and Costell, 1999).

Consumers considered sample D as nice, light and refreshing in flavor, with an adequate degree of fermentation. Samples A and B were described as having adequate sweetness, a strong odor and a high degree of fermentation. Sample A was considered agreeable, but B was not. Sample C was commented as having a weak, sweet, sugary flavor, very different from typical tepache flavor. All the comments regarding the samples agreed with their evaluations by the consumers.

The PCA obtained for the different attributes after a varimax rotation showed that the first component was negatively loaded by the highly intercorrelated attributes of odor, flavor, appearance, first impression and overall acceptance, and the second was associated positively with flavor intensity. Sample D had the highest correlation with these attributes (Figure 3). Beverages A and B, the most fermented samples due to the fermentation, were highly correlated to flavor intensity (Figures 2 and 3). Beverage C deviated from the other beverages. The interaction of the first two components of the global beverages evaluation (Figure 3) explained over 61% of the total variance.

Comparative Sequential Test

The paired comparisons between samples (Table 1) showed that when significant differences existed in the
first impression, as also did in most of their attributes, their overall acceptance and in their preference.

Flavor intensity was significantly different in the six paired comparisons, followed by flavor in five odor in four, consistency in three and appearance and sweetness/sourness ratio in two.

In the preference analysis and in most of the attributes comparisons (Table 1), it was observed that comparisons A–B and B–D did not show significant differences, while A was preferred versus C, D against A, B against C and D versus C. Thus, it can be implied that D was the beverage with a better score.

The differences in the attributes in the paired comparisons can probably be related to process variations and to the degree of fermentation of each beverage, due to the prevailing fermentation (alcoholic, lactic or acetic) taking place (Rubio et al., 1993).

**Gender and Frequency of Consumption in Relation to Monadic Overall Acceptance**

Overall acceptance scores were nonsignificantly different between men and women, which indicates that both genders are fond of the beverage and have similar perceptions (Figure 4).

<table>
<thead>
<tr>
<th>Attributes (Hedonic Scale)</th>
<th>A vs. B</th>
<th>A vs. C</th>
<th>A vs. D</th>
<th>B vs. C</th>
<th>B vs. D</th>
<th>C vs. D</th>
</tr>
</thead>
<tbody>
<tr>
<td>First impression (1–9)</td>
<td>6.38</td>
<td>6.21</td>
<td>6.60*</td>
<td>5.60</td>
<td>5.87</td>
<td>7.02*</td>
</tr>
<tr>
<td>Appearance (1–5)</td>
<td>3.60</td>
<td>3.44</td>
<td>3.77*</td>
<td>3.41</td>
<td>3.38</td>
<td>3.91*</td>
</tr>
<tr>
<td>Consistency (1–5)</td>
<td>2.71</td>
<td>2.75</td>
<td>3.22*</td>
<td>2.58</td>
<td>2.97</td>
<td>3.05</td>
</tr>
<tr>
<td>Odor (1–5)</td>
<td>3.20</td>
<td>3.10</td>
<td>3.38*</td>
<td>2.90</td>
<td>3.01</td>
<td>3.66*</td>
</tr>
<tr>
<td>Flavor (1–5)</td>
<td>3.50</td>
<td>3.77*</td>
<td>3.62*</td>
<td>3.01</td>
<td>3.21</td>
<td>3.81*</td>
</tr>
<tr>
<td>Sweetness/sourness ratio (1–5)</td>
<td>2.95</td>
<td>3.25*</td>
<td>3.19</td>
<td>3.10</td>
<td>2.84</td>
<td>3.41*</td>
</tr>
<tr>
<td>Flavor intensity (1–5)</td>
<td>2.97</td>
<td>3.45*</td>
<td>3.21*</td>
<td>2.88</td>
<td>3.69</td>
<td>3.03*</td>
</tr>
<tr>
<td>Overall acceptance (0–10)</td>
<td>7.34</td>
<td>8.11*</td>
<td>7.73*</td>
<td>6.70</td>
<td>7.11</td>
<td>8.40*</td>
</tr>
<tr>
<td>Preference %</td>
<td>45</td>
<td>55</td>
<td>70*</td>
<td>30</td>
<td>30</td>
<td>70*</td>
</tr>
</tbody>
</table>

*Significant difference between pair of samples at \( p < 0.05 \) level.

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Sensory Attributes of Tepache


