

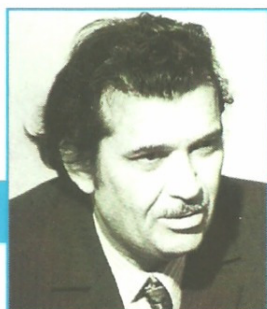
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## FAMOUS AZERBAIJANI SCIENTISTS

### Acad. Ziya Bunyadov (1923-1997)

Ziya Bunyadov was born on December 21, 1923 in the town of Astara in Azerbaijan. His father, originally from Bibiheybat village of Baku, was a Custom Officer and, due to his work, the Bunyadov family changed their residence several times. After finishing secondary (high) school in Goychay in 1939, he joined Baku military school. In 1942 he was sent to World War II to fight on the Caucasus Front, near the town of Mozdok. The Krasnaya Zvezda (Red Star), the official newspaper of the Soviet Army, wrote about Bunyadov in 1942: "...swift as a tiger, the intelligence officer Ziya Bunyadov, who under the improbable conditions, in the most complex situation could clearly orient himself, bring precise data about the number, the armament and the dislocation of the enemy. He was valued in the battalion for the romantic soul and the literary erudition". He went on to fight on the European Front and participated in the Soviet capture of Berlin.

Ziya Bunyadov was awarded the Soviet Union's highest military honor, the Hero of the Soviet Union, for his action in the battle over Pilitsa bridge in Poland on January 14, 1945. As well as this medal, for his participation and heroism in World War II Ziya Bunyadov was also awarded the honorary Red Banner, Red Star, Alexander Nevsky, and 2nd degree Patriotic War. For a year after the end of war, Lieutenant Ziya Bunyadov was deputy military commandant of the Pankow district of Berlin.

After the war, Ziya Bunyadov graduated from the Moscow Institute of Oriental Studies and in 1954 defended his doctorate dissertation. Dr. Bunyadov returned to Baku and started working at the Institute of the History of the Academy of Sciences of Azerbaijan. Here he progressed from the position of research associate to become a chief scientist, head of the Institute of History, corresponding member of the Academy of Sciences and then finally full academician and vice-president of the Academy of Sciences. He was the author and editor of numerous monographs, books, and articles on the history of Caucasus.

He died on February 21, 1997.

# CONSUMER STUDY AND SENSORIAL EVALUATION OF A NEWLY DEVELOPED SPICY STRAWBERRY SYRUP

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## ABSTRACT

The potential beneficial effects of strawberry allied to those of chilly in many aspects of human health lead to the development of a spicy strawberry syrup. The work included the development of the product, including formulation, processing and industrialization aspects, chemical and sensorial analyses as well as a consumer study, of which some will be analysed in the present manuscript.

The sensorial evaluation was performed with a panel of 25 tasters, of which 17 were women and 8 men. The parameters evaluated using a hedonic scale were: visual aspect, colour, consistence, brightness, sweetness, strawberry taste, spicy taste, global appreciation.

To characterization of the product a brief chemical analysis was made. The mineral content was determined by calcination at 550 °C, the total soluble solids (mainly sugars) were determined by refractometry and the moisture by a halogen moisture analyser.

In all characteristics evaluated in the sensorial analysis the medium punctuation was 4 (in a scale from 0 to 5), corresponding to Good. Despite the product being considered quite spicy, its acceptance was very good.

**Key words:** Food development; strawberry syrup; consumer study; sensorial analysis

## 1. INTRODUCTION

Strawberries (*Fragaria×ananassa* Duch.) belong to the most popular fruits and their production, sales and processing is of considerable economic importance in Western Europe. The bright red colour and the strawberry aroma of the fresh fruits are some of the main properties appreciated by consumers (1). Moreover, there is also an increasing number of strawberry products (frozen fruits, concentrates, jam, juice, nectar, syrup, dairy products, etc.) available in the market. The colour intensity and stability are of relevance for processing companies (1).

During processing some attributes, such as texture, colour and aroma, may be lost or altered, namely by the water content in foods. Continuous innovation and process optimization have been taken to improve the quality of fruit products. The quality of fruit products can be improved by applying less invasive process or by the use of specific additives, which can influence physicochemical properties such as aroma, texture and colour, and lead to an improvement in the overall quality of the product (2).

Colour modifications with respect to the original product directly affect the quality and acceptability of the food. Offcoloured food is likely to be rejected, even though it may present good flavour and pleasant texture (3). The use of colourant compounds to avoid colour transformations is common practice to some foods. Among such compounds, paprika is one of the most commonly used, and meat products containing this spice are known as "red line" products. The addition of paprika confers redness to these products because of its high content of carotenoid pigments (4,5), besides its characteristic taste, which exerts an effect of differentiation. Of all spices, paprika has one of the lowest redox potentials (5,6).

Strawberries contain a wide range of nutrients, of which vitamin C leads the group. In addition, they also constitute a good source of vitamins such as vitamin K, folic acid, riboflavin, vitamin B<sub>5</sub> and vitamin B<sub>6</sub>, as well as some minerals like copper, magnesium, potassium, and manganese. Furthermore, strawberries contain some important omega-3 fatty acids. Potassium is responsible for the transmission of nervous impulses and good functioning of the muscles (7) and folic acid participates in the production of white and red globules and in the synthesis of antibodies (8). Furthermore, strawberry has diuretic effect, favouring the elimination of uric acid and salts. Besides, strawberries can be considered a very important source of antioxidants that fight free radicals, which are elements that can damage cells, and are thought to contribute to the formation of many kinds of cancer. In this way they are rich in phytonutrients and bioactive phenolic compounds and, compared with other fruits, they possess higher antioxidant activity (9). This property is also characteristic of paprika, which possesses antioxidant properties as well (10,11). The antioxidant activity of strawberry phenolics is important in the prevention of cancer, cardiovascular and other chronic diseases (12).

It is estimated that 75% of the new products fail within their first year on the supermarket shelf (13) and that, as a consequence, considerable resources invested in product development is squandered (14). When integrated within the products development process, sensory analysis allows cost-effective delivery of acceptable products to consumers and thus reduces the risk of failure (15).

Developing a successful new product requires a correct sensory evaluation and a complete understanding of an acceptance pattern of consumers (16).

Sensory evaluation is often described like a scientific method used to evoke, measure, analyse and interpret those responses to foods as perceived through the senses of sight, smell, touch, taste and hearing (17). Sensory characteristics comprising appearance, odour, flavour and texture are included within the quality of food products.

For the sensory analysis there are two types of sensory tests, discrimination and descriptive. The discrimination tests are used to determine if a difference exists between two or more sample. Descriptive analysis characterises the sensory properties of a product, normally a scale was using to measuring each evaluation term (18).

Today's innovation practises in the food industry are filled with the recognition that the voice of the consumer is paramount (19,20). One consequence of consumer focus is the enormous quantity of literature and studies on this so-called "voice of the consumer", as a part of the stages for new product development (21). Rather everywhere, innovation means incorporating the consumer needs and wants into products (20). In other words, for "food scientists" to perform tests that will accurately predict consumer behaviour at the point of purchase, it is necessary that they include in their experimental designs a certain set of marketing variables in their experimental design specifications, to assure that consumers (and the "right consumers") will respond appropriately to new products (22). That is, for the success of one type of product on the market it is very important to direct it to the right people – target segmentation. Target segmentation is the process of identifying particular subsets of consumers within a total market whose behaviour is homogeneous with respect to their response to a product and their marketing strategy (22). For instance, we can target the market by demographic characteristics (like sex or age), psychographic (like lifestyles) or by behavioural criteria, like consumer's habits and types of purchase (23).

The potential beneficial effects in many aspects of human health of these two food products (strawberry and paprika) lead to the development of a spicy strawberry syrup. The work included the development of the product, including formulation, processing and industrialization aspects, as well as the analysis of the final product. Furthermore, to evaluate how the consumer would perceive and accept such a product, a sensorial evaluation was performed and a consumer study was carried out. For this, a sample of 100 persons were chosen using arbitrary criteria with the purpose of obtaining information about the types of purchase (types of buying), buying habits (frequency of consumption, occasion of consumption, elements influencing the buying decision) and other information relating to the tastes and preferences (such as "do you like strawberries") that would enable us to comment on the possible acceptance of the product for them. Although the consumer's study should be refined and extended to a greater number of people, we think that the one made gives an idea about the possible acceptance of the product by this people.

## 2. EXPERIMENTAL

The sensorial evaluation was performed with a panel of 25 untrained tasters, of which 17 were women and 8 men. Descriptive analyses were made according to international protocols (ISO 6658) (24). The parameters evaluated using five point hedonic scales were: visual aspect, colour, consistence, brightness, sweetness, strawberry taste, spicy taste and as an overall perspective the global appreciation. Hedonic scales perform best results when untrained panellists are used (25).

With respect to the determination of some major chemical components, with some relevance in terms of the nutritional value of the product, standard methodologies were used. The mineral content was determined by calcination at 550 °C, the total soluble solids (of which the majority are sugars) were determined by refractometry with a refractometer (Atago) and the moisture by a halogen moisture analyser (Mettler Toledo HG53) with operating parameters set to: temperature = 120 °C, speed = 3. The analyses were performed in triplicates.

Furthermore, a consumer study was also conducted in order to evaluate the acceptability of the product by potential consumers as well as to perceive the eventual buying intentions. The questionnaires were applied to 100 persons, of which 65 were women and 35 were men.

## 3. RESULTS AND DISCUSSION

As previously said, an evaluation was performed to determine the contents of some major chemical components of importance in this type of product, namely mineral content (ashes), moisture and sugars. The results are presented in Table 1, and result from the calculus of the mean value between three replicates. The results show that, as expected for this type of product, the sugar content is high, with the total soluble solids content over 77 %. On the other hand the moisture content for this syrup is also high, near 63 %, and the mineral contents, evaluated as ashes, is 0.63 %.

**Table 1.** Results of the chemical analysis performed

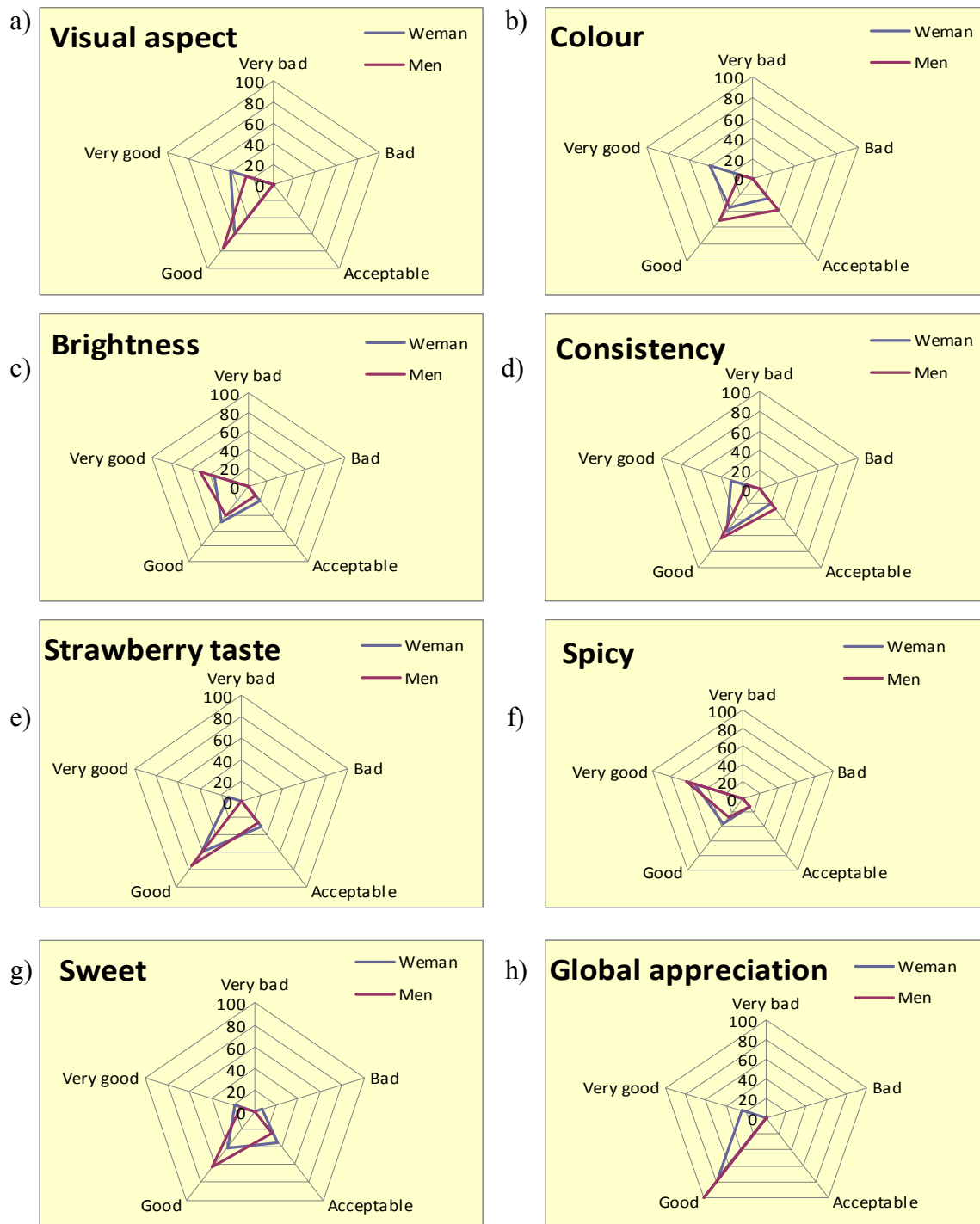
Property	Value (g/100 g sample)
Moisture	62.71
Total soluble solids	77.50
Ashes	0.63

With respect to the sensorial evaluation performed, Figure 1 shows the results of the sensorial evaluation considering the different attributes analysed: visual aspect, colour, brightness, consistency, strawberry taste, spiciness, sweetness and global appreciation.

The visual aspect (Figure 1a) was mainly considered as good (64 %) or very good (36 %) by all panelists. With respect to each group, 59 % of women and 75 of men considered it good whereas 41 % of women and 25 % of men considered it very good.

The colour and brightness, which are some of the main aspects usually appreciated in syrup by consumers are presented in the graphs b and c in Figure 1. The colour (Figure 1b) was evaluated as very good by 10 people (6 women and 4 men), very good by 8 (7 women and 1 men) and acceptable by 7 persons (of which 4 were female). This way, 41 % of women and 12 % men considered it very good, 35 % women and 50 % men considered it good, and 24 % women and 38 % men considered it just acceptable.

As to brightness (Figure 1c), 11 tasters considered it good (8 of which were women), 10 very good (6 women and 4 men) and 4 acceptable (of which one was a man). Therefore, 50 % men and 35 % women found the product very good with respect to this property whereas 47 % women and 38 % men considered it good.



**Fig.1.** Sensorial analysis considering different parameters evaluated (results expressed in percentage of answers with respect to each group separately: male and female)

The consistency (Figure 1d) was considered as good by the major part of the panellists, 9 women (representing 29 % of the female group) and 5 men (representing 12 % of the male group), whereas 5 women (29 % of this group) and 1 men (12 % of this group) considered it very good and only 3 women and 2 men evaluated it as reasonable, 18 % and 25 % respectively for each group.

The strawberry taste (Figure 1e) was good for the 64 % of the panellists (10 women and 6 men), however 28 % considered it as just acceptable (5 women and 2 men). Consequently with respect to the female group, 12 % considered it very good, 59 % good and 29 % acceptable. As to the male group, 75 % considered it good and the other 25 % considered it acceptable.

Our results also showed that the spicy intensity (Figure 1f) was mainly considered as very good, as referred by 9 women and 5 men, while 6 women and 2 men considered it good. In This way, the product was evaluated as very good

by 53 % of women and 63 % of men, good by 35 % of women and 25 % of men and just acceptable by 12 % of women and 12 % of men.

In Figure 1g it is possible to see that 48 % of the panel considered the sweetness of the product good (7 women and 5 men) while 32 % considered it acceptable (6 women and 2 men). With respect to the female group, 18 % considered the product very good, 35 % acceptable and 41 % good. As for the male group, 12 % considered it very good, 25 % acceptable and 63 % good.

The global appreciation (Figure 1h) was mainly considered as good (13 women and 8 men), although some described it as very good (4 women). In this way, 76 % of the female group considered the product as good while 24 % considered it as very good. With respect to the male group, 100 % of the enquired considered the product good.

The sensory profile of strawberry syrup was built using the marks given for each attribute by the panel. Figure 2 shows these results expressed as an overall sensorial evaluation relative to the strawberry syrup analysed. From the results obtained, it is possible to see that the product developed was considered very tasty (4 points), extremely spicy (5 points), and with good consistency (4 points). It was well appreciated (4 points) and the visual aspect was considered good (4 points). As to sweetness, colour and brightness, some difference was found in the appreciation by men and women. While men considered the product extremely bright (5 points) and very sweet (4 points), woman gave these attributes the scores 4 and 3, respectively. As to the colour, it was given 4 points by man and 5 by women, thus indicating that these last considered the product with an extremely appealing colour.

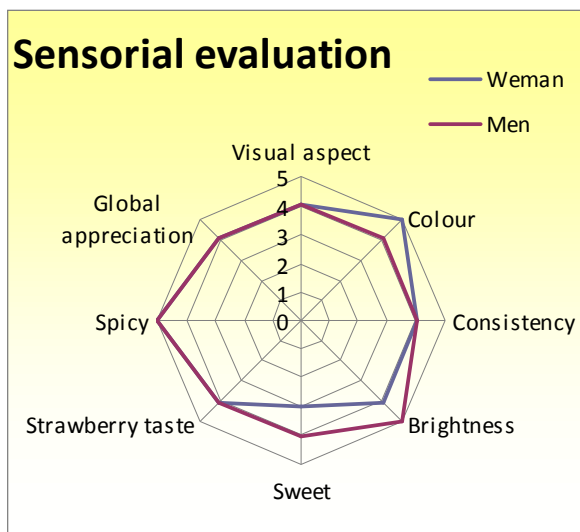


Fig. 2. Overall sensorial evaluation

In the first phase of the consumer research the questions asked intended to perceive what are the consumer's habits towards this kind of product (syrups in particular). In a second phase, more specific questions were asked having in mind this specific product: the spicy strawberry syrup. Figures 3 and 4 resume some of the most important results obtained from applying the questionnaires to a sample of 100 people (65 women and 35 men), in relation to the first and second phases of the consumer research, respectively.

Figure 3 shows that most of the inquired people seldom eat syrups (39 %), 19 % of the answers are to eat once a week and only 3 % say they eat this product 3 to 6 times per week (Figure 3 a). As to when this type of product is consumed, most of the people eat it at tea time (56 %), followed by breakfast with 27 % (Figure 3b). In relation to the aspects in the syrup that are more important to the consumer (Figure 3c), the major part of the inquired consider the taste (24%) the most important characteristic. Texture, sweetness and consistency were also aspects quite appreciated, by 19 %, 19 % and 12 % of the inquired, respectively. Figure 3d shows that 79 % of the people buy by impulse whereas 9 % buy by planning. Among the elements that influence the

decision to buy jams (Figure 3e), family appears with the highest number of responses (38 %), coming before advertising and promotions, with 24 % and 22 % of the answers, respectively. As to the purchase (Figure 3f), 50 % buy themselves while for the other 50 % someone else does it.

Figure 4 shows some results concerning the acceptance of this particular type of syrup, also allowing the comparison of the behaviour between men and woman. The results showed that the major part of the inquired usually didn't eat syrups (30 % men and 50% women) and some even never tasted them (5 % men and 10 % women) (Figure 4a). As to the sweet & spicy experience, 10% of the men and 40 % of women had already tasted a mixture sweet&spicy (Figure 4b). More than 90 % of the inquired persons affirmed to like strawberries (35 % men and 60 % women) as seen in Figure 4c. In Figure 4d is possible to see that 60% (30 % women and 30 % men) of the inquired liked paprika, while 40% claimed not to like it (of which 5 % were men). When questioned about the existence of any kind of allergic reactions to any of these ingredients (Figure 4e), all answered no. As a new product, with different taste and characteristics, the level of acceptability was found to be good. Our results also showed a great number of people (80 %) interested in this product (Figure 4f), of which 35 % were men and 45 % were women.

#### 4. CONCLUSIONS

In all characteristics evaluated in the sensorial analysis (visual aspect, colour, brightness, consistency, strawberry taste, spicyness, sweetness and global appreciation) at general the classification was 4 (in a scale from 0 to 5), corresponding to Good. Despite the product being considered quite spicy, apparently the global appreciation was very good.

As to the introduction of this product in the market, the consumer study performed allowed to conclude that it would be quite well accepted.

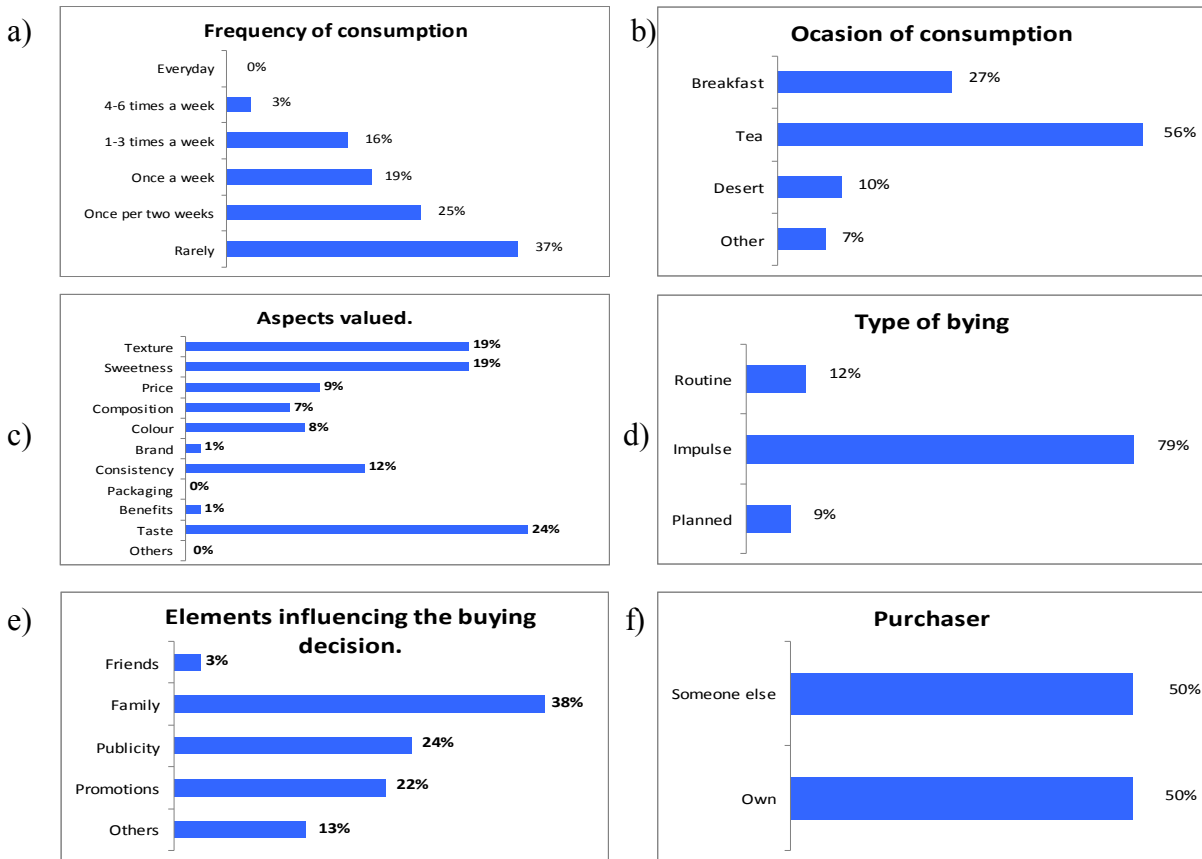


Fig. 3. Results obtained from the questionnaires in the market study in phase 1

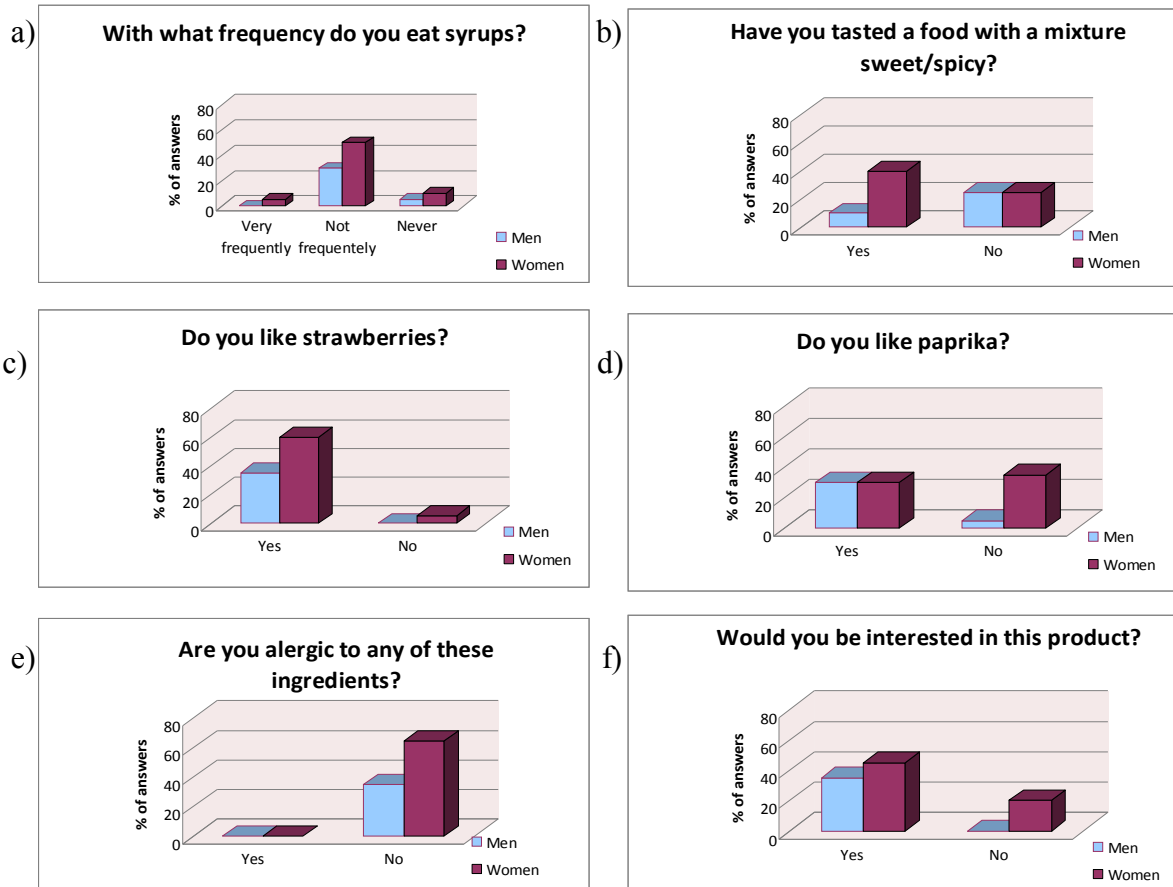


Fig. 4. Results obtained from the questionnaires in the market study in phase 2.

## 5. ACKNOWLEDGEMENT

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