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Influence of Information, Gender and Emotional Status for Detecting Small Differences in the Acceptance of a New Healthy Beverage

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Abstract

Moderate wine consumption has been recommended as a health benefits practice, although alcohol content is sometimes the main factor for rejecting its consumption. This study focuses on the development of a fruit flavoured powder beverage, having the same polyphenols of wine but without the alcohol content. The specific aim of the present work was to evaluate if the factors gender and information regarding health benefits could have some influence on consumer decisions while evaluating preference of samples with small formulation differences. In addition, emotional status and comments about likes and dislikes of the beverages were also investigated. For this purpose, one hundred and forty four consumers (70 females and 74 males; aged 19 to 35 years old, $M = 23.3$, $SD = 4.0$) gave their degree of acceptance for four beverages. Each drink contained different levels of a powder concentrate of red wine (35 and 40 g/L) and sweetener (4 and 5 g/L). The participants estimated first by 9-point category scale and, then by Visual Analogue Scales (VAS) the following attributes: acceptance, appearance, aroma, sweetness, flavour, acidity and astringency. Having two scales allowed the study to double check consumer evaluations. Results showed that the acceptance scores among formulations only showed significant differences with the 9-point category scale. The cross study presented the highest divergences by gender factor. Males gave similar or higher values when confirm the evaluation using the second scale. Conversely, females gave similar or lower values in the same conditions. Thus, the double scale strategy highlighted the differences of the target population. Even though, information of health benefits did not increase the acceptance of the new beverage, it had a different impact between males and females. The emotions chosen by the consumers to describe their feelings about the new beverage helped to explain the acceptance data.

1. Introduction

The health benefits of phenolic compounds in red wine have been extensively verified. Red wine is a natural source of antioxidants, which may protect the body from oxidative disorders and reduce the risk of coronary heart disease (Renaud & de Lorgeril, 1992; Klatsky, 2009). However, wine consumption has some clear drawbacks in relation to alcohol ingestion such as alcohol related diseases affecting liver and other digestive organs. In addition, certain sectors of the population are prevented from consuming wine due to ethnic, social, or religious reasons (Midgley, 1971).

In previous works Sanchez, Baeza, Galmarini, Zamora & Chirife (2013), and Galmarini, Maury, Mehinagic, Sanchez, Baeza, Mignot, Zamora & Chirife (2013) have reported the freeze dried encapsulation of the red wine's dry extract in an amorphous carbohydrate matrix. Water and almost all alcohol from wine were removed during freeze drying leading to an amorphous glassy microstructure entrapping the wine phenolics as well as other components of the dry extract. The free flowing powder obtained after milling was arbitrarily named "wine powder" and was proposed to be added to other powdered drinks as a source of enrichment with wine phenolics. This study focuses on the development of a powder beverage using this "wine powder" as the main ingredient keeping the same polyphenols of wine but without, the alcohol content. On the basis of these preliminary observations, the new beverage was formulated according to two factors, namely the amount of "wine powder" and the level of sweetener; moreover the formulations selected for the current study had only slight differences among these variables. Consequently, multiple methodologies were searched to enhance the detection of such small differences in the acceptance of this drink.

One of these strategies was to use a second scale to double check consumer evaluations. A large number of studies have been conducted comparing the use of different scaling methods (Lawless & Heymann, 2010), because scaling data is often used to identify differences between products. Some methods, like category scales, line scales and magnitude estimation, can be applied to both intensity and hedonic (like–dislike) responses. For hedonic scaling, one might want the method to correspond to other behaviours such as choice or consumption (Lawless, Popper & Kroll, 2010). A related criterion is the ability of the scale to identify or uncover consumer segments with different preferences (Villanueva & Da Silva, 2009).

In regards to consumer segments with different preferences, specific differences exist in the wine consumption behaviour and sensory preferences between males and females. Generally speaking, females drink less wine than males but they do however consume a higher amount of white wine than their male counterparts. Moreover, women showed a preference for a sweeter wine style at a young age, and reported a strong preference for medium body style wines instead of light and full-bodied wines. From a sensory preference viewpoint, fruit tastes and aromas are by far the most important, especially among females (Bruwer, Saliba & Miller, 2011). Since these differences exist for wine, one of the objectives of the present study was to investigate if they might be transferred to the new wine-based beverage.

Concerning polyphenol-rich beverages, disclosing information about their health benefits could have a big impact on consumers´ evaluations (Jaeger, Axten, Wohlers & Sun-Waterhouse, 2009). The strategy of providing health-related information can contribute to a more positive evaluation of some products, particularly in relation to purchase intention (Tuorila & Cardello, 2002; Casati, Sánchez, Baeza, Magnani, Evelson, & Zamora, 2012). Therefore, in the current paper we analysed the influence of health advantages on the new beverage´s potential.

Consumer expectations for a new food or beverage may also be explored taking into account the emotions that these products generate. It is generally acknowledged that human eating choices are affected by and associated with emotions (Desmet & Schifferstein, 2008; Hanoch, Wood & Rice, 2007). Manzocco, Rumignani & Lagazio (2013) studied the emotional response to fruit salads with different visual quality level by analysing fruit browning, microbiological count, and overall visual acceptability. In the current paper, a preliminary approximation was made to correlate the acceptance level with the consumer´s identification of their emotional status in relation to detect small differences in acceptance.

The main objective of this work was to detect changes in the acceptance among four different formulations of a new fruit flavoured powder drink using a concentrate of red wine polyphenols ("wine powder") as one of its main ingredients. The hypothesis to be tested was whether health information, gender and scaling methods could contribute to a more discriminative evaluation of the beverage acceptance. Moreover, which sensory attributes contributed to consumer liking/disliking and the emotional status level evoked by consumers after tasting the beverage were also investigated. In addition, consumers' attitude for a novel product was evaluated by comments and emotional status, in regards to gender.

2. Materials and Methods

2.1 Drink powder formulation

The "wine powder" which constituted the base of the healthy beverage was obtained by freeze drying the wine according to a method previously described by Sanchez et al. (2013) and

Galmarini et al. (2013). The wine used was *Cabernet Sauvignon,* "Postales del Fin del Mundo" (*Bodega Fin del Mundo*) from a cold climate wine growing region (Neuquén province, Patagonia region, Argentina) with an original alcohol content of 13.7% in average and a pH of 3.8 (vintage 2013, aged in oak). Carbohydrates used as drying aids for encapsulation were a mixture of Maltodextrin (Dextrose Equivalent 10 (MD10) provided by Productos de Maíz S.A., Argentina) and Arabic gum (provided by Gelfix, Argentina). The solution of wine + carbohydrate was freeze-dried at room temperature in a FIC Ll-I-E300-CRT freeze dryer (Rificor, Argentina). The powder so obtained had 3% moisture content and about 1400 mg polyphenols/ 100 g.

The maximum amount of wine powder to be used in a litre of reconstituted beverage was of 35 - 40 g. This was determined making a compromise between the total powder content in commercial powder beverages and the concentration of phenols. It was expected to obtain, per serving, the same amount of polyphenols as in a glass of red wine.

Preliminary studies - performed with 40 consumers - were made to adjust the level of powder, raspberry aroma (Symrise, Argentina), thickener (Guar gum, Gelfix, Argentina) and a commercial diet sweetener (cyclamate 5700 mg/100 g; saccharin 2000 mg/100 g) in the formulations of the drink powder. The critical points observed by the consumers in these formulations were the degree of sweetness and, the powder content which was perceived as differences in viscosity. Therefore, a 2^k full factorial design with two factors, wine powder level and commercial sweetener level was applied. The formulations selected for the present work were the following four combinations (for one litre of reconstituted drink powder): 35g of wine powder + 4 g of commercial sweetener (sample hereon called 35-4), 40g of wine powder + 4 g of commercial sweetener (hereon 40-4); 35 g of wine powder + 5g of commercial sweetener

(35-5) and 40 g of wine powder + 5g of commercial sweetener (40-5). All the formulations had the same concentration of raspberry aroma and thickener.

2.2 Quantitative descriptive analysis

The sensory profiling of the four samples was generated by the quantitative descriptive analysis (QDA) according to methodology proposed by Stone & Sidel (2004). This technique has been

- adopted to analyze several food products, and its principles and steps are well established (Morais, Cruz, Faria & Bolini, 2014; Cadena , Cruz , Netto, Castro, Faria & Bolini, 2013).

The sensory panel consisted of 10 female assessors (20–22-years old), students of Facultad de Ciencias Agrarias, Pontificia Universidad Católica Argentina. All assessors were experienced in sensory analysis. They were trained in descriptive wine flavours (8 h). During training period, judges performed the following tasks: (1) tastes and odours identification using standard solutions (Table 1); (2) matching of aromas; (3) attribute generation of the four wine powder samples with the aid of standards and (4) use of unstructured scales. A total of 12 descriptive terms were defined by consensus among the assessors.

As part of training and to obtain additional information about the similarity among the samples a sorting task was performed. The assessors analyzed the samples in duplicate using the sorting task with description methodology (Chollet, Lelièvre, Abdi, & Valentin, 2011). The assessors were asked to taste all the samples and to group the samples that were perceived as similar, making as many groups as they wanted. At least three attributes had to be selected from the standards (Table 1) to describe each group. Testing took place in individual booths kept at 22 °C, in daylight (6,500 K).

The four rehydrated samples (10 mL) were served at 15º C in white plastic containers 5 cm diameter, encoded with three-digit random numbers to record the sample and presented to the assessors in randomized order per subject. Mineral water was provided for oral rinsing between samples which were assessed in triplicate (three sessions). The intensity of sensory attributes was recorded on a 100 mm unstructured scale.

-Table 1 here-

2.3 Consumer evaluation

2.3.1 Participants

The study was carried out with 144 consumers, recruited from the University campus (Universidad Nacional de Quilmes, Argentina) based on their frequency of consumption of fruit juices (at least 2–3 times a week) and red wine (at least once a week). The whole population was homogeneous, consisting of 70 females and 74 males, ages ranging from; aged 19 to 35 years old, M = 23.3, SD = 4.0.

In order to investigate the influence of health information on the acceptance of the new beverage and an additional factor, the presentation level of health related information (absent or present) was added. The total population was randomly divided into two groups, one of them being the control group and to the other group the following information was provided:

"You are going to taste a new healthy beverage, which was prepared with a red wine concentrated, without alcohol. A regular and moderate wine consumption is a highly evoked fact for explaining the low incidence of cardiovascular events in France (known as "the French paradox") compared with other industrialized countries. However, there are some clear

drawbacks in wine consumption and it must therefore be moderate (i.e., 1–2 glasses/day) in

order to avoid alcohol related diseases.

The new beverage contains the red wine phenolics but does not contain alcohol"

2.3.2 <u>Procedure</u>

The participants were asked to evaluate the four samples (10 mL each) in one session, which

were presented following a Latin square design in a sequential monadic way, and served in three-

digit white plastic containers (5 cm diameter) at 15° C. The order of samples presentation was

balanced among 144 consumer as MacFie, Bratchell,Greenhoff and Vallis (1989) recommended.

Mineral water was provided for oral rinsing between samples.

The attributes were sequentially analyzed in the following order:

1. Overall acceptance:

   a. First using a 9-point category scale, with the anchors dislike very much (1) to like very

   much (9), and with a neutral point at 5 (neither like nor dislike).

   b. Second using a 10 cm continuous visual analogue scale (VAS; Aitken, 1969) being

   the extremes ''I like it very little – I like it very much"

This second scale was only used to double check consumer evaluations, for this reason the order

of measurements was always the same.

2. Likes and dislikes: the participants were also requested in two open-ended questions to

   express their likes and dislikes about the beverage:

   a. What did you like about the beverage?

   b. What did you dislike about the beverage?

3. Emotional status: the consumers were asked to express how they felt after tasting the beverages by selecting all the words that apply from the check list of 39 terms (Table 2). The list to describe emotions associated with foods was adapted from King and Meiselman (2010) for Argentine Spanish speaking people. It is to be noted, that six of the original terms proposed were suppressed (friendly, good-nature, loving, merry, nostalgic and polite) and six new terms were introduced "Neutral", "Natural", "Relaxing", "Sad", "Alive", "Surprised". These terms were changed for more understanding in the translation to Spanish. The order of the words was the same for all participants.

4. Body/ viscosity was measured with a just about right scale (JAR; 5-point) anchored at both extremes: $+2$ = too much viscous and -2 = too much dilute, and a central point (0, optimum body).

5. Freshness, Aroma, Flavour, Sweetness, Sourness and Astringency were measured by using the two scales.

6. Intention to purchase and to drink again were scored with a five-point scale ranging from 1 = 'certainly wouldn't buy' / drink again to 5 = 'certainly would buy' /drink again.

-Table 2 here-

2.4 Data Analysis

Sensory trained panel data were evaluated by Analysis of Variance (ANOVA) to assess attributes significantly different among samples using the General Linear Model command of PASW Statistics 18 (SPSS Inc., Chicago, IL). The variability of each descriptor was studied

using a model where the assessor was considered a random factor and sample and replication fixed factors. Multiple means comparisons were carried out by the Least Significant Differences (LSD) test at $p < 0.05$.

Sorting task data was analyzed by applying a multidimensional scaling method and citation frequency of the descriptors using Infostat v. 2013 (Universidad Nacional de Córdoba, Argentina). For each assessor, the results of the sorting task were encoded in individual distance matrices where the rows and the columns are samples. The sum across all the subjects of these individual matrices provides information on similarities (Euclidean distance) between products

Differences among sample formulations, health information and gender were analyzed with the General Linear Model command of PASW Statistics 18 (SPSS Inc., Chicago, IL) Multiple means comparisons were carried out by the Least Significant Differences (LSD) test at $p < 0.05$.

Penalty analysis was performed on the JAR scale data to determine the impact on overall acceptance where in consumers scored the body attribute at "too little" or "too much" on a 5-point JAR scale (Lovelly & Meullenet, 2009) using XLSTAT v. 2014.5.03 (Addisoft[TM]).. This analysis allows the study to reach conclusions related to the effects of body on overall liking, identifying decreases in acceptability associated with this sensory attribute not at optimal levels in a product (Morais, Morais, Cruz & Bolini, 2014).

Preference and descriptive data were analyzed by External Preference Mapping approach as described by Schlich and McEwan (1992) using XLSTAT v. 2014.5.03 (Addisoft[TM]). This procedure makes first a Principal Component Analysis with the data of QDA using a correlation matrix with the means of the samples. After that, consumers were grouped according with their

preferences. Finally using the average acceptance values for each cluster, a vector model was applied to predict the acceptance of each consumer group based on the attributes of the samples.

The like, dislike and emotion words data were analyzed by citation frequency, chi-square distribution and Factorial Correspondence Analysis (FCA) using Infostat v.2008 (Universidad Nacional de Córdoba, Argentina). FCA resulted in a data matrix where the rows represent the samples evaluated, and the column represent the attributes used to describe the samples. Two contingency tables are made (McEwan & Schlich, 1991). Multiple means comparisons were carried out by the Friedman test at $p < 0.05$.

3. Results

3.1 Descriptive analysis

According to the sorting task results (Fig. 1), there was a clear separation of the four samples. The closeness of a sample and an attribute is interpreted in terms of correspondence. This means that this sample received higher relative mentions than others for this particular attribute. The attributes most mentioned to describe the samples were body, sweetness, aroma, acidity and astringency. The sample 40-5 was well identified by the three same descriptors by all the assessors; but 35-5 only was characterized by sweetness for all the assessors. Thus, the small changes made in the formulation were sufficient to determine that the samples were perceived as different by trained assessors.

 The mean scores for every attribute evaluated by the trained assessors and F-values of mixed model ANOVA are summarized in Table 3. As it can be observed, the attributes which showed differences among samples were sweetness ($p < 0.05$), acidity ($p < 0.05$), body ($p < 0.01$), yeast ($p < 0.05$), berry fruits ($p < 0.05$), and astringent aftertaste ($p < 0.05$). The panel performance

evaluated by the interactions sample*assessor presented some inconsistencies for aroma descriptors, because they shows differences among assessors and interactions sample*assessor (raspberry, alcohol and yeast; $p < 0.01$). This would be indicating that not all assessors evaluated aroma attributes in the same fashion for every sample, and /or that the samples are very similar in these descriptors so assessors cannot differentiate easily among them (Tang, Hsieh, Heymann, & Huff, 1999; Zamora & Guirao, 2002). In fact, all the samples had the same amount of raspberry aroma added, thus the four samples could be perceived with similar aroma.

Body was the most relevant descriptor to explain variations among the four formulations, and sweetness highlighted the body perception. This effect was only observed when the samples with the highest amount of wine powder (40-5 and 40-4) were compared. Therefore, this level of powder was necessary to induce the body enhancing. On the other hand, the sample 35-4 was perceived as less sweet and with the highest astringent aftertaste.

-Fig. 1 here-

-Table 3 here-

3.2 Consumer evaluation of the drink powder

3.2.1 Body measurement by Just About Right scale

As body was the key attribute to drive the differences among samples, a Just About Right (JAR) scale was applied to obtain information about whether this attribute was at its optimal level. Attribute diagnosis - body - measured by JAR scale (5-point) was analyzed by performing a Penalty analysis. Table 4 displays the percentage of consumers who scored body attribute at the three levels of penalty categories , and the statistically significant mean drop in overall acceptance for

each sample according to standard penalty analysis procedures. Consumers felt that samples 35-5 and 35-4 were too little in body and thus suffered a significant drop in the mean overall liking score ($p< 0.05$ and $p< 0.01$, respectively).

 As it can be seen, the sample 40-5 had the highest consumer frequency (56.9%) on the ideal point (point-0 in the middle of the scale). Probably, a little increase in body would be necessary since this sample had 31.3% of consumer perceived the body as "too much" diluted. However, the mean drop in overall liking (0.14) was not significant.. As it was described by the trained panel, the consumers also perceived the sample 40-5 with the highest values for body, revealing the influence of sweetness in body perception since the sample 40-4 was evaluated with less body. Therefore, this sample had the most liked combination of wine powder and sweetener of the four samples.

-Table 4 here-

3.2.2 Overall acceptance, intention to drink again and purchase intent taking into account information and gender as variation factors.

The participants evaluated overall sample acceptance by a 9-point category scale showing differences among samples ($p< 0.05$; Table 5), without significant effect from information and gender factors. The most accepted sample was 40-5 which was in accordance with the results obtained from body measurement.

In regards to drinking and purchase intent (using the 5-point scale), differences were only observed for purchase intent between males and females ($p< 0.05$; Table 5; gender factor). Male participants expressed higher purchase intent than females. Inspection of individual data revealed

that 43% of males "certainly or probably would buy" the new beverage (values 4 and 5 on the scale), but only 35% of the female consumers gave the same opinion ($F_{1\,207} = 4.12$; $p < 0.05$)). It is to be noted that males awarded the same scores for both measurements, intention to drink again and to purchase, but females' tended to decrease the scores for purchase intention. This segment of consumers with higher values in both measures (intentions to buy and to drink again), only showed a tendency to buy the sample 40-5 ($F_{3,\,207} = 2.09$; $p = 0.100$). The strategy of providing health-related information looking to contribute for a more positive evaluation of the new beverage was not sufficient to increase the differences among sample acceptation and purchase intention.

-T**able 5 here-**

3.2.3 Correlation between consumers' acceptance and sensory descriptors.

To support insight into how consumer acceptance is based on sensory attributes, data from descriptive analysis was correlated with each consumer's sample acceptance using Preference mapping approach (Fig. 2). Principal Component Analysis from sensory descriptive data showed that the first two factors explained 88.2 % of the total variance. Consumers were grouped in five clusters based in similarity of the scores given to sample preferences. Cluster 1 (29.2 % of consumers) is defined by better acceptance for samples (first 40-5 and, 35-5 in the second place) with higher sweetness and raspberry aroma. Cluster 2 (22.9 % of consumers) and 3 (18.1 % of consumers) are characterized by a group of people that likes the sample 40-5 for the attribute body and, aromas of strawberry and berry fruit. On the other hand, Cluster 4 (22.9 % of consumers; sample 40-4) represents the consumers that like a bitter beverage. Finally, Cluster 5 only 6.9 % of consumers prefer the sample 35-4 characterized by astringent aftertaste and in opposite direction to body. The highest density of consumers was close to the sample 40-5 (70.2

%, addition of cluster 1, 2 and 3) and the sensory attributes related to this sample were mainly sweetness and raspberry, followed by body, berry fruits and strawberry. As it can be seen, sweetness highlighted the perception of aroma which was also considered by the participants as a preference defining attribute.

-Fig. 2 here-

3.2.4 Double check consumer evaluations .

In the present study, the VAS scale was only used to double check consumer evaluations in order to confirm the participant perceptions about this new beverage. Therefore, the order of measurements was always the same, first 9-point category scale and then VAS scale.

The influence of information about the new healthy beverage resulted in differences in the following attributes evaluated by consumers: aroma ($F_{1,574} = 3.912$; $p < 0.05$) and sweetness ($F_{1,574} = 4.269$; $p < 0.05$) using a 9-point category scale, acidity with both scales ($F_{1,574} = 8.413$ and $F_{1,574} = 6.899$; $p < 0.01$), and astringency with VAS ($F_{1,574} = 5.039$; $p < 0.05$). In all of the cases information had a positive impact and scores obtained with information were higher than without information. It was expected for consumers to be more interested in a healthy beverage, and therefore increase the acceptance scores when given information about the possible health benefits of the drink. The effect of information was shown in few attributes both hedonically positive (like sweetness and aroma) and negative (like acidity and astringency). However, as previously stated, it had no influence on overall liking.

Table 6 shows the means and ANOVA F-values for the attributes measured by the participants taking gender as a factor. The double check presented the highest divergences by

gender factor, in which there were variation in acceptance ($p < 0.001$), appearance ($p < 0.01$), freshness ($p < 0.001$), flavour ($p < 0.01$), sweetness ($p < 0.01$), acidity ($p < 0.05$) and astringency ($p < 0.05$). Males gave similar or higher values when confirm the evaluation using the second scale. Conversely, females gave similar or lower values in the same conditions This result may be interpreted as a consequence of a confirmation of the sample acceptance, in which the tendency was that male participants liked the new beverage more than female participants.

-Table 6 here-

3.3 Expressions of the participants about their likes and dislikes of the beverage

In order to understand more clearly what would be the impact on consumer's acceptance of the little differences among formulations, the participants were asked to express likes and dislikes about the beverage. Citation frequency analysis of words used to express likes for all the samples showed that "sweet" (28% frequency) and "flavour" (27.5%) were the most frequently mentioned words by the consumers. "Colour" (10%), "body" (8%), "soft flavour" (6%) and "odour" (6%) were the second most mentioned terms. The less cited words were "freshness" (4.4%), "fruit flavour" (3.7%), "aroma" (2.1%), "acidity" (1.8%), "wine flavour" (1.1%) and "grape flavour" (0.7%). The citation analysis by sample indicated that all the samples had a similar frequency of the two more mentioned words, except to 40-5 for "flavour" (31% ; $p < 0.05$). Probably, what they liked about the samples was expressed in a holistic way through the word "flavour" in sample 40-5 which had the highest combination of wine powder and sweetener.

In regards to the dislikes, the participants used more words to express what they disliked (23 words) than they liked (13 words). The most frequently mentioned of the dislike words for all the samples was "diluted" (19%). The citation analysis by sample for "diluted" indicated that 35-4 was the most

mentioned (36%), then 40-4 (31%), 35-5 (21%) and finally 40-5 with only 12% (p< 0.05). It is to be noted that both ingredients - amount of powder wine and sweetener level - were important to decrease this perception. This result is in agreement with the measure of body using the Just About Right scale, in which the 40-5 sample had the highest consumer frequency (%) on the ideal point (p< 0.05).The following are more cited disliked words "flavour" (11.5%) and "sweetness" (11%), "odour" (6.2%), "aftertaste" (5.7%), "acidity" (5.7%), "consistency" (5.1) and "astringency" (5.1%).

In relation to the impact of information and gender in the citation frequency of liked words, it was observed that "Flavour" was more mentioned by males (8.6%) than females (5.5% ; p< 0.05), and information practically did not have any effect in this attribute. "Sweetness" was more cited by females (7.2%) than males (5.5% ; p< 0.05), and in both groups information increased the mention of likes (8.6 and 6.9%, respectively; p< 0.05). Females increased the citation of "Colour" and "Odour" when they received information. Concerning disliked words, "Diluted" was more mentioned by males (7.6%) than females (4.1% ; p< 0.05), and information decreased the mention in the male group (2.5% ; p< 0.05). Information increased the mention of "Astringency" and "Consistency" in the female group.

3.4 Emotions status after tasting the samples

The description of the emotional status after tasting the beverages by selecting all the words that apply from the check list (King & Meiselman, 2010) did not show a high consensus among consumers because most of the words were chosen, but with a low frequency. In general the participants tended to check only a few emotion words, between one to five. The words most frequently selected were "Neutral" (12.1%), "Natural" (9.5%), "Calm" (7.1%) and "Quiet" (6.2%). The second most elected terms were "Satisfied" (4.3%), "Interested" (4.0%), "Steady" (3.8%), "Good" (3.2%) and "Free" (3.3%). Negative emotions, such as "Guilty", "Sad", "Angry", "Worried", "Aggressive" and "Eager" were selected with a frequency less than 0.8%.

In regards to the words chosen by gender, there were a similar frequency between males (23%) and females (24%). However, information had a dissimilar effect because males increased the frequency of positive emotions (34%) and females decreased (19%) this frequency.

In order to highlight the frequency of selected words, six related terms were summed to another similar which was more cited, such as: "Understanding to Tender", "Energetic to Active", "Joyful to Happy", "Peaceful to Calm", "Pleased to Satisfied" and "Tame to Calm". "Guilty" was deleted because it was mentioned by only three participants. These emotion profiles comparing males and females with and without information are shown in Fig. 3.

-Fig. 3 here-

Factorial Correspondence Analysis (FCA) was applied by taking into account the words mentioned by sample (Fig.4). As can be seen, the most frequently selected emotions ("Neutral", "Natural", "Calm" and "Quiet") are placed near the centre of coordinates indicating that these words were mentioned with similar frequency for all the samples. The formulations 40-4 and 40-5 were grouped, showing agreement in the emotions provoked. Sample 40-5 was identified with the highest amount of positive words like "Pleased", "Secure", "Energetic", "Satisfied", "Adventurous", "Joyful" and "Whole. Sample 40-4 is recognized by the same emotion words that 40-5, but with less citation frequency; it is near the most mentioned words (like "Quiet") for all the samples. The two samples with less amount of powder wine (35-4 and 35-5) provoked in the consumers some negative emotions such as "Bored" (35-4) and "Aggressive" (35-5). Therefore, the emotions - chosen by the consumers to describe their feelings about the new beverage - helped to explain the acceptance data.

-Fig. 4 here-

3. Discussion

For consumers, the most relevant difference among the four different formulations of the drink powder was the body characteristic which was evaluated by a Just About Right (JAR) scale and the data studied by Penalty analysis. This scale provides an idea of the proportion of consumers who perceive each sample in a certain way and allows the determination of the intensity of an attribute considered as ideal for a given product (Costell, Tárrega & Bayarri, 2010). Penalty analysis gave more information about the group of consumers (31.3%) that considered the body of sample 40-5 as "too much" diluted. Even though this group perceived it "too much" diluted, these consumers did not drop significantly the overall liking. In the present paper, JAR scale was a good instrument to know the opinion of consumers about the body level, because there was a consensus of the attribute which checked the differences among formulations.

It is to be noted, - as the main objective of this work was to detect changes in the acceptance - that the acceptance scores obtained with the 9-point category scale were the only results in which a significant difference among formulations was observed. Thus, the first impact of the sample is the most important to find differences among consumer preferences.

The difference in acceptance between genders was only obtained with the confirmation scales. Moreover, males and females showed the same intention to drink again but, females decreased the scores for purchase intention, obtaining in this case differences between genders. The results obtained with the confirmation scale were unexpected, for this reason more studies will be necessary to explore this condition.

Concerning the effect of health-related information in order to increase the acceptance of the new beverage, this objective was not verified. Probably, the age range (19 to 35) of the participants may explain the lack of concern about health related properties of the beverage. In line with this statement, previous studies have demonstrated that effect of information on product acceptance is more noticeable when targeted to and matching with the socio-demographic

characteristics age and gender. For example, older consumers and women were more likely to accept fruit juices that claim a particular health benefit (Sabbe, Verbeke, Deliza, Matta & Van Damm*.,* 2009). Other studies (Niva, 2006; Siró, Kápolna, Kápolna & Lugasi, 2008; Urala, Arvola, & Lahteenmaki, 2003) mentioned women to be more affected by information than men. However, some researchers (Lyly, Roininen, Honkapaa, Poutanen & Lahteenmaki, 2007; Mialon, Clark, Leppard & Cox, 2002; Urala & Lahteenmaki, 2007; Verbeke, 2005) did not find gender effects determining the acceptance of food products with nutrition and health-related claims.

On the other hand, the expressions of the participants about their likes and dislikes of the beverage revealed that consumers were more certain of what they disliked than liked. Since they expressed their likes with the holistic term "Flavour" and identified specifically the term "diluted" as the most disliked characteristic. In this way, the use of comment analysis allowed a better interpretation to the sample descriptions because, the trained assessors used viscosity and the consumers "diluted" which was related to the relative amount of wine powder in the healthy beverage

It is to be noted that emotions chosen by the consumers to describe their feelings about the new beverage, helped to explain the acceptance data. As referred King and Meiselman (2010) a large number of emotions appear to be needed to fully characterize the emotional response to foods. However, in the current research the participants tended to check only a few words from the list of 39 emotions. Probably, the order of evaluation (Overall liking – What did you like/ dislike about the beverage- Emotional status) should be modified in order that participants assess a product, first in an emotional way, and then by more analytical form.

Conclusions

The present data suggests that the changes in acceptance due to slight variations in the formulations of a new fruit flavoured healthy beverage can be obtained with the 9-point category scale and probably, this result may be awarded to the first impact of the sample. Double checking consumer evaluations highlighted the differences in the target populations. Information of health benefits did not increase the acceptance of the new beverage, but this may be attributed to the age range of participants (19 to 35 years old). It would be interesting to study what happens in the target population with ages older than 35 years. The emotions chosen by the consumers to describe their feelings about the new beverage helped to explain the acceptance data.

Acknowledgements

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Figure captions

Fig. 1. Multidimensional scaling method from Sorting tasks followed by descriptions data of trained assessors. ——

Fig. 2. Preference mapping between consumer acceptance (9-point category scale) and descriptive analysis data.

Fig. 3. Emotion profiles (Absolute frequency) comparing males and females, with and without information taking the four samples as a whole. *** ($p < 0.001$), * ($p < 0.05$).

Fig. 4. Factorial Correspondence Analysis (FCA) of the emotion words selected after tasting the samples.
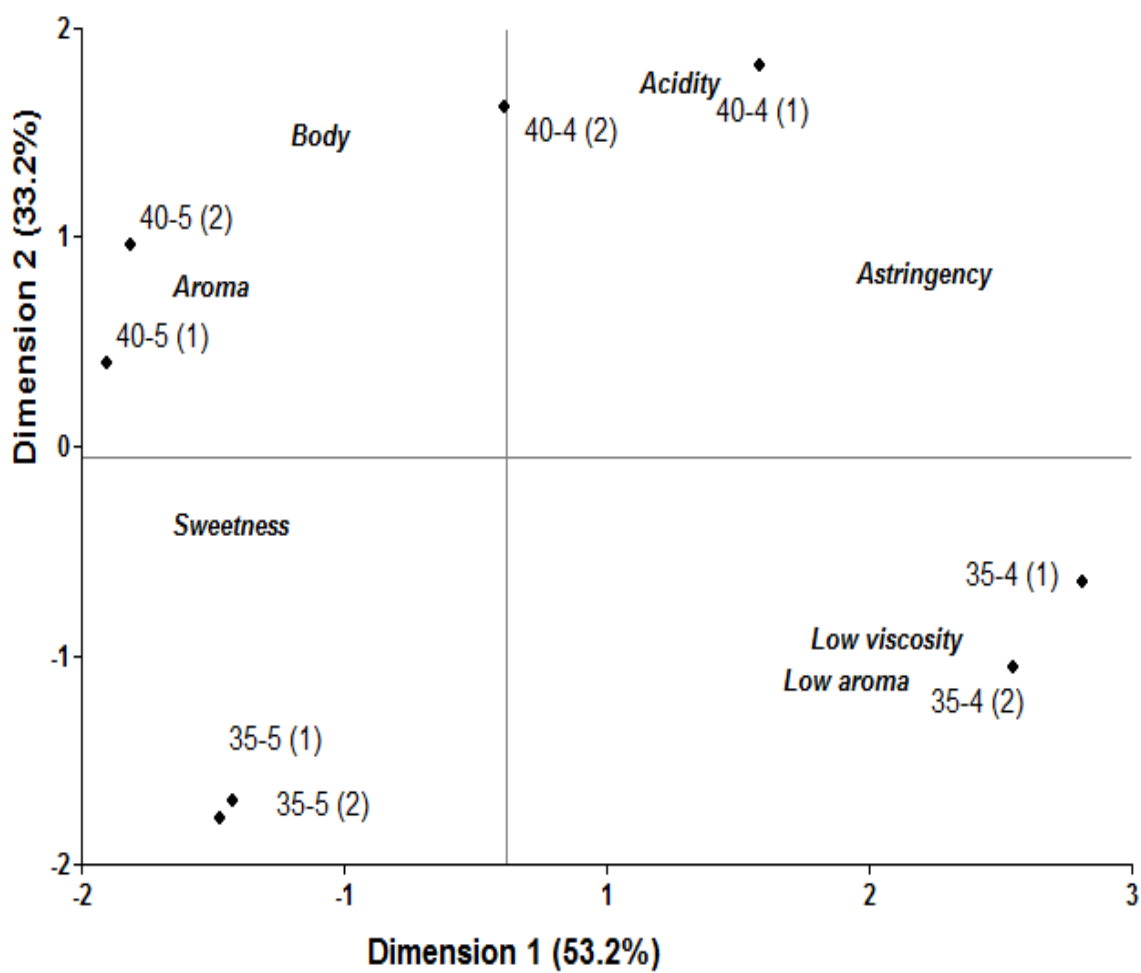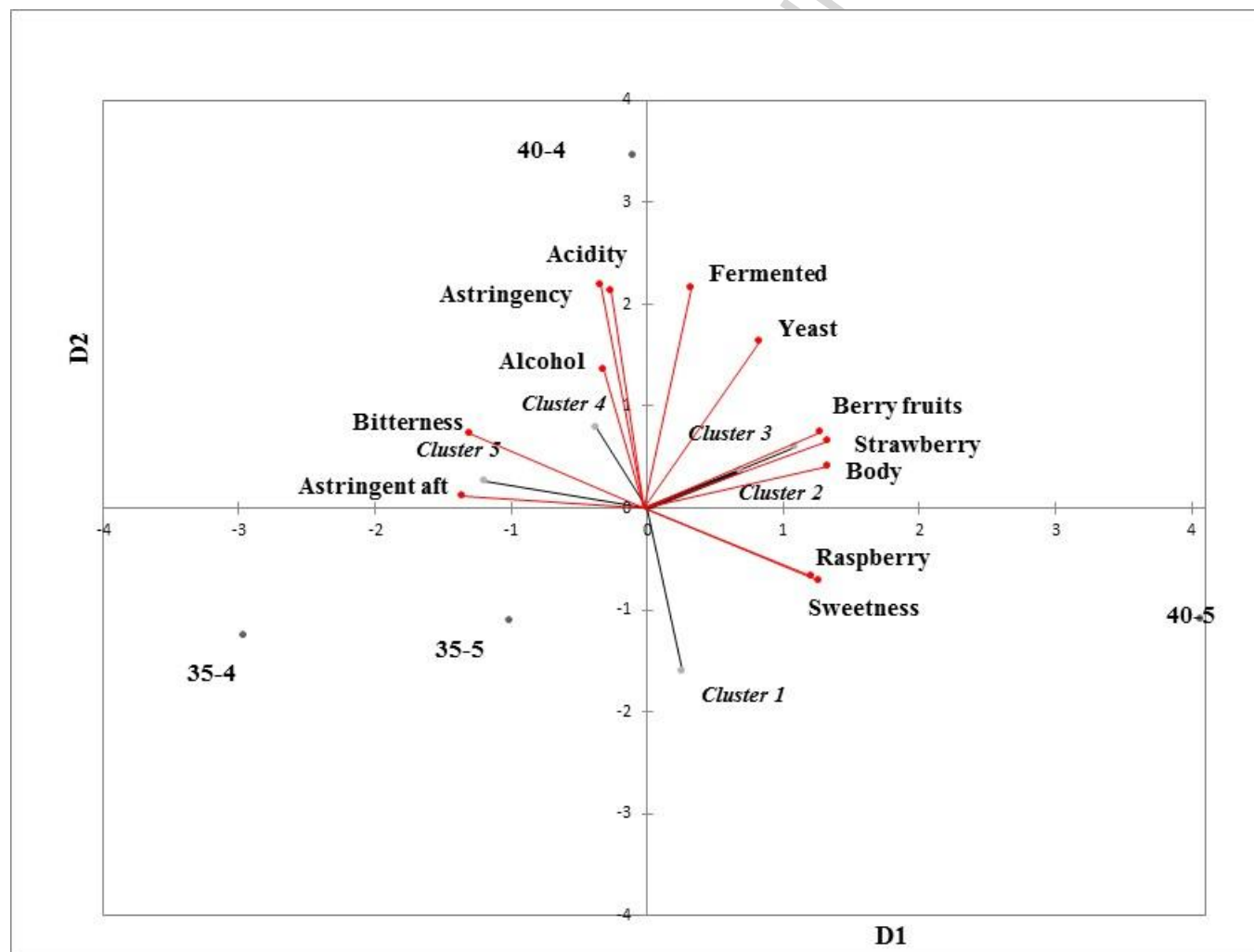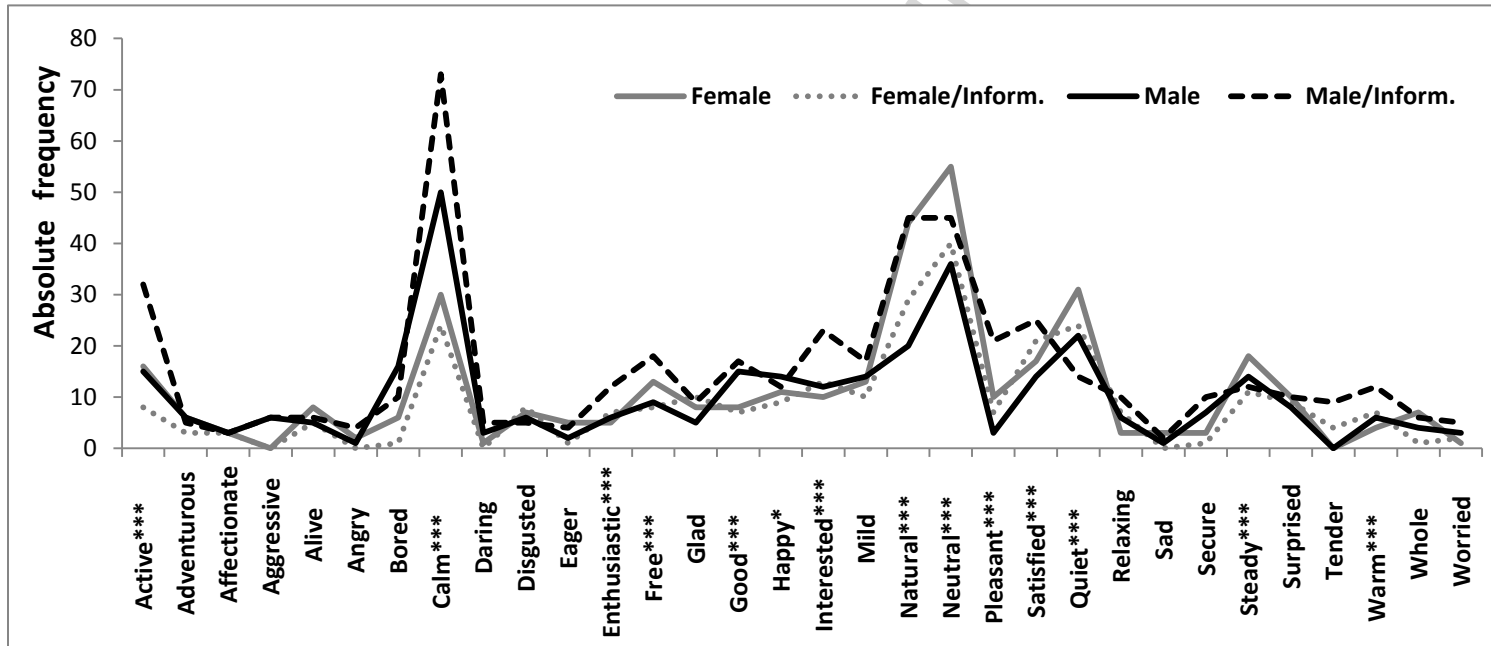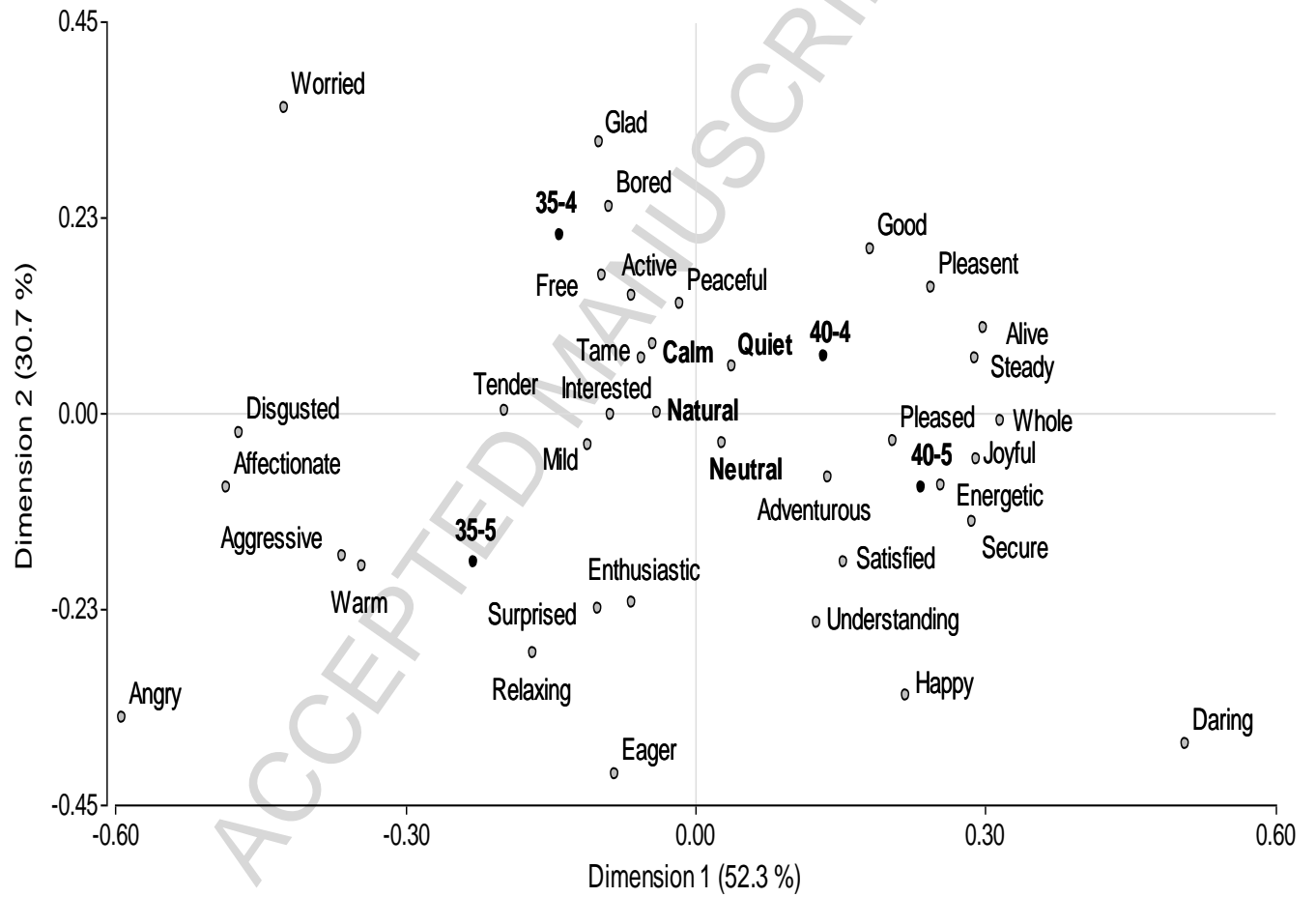
Fig. 1

Fig. 2

Fig. 3

Fig. 4

Table 1

Attribute definitions and reference standards used for descriptive sensory analysis of the wine powder beverage

Attribute	Definition and reference standard
Acidity	Taste sensation stimulated by acids contained in citric fruits such as lemon. Citric acid 0.15% (w/vol.)
Sweetness	Taste sensation stimulated by sugars such as sucrose and other substances such as saccharin. Sucrose 5%
Bitterness	Taste sensation associated with caffeine in a water solution. Caffeine 0.15%.
Astringency	A combination of shrinking, puckering, drying, and roughening sensations in the mouth caused by substances such as phenolic compounds contained in infusions including tea, mate and wine. Tea bag soaked in hot water for 1 hr.
Body/ Viscosity	Thickness, consistency or density in the mouth for example the sensation produced by a light cream. Guar gum 0.25%.
Alcohol (odour)	Odour associated with ethanol (Ethanol 1% in water, Soria, Bs. As., Argentina)
Raspberry (odour)	Aroma associated fresh raspberry (Symrise, Argentina; 0.02% in water)
Yeast (odour)	The aroma of yeast in bakery products. Filter paper soaked in essence of Firmenich, Argentina, placed in a sealed glass flask.
Berry fruits (odour)	Aromatic characteristics of a mixture of fresh berries. Filter paper soaked in essence of Firmenich, Argentina placed in a sealed glass flask
Strawberry (odour)	The aroma of strawberry fresh fruit. Filter paper soaked in essence of Firmenich, Argentina placed in a sealed glass flask
Fermented (odour)	The aroma of fermented beverages. Filter paper soaked in essence of Firmenich, Argentina placed in a sealed glass flask
Astringent aftertaste	Astringency sensation that remains in the mouth after the beverage has been swallowed.

Table 2. Emotion check list*

Active (*Activo*)	Glad *(Contento*)	Pleasant (*Placentero*)
Adventurous(*Innovativo*)	Good (*Bueno*)	Surprised (*Sorprendido*)
Affectionate (*Afectuoso*)	Natural (*Natural*)	Quiet (*Tranquilo*)
Aggressive (*Agresivo*)	Guilty (*Culpable*)	Satisfied (*Satisfecho*)
Bored (*Aburrido*)	Happy (*Feliz*)	Secure *(Seguro*)
Calm (*Calmo*)	Interested (*Interesado)*	Steady (*Estable*)
Daring (*Atrevido*)	Joyful (*Alegre*)	Tame (*Manso*)
Disgusted (*Disgustado*)	Relaxing *(Informal*)	Tender (*Tierno*)
Eager (*Ansioso*)	Mild (*Liviano*)	Understanding (*Comprensivo*)
Energetic (*Enérgico)*	Sad (*Triste*)	Warm (*Cálido*)
Enthusiastic (*Entusiasta*)	Alive (*Animado*)	Whole (*Entero*)
Free (*Libre*)	Peaceful (*Pacífico*)	Wild (*Enojado*)
Neutral (*Neutral*)	Pleased (*Encantado*)	Worried (*Preocupado)*

*Adapted from King and Meiselman (2010) for Argentine Spanish speaking people.

( ) Spanish translation

Table 3

Sample intensity values for sensory attributes from descriptive analysis, and corresponding F-values resulting from analysis of variance

Attributes	Samples				F-value		
	35-4	35-5	40-4	40-5	Sample (S)	Assessor (A)	S*A
Basic tastes and mouthfeel sensations							
Sweetness	6.0 ± 0.2^a	7.2 ± 0.3^{bc}	6.5 ± 0.4^{ab}	7.9 ± 0.2^c	7.98*	1.18	0.62
Bitterness	1.7 ± 0.1^a	1.7 ± 0.1^a	1.7 ± 0.1^a	1.6 ± 0.2^a	0.53	1.41	1.13
Acidity	4.1 ± 0.1^a	3.8 ± 0.2^a	4.6 ± 0.2^b	3.9 ± 0.1^a	8.31*	0.69	1.31
Astringency	3.7 ± 0.1^a	3.5 ± 0.5^a	4.2 ± 0.3^a	3.5 ± 0.1^a	1.37	1.63	0.44
Body	2.8 ± 0.1^a	2.9 ± 0.1^{ab}	3.6 ± 0.3^b	4.4 ± 0.2^c	16.45**	1.62	1.35
Aromas							
Raspberry	5.6 ± 0.1^a	5.6 ± 0.2^a	5.6 ± 0.1^a	5.9 ± 0.1^a	0.76	2.93**	1.94*
Alcohol	2.3 ± 0.2^a	2.4 ± 0.2^a	2.4 ± 0.1^a	2.3 ± 0.1^a	0.35	3.51**	2.78**
Yeast	2.7 ± 0.1^a	2.6 ± 0.2^a	3.1 ± 0.3^b	3.0 ± 0.2^b	4.29*	2.75*	2.58**
Berry fruits	5.5 ± 0.1^a	5.7 ± 0.1^{ab}	5.8 ± 0.1^b	5.9 ± 0.2^b	8.00*	2.14*	1.05
Strawberry	4.6 ± 0.1^a	4.7 ± 0.2^a	4.8 ± 0.1^a	4.9 ± 0.2^a	1.71	2.92*	1.50
Fermented	1.6 ± 0.1^a	1.7 ± 0.2^a	1.9 ± 0.1^a	1.7 ± 0.1^a	1.51	2.21*	0.86
Aftertaste							
Astringent	4.6 ± 0.2^c	4.0 ± 0.1^{ab}	4.1 ± 0.2^{bc}	3.5 ± 0.2^a	9.96*	1.13	1.11

Data expressed as mean ± standard deviation

Different lower case letters represent significant differences (p < 0.05) among samples according to *Fisher's Least Significant Difference* (*LSD*).

*, ** Indicate a significant difference at p< 0.05, 0.01

Table 4. Penalty analysis of body JAR results: consumers (%) and mean drop
in overall acceptance (base on a 9-point scale).

Sample	Penalty category		
	Too much	Too little	JAR (ideal-point)
	% consumers (mean drop)		
40-5	11.8 (0.28)	31.3 (0.14)	56.9
40-4	9.1 (0.12)	47.2 (0.54)	43.7
35-5	9.7 (0.37)	42.1 (0.66)*	48.3
35-4	9.1 (0.14)	49.7 (0.89)**	41.3

* $p < 0.05$; **$p < 0.01$

Table 5.

Sample acceptance means (9-point category scale), drinking and purchase intent (5-point

category scale); and ANOVA F-value taking sample, information and gender as variation factors.

			F-value		
Attribute	**Sample**	**Means**[1]	**Sample**	**Information**	**Gender**
Acceptance	40-4	6.2 ± 1.7^a	2.564*	0.404	0.611
	35-5	6.1 ± 1.8^a			
	35-4	6.1 ± 1.7^a			
	40-5	6.6 ± 1.3^b			
Intention	**Gender**				
To drink again	Female	3.2 ± 1.1	1.288	0.584	2.384
	Male	3.4 ± 1.1			
To purchase	Female	2.9 ± 0.9^a	0.854	1.983	3.298*
	Male	3.4 ± 1.0^b			

[1]Data expressed as mean ± standard deviation

Different lower case letters represent significant differences ($p < 0.05$) among samples according

to *Fisher's Least Significant Difference* (*LSD*). * Indicate a significant difference at $p < 0.05$

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Table 6.

Double check consumer evaluations. Means and ANOVA F-values for the attributes measured

by the participants taking gender as variation factor.

	Means		F-values
Attributes	**Female**	**Male**	**Gender**
Acceptance	6.2	6.3	0.611
Acceptance VAS[1]	5.7	6.4	12.843***
Appearance	6.3	6.2	1.048
Appearance VAS	6.2	6.7	7.868**
Freshness	6.1	6.4	4.322*
Freshness VAS	5.8	6.5	17.269***
Aroma	6.0	6.0	0.009
Aroma VAS	6.0	6.2	0.357
Flavour	6.0	6.2	1.688
Flavour VAS	5.8	6.3	6.132**
Sweetness	6.2	6.4	1.374
Sweetness VAS	6.2	6.6	7.292**
Acidity	5.5	5.7	1.533
Acidity VAS	5.5	5.9	5.780*
Astringency	5.6	5.7	0.888
Astringency VAS	5.6	5.9	4.022*

*** ($p < 0.001$), ** ($p < 0.01$), * ($p < 0.05$)

[1]Second evaluation

Highlights

- An alcohol- free red wine powder drink with high polyphenol content was developed

- Second scale consumer evaluations highlighted the differences in target populations

- Emotional status and dislike comments were more accurate in clusters the samples