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Research Article

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Studies and Research on the Development of Innovative Wine-Based Products

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Abstract

Wine has been part of the history of mankind for millennia and is a very important product for the industry from an economic point of view, being considered a luxury product, which makes it susceptible to fraud and adultery. The predisposition to purchase new foods or products obtained in a non-traditional way depends largely on the individual, perception and consequently, a new approach to consumer development focused on the consumer is needed. In the current study, wine was considered as an important and healthy base for development of new and innovative products – jelly and jellybean. By valorizing the properties of several ingredients – anise, cinnamon, cloves, lime and Psyllium husk the obtained products were improved considering the sensory and physicochemical profile. It was noticed that the viscosity of the jelly was significantly influenced by the amount of Psyllium husk added (5g, 10g) – 152 cP for 5g added and 96.8 cP for 10g added, similar results being reported for jellybean – 20.4 cP for 2g added and 60.2 cP for 4g added. Also, the acidity of the products was influenced by the addition of Psyllium husk, the values varying according to the added proportion.

Keywords: Wine, Innovation, Development, Psyllium Husk, Jelly

Introduction

Wine has evolved as part of life, culture and diet since ancient times. One can easily understand and evaluate the value of wine, by monitoring several of its roles among societies, inherited from one generation to another and over the years, wine has been considered a significant part of the daily diet and people have begun to favor stronger and heavier wines.

According to Charters, it is probably, more than any other existing beverage, a product that has a substantial symbolic significance that not only gives pleasure, but has gained crucial roles, such as intrusion in the culinary and medical sector [1]. Shrikhande concluded that by-products resulted from wine processing can constitute a healthy and accessible alternative as a potential ingredient for food products obtaining [2].

Wine itself is part of a "civilized life" and this is important for several reasons. The first reason is that one of the major symbolic uses of wine is the communication of stories about the refinement and culture of an individual or a community. The second is the idea that wine is the alcoholic beverage of self-control, at least compared to beer or other alcoholic beverages, has a long tradition, which can be emphasized by the Greeks, who considered the consumption of wine to be something that delimited them from drunk men around them. Third comes the fact that wine, probably more than any other drink, comes in various styles, can be prepared in different ways and is a reflection of the production of many countries and regions. Last but not least, the significance of wine as part of civilized life can be highlighted by the fact that it is in fact a naturally produced drink, which is essentially ecological and reflects nature at a much higher level, because, often, wine can be characterized as beautiful and gentle, due to the "aesthetic satisfaction" obtained from it as an aesthetic object [2-5].

The terminology that describes food (e.g., herbal, spicy, fruity, smoked) is much broader, as are the terms we use to describe wine (e.g., dry, oak, tannic, floral), so, with all these possible elements, it is difficult to determine the key factor behind the right choices [6].

Making decisions about how to combine the right wine type with the food served is quite a challenging task. The key is to focus on what is most important, the texture and aroma of the food and wine, taking into account the role of the primary sensory components (sweetness, salt, acidity and bitterness) [6].

The wine industry can be considered as a case study of the effects of globalization, expressed in changes in the level of international trade, geography of production and consumption, logistics, but also sharp changes in tastes, patterns and habits of consumers.

In addition to this trend, there is a decrease in consumption rates in recent years and the performance of various marketing providers. Therefore, there is a need for a better understanding of consumer preferences, using innovative integrated approaches to adequately define new marketing strategies. However, in value both wine production and consumption will tend to increase as a result of changing consumer preferences for high quality wines, making markets and consumers more heterogeneous and more complex to represent.

Adapting the product to different market segments is a challenge and a priority for wine companies. The main concerns of wine companies will be less and less focused on the technical-qualitative aspect of their products, but rather to anticipate market trends and consumer behavior [7].

Traditional foods and beverages that have been consumed locally and regionally over the years and passed down from generation to generation are still an important part of the culinary culture and provide sustainable food and nutrition security related to specific regions, especially in developing countries.

Wine consumption is a socio-cultural phenomenon with a very long history, in modern times having a significance with less religious and historical importance, becoming more significant for its pleasant, satisfying taste and relaxing effects [7, 8].

The association of wine with food is so well established in Western culture that it is inherently considered logical. However, the attributes that characterize most wines find no counterpart in food, or vice versa. Thus, it seems that the association is based more on habit than on reason. When evaluated experimentally, more desirable combinations of food and wine usually result from a reduction in more negative reciprocal attributes than a synergy of similar or compatible flavors.

Although fascinating, in the case of food and wine pairing, two negatives combine to give the perception of a sensory positive. In addition, human sensory acuity is so diverse that almost any combination will be satisfactory to some. However, it is likely that most people will follow the standard recommendations, even if they accept traditional wisdom (justified or not). In addition, the way wine is taken with food varies considerably from culture to culture.

The food lifestyle approaches the lifestyle as a cognitive mediator between the values of life, namely the basic statements that people consider desirable and the perception and behavior towards concrete objects related to food. In other words, the concept of food-related lifestyle is an attempt to capture the differences in the way people view food and drink as a means by which they can achieve the basic values of life.

The food lifestyle adopts this basic thinking to gain an understanding of the role that food has in people's lives. Everyday observation suggests that the role of food in life differs between people. Everyone should eat, but not everyone is as interested in food.

For some people, food seems to be a necessity, other aspects of life being more important. For other people, food is extremely important and consumes considerable resources both in terms of time and money to buy food and prepare meals. When it comes to the means, this suggests that for some people, food plays a major role in achieving the values of their lives, while others try to achieve their core values of life through other areas of life, not food. People not only differ in the degree of involvement with food, but also in the degree of involvement they have with food.

The connection between the wine industry and the culinary industry is very close and develops over the years, adapting to new technologies and innovative production and marketing processes [9].

Food and wine should be considered as two complementary goods, where one works in absolute synergy with the other. The main concept behind the pairings is that certain elements (such as texture and flavor) in both food and wine interact with each other, and thus finding the right combination of these elements will make the whole dining experience more enjoyable and enjoyable [10].

Although there are many books, magazines and websites with detailed guidance on how to combine food and wine, as well as studies established in the past, most food and wine experts support the idea that the most essential element of food and wine pairing it is the understanding of the balance between the "weight" of the food and the weight (or body) of the wine [11, 12].

Schaefer et al. concluded in his study that there are several differences in wine consumption according to gender, age, income, social media and accessibility to markets and identified a series of factors that strongly influence wine choice. Also, it was observed that consumers are interested in learning more about wine [13].

Against the background of growing health concerns among consumers, preferences are shifting to healthier foods and beverages. Consumers eat less at restaurants and have changed their diet to include less saturated fat and cholesterol.

The aim of the current study is to harness the potential of wine in several jellied food products – jelly and jellybean combined with Psyllium husk and to analyze their physicochemical properties and sensory profile.

Materials and Methods

Materials

Red wine

Red wine is a source of phenolic compounds, including flavanols such as catechins, oligomeric and polymeric proanthocyanidins (PA, also known as condensed tannins) with varying degrees of galilose that are extracted from grapes during vinification, leading to differences in wine composition. Other major compounds, such as anthocyanins and flavonols, have also shown great qualitative-quantitative variability between grape varieties and, depending on their extraction and stabilization, are essential for wine quality. The red wine used in this study was achieved from Recaș wineyard, Romania, Cabernet sauvignon type.

Sugar

Sugar is an odorless chemical compound, sweet and soluble in water, obtained from sugar cane or sugar beet, in the form of crystals, powder, cubic being a very rich source of nutrients and phytocompounds. The sugar was achieved from a local beetroot factory located in Brasov, Romania.

Psyllium Husk

Psyllium is a plant with a high content of water-soluble fiber, which has a number of positive effects on health, has the appropriate pharmaceuticals and the desired nutritional effects. In addition to its beneficial effects on health, Psyllium seed husks have functional functions in food due to its hydrophilic and gelling properties, stabilizing the strength of suspension and emulsification. Psyllium Husk was purchased from a local store in Brasov.

Apple

Apples are known to have antioxidants with high polyphenols (second only to berries) accounting for 20-25% of fruit polyphenols, as well as 10-30% of daily fiber and potassium intake. The main phenolic compounds related to apple are chlorogenic acid, epicatechin, procyanidins, floretin and quercetin, and their profile depends on the variety, environmental conditions, cultural practices, maturity and storage time. Apples belong to the species Malus domestica, type Red Melba from a local farm located in Voinesti, Romania.

Thyme

Thyme (Satureja hortensis L.) also called garden thyme or good thyme, is a plant that belongs to the labiatae family (Lamiaceae), is a popular spice that contains volatile oil. Thyme is an aromatic herb for which they are widely used added to the preparation giving a distinct flavor to food [14]. Dried thyme was used for the preparation of products achieved from the local market in Brasov

Cinnamon

Cinnamon, from the genus Cinnamomum and the Lauraceae family, being extracted from the inner bark of trees, has been used as a popular spice for thousands of years around the world. Many studies have shown the therapeutic effects of cinnamon including antimicrobial, antiviral, antifungal, antioxidant, antitumor, antihypertensive, antilipemic, antidiabetic, gastroprotective and immunomodulatory effects, also cinnamon can be used to improve body weight [14]. Cinnamon sticks were used in the current study purchased from the market.

Lemon

Citrus limon (L.) Burm., Popularly known as lemon, is a species of the Rutaceae family, native to Asia. Lemon fruits are a rich source of nutrients for a healthy diet and offer health benefits. Lemons are an interesting source of flavonoids, vitamins, minerals, dietary fiber, essential oils, organic acids and carotenoids. The lemons were cultivated in an organic system, without synthetic additives.

Cloves

Cloves are some of the most valuable spices used for centuries as a food preservative and for many medicinal purposes. They are original from Indonesia, but nowadays they are cultivated in many parts of the world. It is one of the richest sources of phenolic compounds such as eugenol, eugenol acetate and gallic acid and has great potential for pharmaceuticals, cosmetics, food and agriculture [14]. The dried cloves were achieved from a herbal market in Brasov.

Anise

Star anise (Illicium verum), an evergreen shrub or plant belonging to the Magnoliaceae family (Magnolia), is a plant with significant economic value, the fruit of which is widely used in food and beverages. In particular, star anise fruit is widely used as a common and traditional spice in Chinese cuisine, offering some unique flavors [14]. It is also used in cosmetics and aromatherapy. The dried star anise was collected from an herbal market in Brasov.

Methods

Determination of pH with Portable Measuring Apparatus

It is based on the potential difference between a glass electrode and a reference electrode (calomel - saturated KCl) introduced in the test sample which varies linearly with the pH of the sample. Consort C5020 pHmeter was used for determination.

Determination of Viscosity Using Viscometer BROOKFIELD DV – II +-

Viscometers are often used in food processing sectors, where a precise basic analysis of the viscosity of the product is required. These viscometers use the principle of 'rotational viscosity', and the measurement of the viscosity of the product is based on the immersion of a specific spindle selected in a product sample followed by the measurement of the torque required to rotate the shaft at a set speed while immersed in the product sample. As the required torque will be proportional to the amount of viscous traction on the shaft, it therefore provides an assessment of the viscosity of the product, reported in centipoise units (cP).

Determination of Total Titratable Acidity

It is based on the titration of an aqueous extract with a solution of sodium hydroxide 0,1 mol/ dm3 in the presence of phenolphthalein as an indicator.

Data Analysis

Obtained data were processed operating with Excel Data Analysis software (Microsoft Excel Professional Plus, 19th version, Microsoft EULA, USA) and analysed by standard deviation in order to measure how widely values are dispersed from the average value. The analysis was performed in threefold and the results were reported as mean value ± standard deviation.

Sensory Evaluation

Panelists selected for sensory analysis were selected and trained accordingly. The group of tasters consists of 7 people. For tasting, the samples must be prepared and distributed equally and in identical vessels for all tasters. Tasters fill in an individual analysis form with personal data and then evaluate the organoleptic characteristics of the samples. In order to evaluate the shape, appearance and color, the analysis is performed in natural

light, but artificial light with an intensity of 550-800 lx/ m is also allowed. They are examined both externally and in section. The evaluation of the smell is done either by simple inspiration or by deep inspiration. The taste is evaluated with breaks of about 2 minutes between samples, and for tasting take between 3-10 g. The sample moves from one side to the other of the oral cavity or chewing through movements of the jaw and tongue to reach all sensitive areas. The evaluation of organoleptic characteristics is performed on a scale from 0-5 points. The tasters examine each organoleptic characteristic and give a note which is then passed on to the individual sensory analysis sheet.

Red wine jellybean preparation – jellybean was prepared according to the working flow presented in Figure 1.

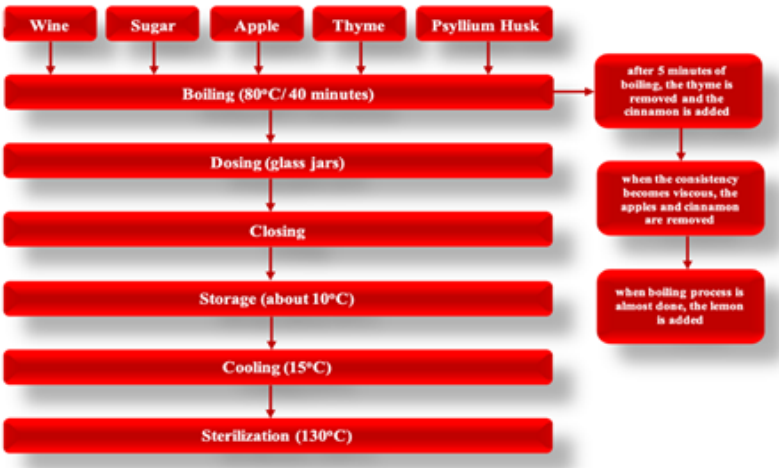

Figure 1: Technological Flow for Obtaining Red Wine Jellybean with Psyllium Husk

Red wine jelly preparation – red wine jelly was prepared according to the working flow presented in Figure 2.

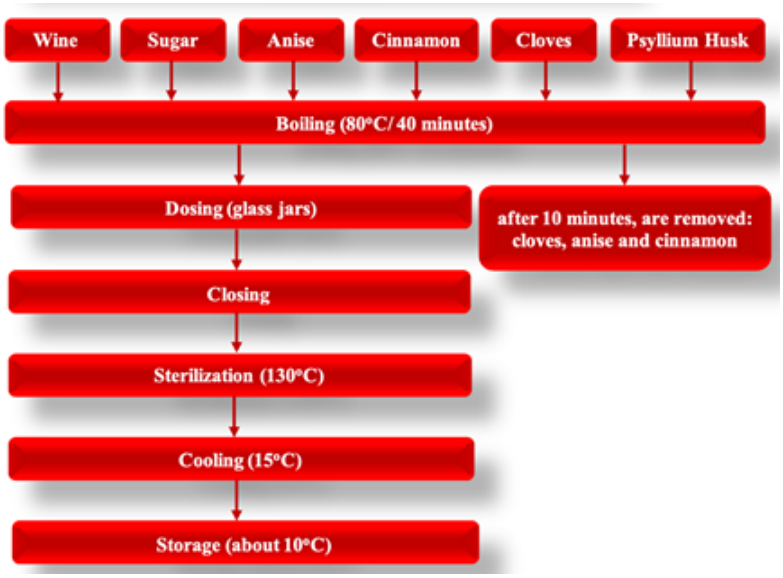

Figure 2: Technological Flow for Obtaining Red Wine Jelly with Psyllium Husk

Results and Discussion

The resulted samples were coded according to the codification detailed in Table 1 and Table 2.

Table 1: Sample Coding - Jellybean

Sample coding	Sample composition
PM	blank sample, without Psyllium Husk addition
P1	sample with 5g Psyllium Husk addition
P2	sample with 10g Psyllium Husk addition

Table 2: Sample Coding - Jelly

Sample coding	Sample composition
PM	blank sample, without Psyllium Husk addition
P1	sample with 2g Psyllium Husk addition
P2	sample with 4g Psyllium Husk addition

Determination of pH, Viscosity and Acidity of Jellybean

Table 3: Values Obtained for Physicochemical Analysis of Red Wine Jellybean

Analyzed parameters[1]	Sample coding		
	PM	P1	P2
pH	3.19±0.01	3.05±0.03	3.02±0.03
Viscosity (cP)	651.33±1.15	151.67±1.53	95.93±0.90
Acidity (oT)	7.07±0.12	8.57±0.12	8.73±0.21
[1]Data were expressed as mean of three experiments ± standard deviation.			

Table 4: Values Obtained for Physicochemical Analysis of Red Wine Jelly

Analyzed parameters[1]	Sample coding		
	PM	P1	P2
pH	3.82±0.03	3.78±0.08	3.82±0.03
Viscosity (cP)	32.52±0.08	20.43±0.03	60.15±0.05
Acidity (oT)	7.35±0.05	8.22±0.08	8.88±0.03
[1]Data were expressed as mean of three experiments ± standard deviation.			

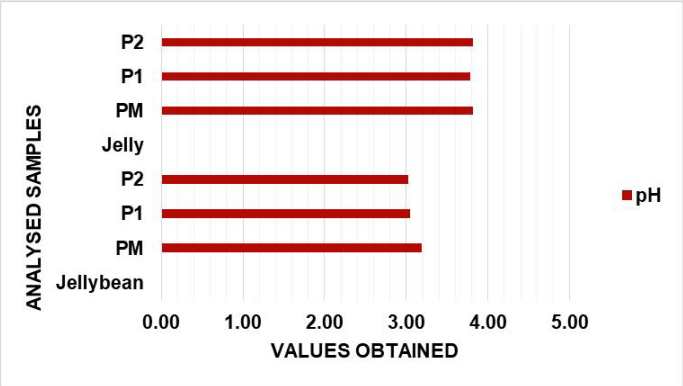

Figure 3: Results of the pH Determination of Samples

Figure 3 shows that the pH value of the control sample is the highest, exceeding the value of 3.19. The samples with the addition of Psyllium Husk had lower pH values, of 3.05 for sample P1 with an addition of 5 g of Psyllium Husk and 3.02 for P2 with the addition of 10 g of Psyllium Husk. It is observed how the increase of the proportion of Psyllium Husk added increases the pH value of the finished product, imprinting an acidic pH of the samples and an acidic character. Considering this observation, Psyllium Husk can be used as a proper source of hydrocolloids and can be successfully used as additive for several gelled products [15].

Figure 3 shows how the pH value of the jelly samples increased, the control sample and the one with the addition of 2g of Psyllium bran recording equal values. In comparison, the sample with the addition of 4g of Psyllium bran provided higher values, of 3.82, the addition of Psyllium increasing the pH of the samples.

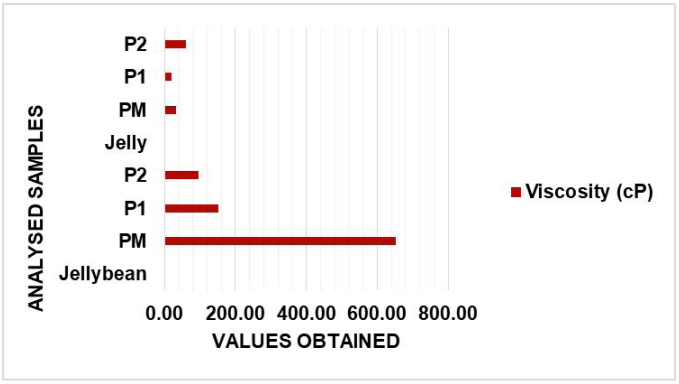

Figure 4: Results of the Viscosity Determination of Samples

Concerning the values of the viscosity of the jellybean for the two types of products, it can be observed in figure 4 that the highest value of viscosity was recorded in the case of the control sample for the pellet – 651.33 cP, followed by the jelly with the highest proportion of Psyllium Husk added - 60.15 cP. The lowest value of viscosity was recorded in the case of jellybean with the addition of 10g of Psyllium Husk - 95.93 cP. The jelly samples recorded values of 32.52 cP for the control sample, 20.43 cP for the P1 sample and 60.15 cP for the P2 sample. It can be seen how the increase in the amount of Psyllium Husk added adds to the viscosity of the samples, due to their gelatinization and rheological behavior in the structure of the product.

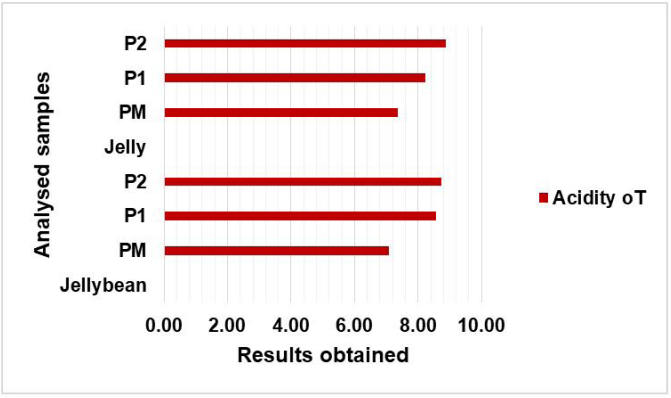

Figure 5: Results of the Acidity Determination of Samples

From the analysis of the obtained data, in figure 5, it can be observed how the acidity of both types of samples increased with the increase of the amount of Psyllium bran added, the highest values being 8.88 oT. Regarding red wine jellybean, the lowest acidity was recorded for sample P2 – 8.73oT with the highest addition of Psyllium Husk, comparing to sample P1 – 8.57oT. The intrusion of Psyllium Husk increases the acidic profile of samples and decreases the viscosity, samples becoming more liquid and less firm. A similar rheological behavior was noticed for red wine jelly samples in case of acidity – 8.88oT for sample P2 and 8.22oT for P1. A different series of values was recorded for viscosity, the decrease being noticed for the blank sample without addition of Psyllium Husk. The values were increasing as the quantity of addition was higher. Psyllium Husk has a polymeric phase that contributes to the rheological behavior of obtained samples and confers viscoelastic properties to the final products. According to Ladjevardi et al., Psyllium Husk gum can act as a polymer considered ideal for improving the stability of yogurt [16]. Noguerol et al. noticed that the intrusion of Psyllium Husk in food products can contribute to the obtaining of functional products without conferring negative effects concerning sensorial and structural attributes [13].

The results were compared to the results obtained for similar products from recent literature and conducted studies.

Sensory Profile of Products

Analyzing the sensory profile of the obtained samples, it can be observed that the samples with the highest percent of Psyllium Husk addition were the most appreciated by the panelists. The texture of the products was significantly influenced, similar to the viscosity, these aspects being positively assessed. The astringency of the jelly was appreciated with 4 points, comparing to the jellybean that was noted with 5 points. The blank sample was marked with a weaker score – 3…4 points. Color intensity of jelly was much more appreciated for the samples with highest addition of Psyllium Husk – 5 points. In contrast, jellybean samples with high addition had a less pronounced color, compared to blank sample and P1 that were evaluated with 5 points.

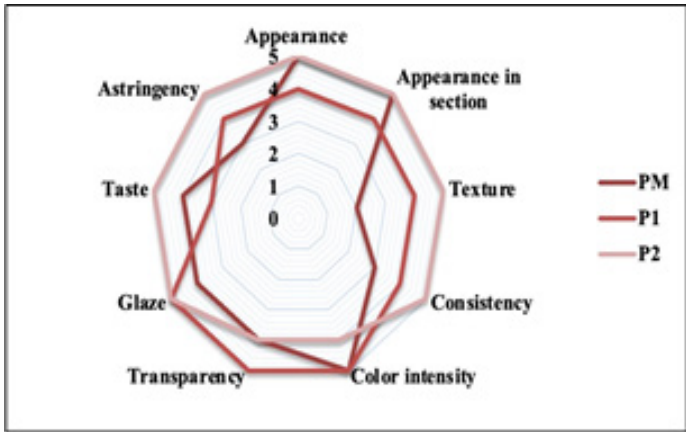

Figure 6: Sensory Profile of Red Wine Jellybean

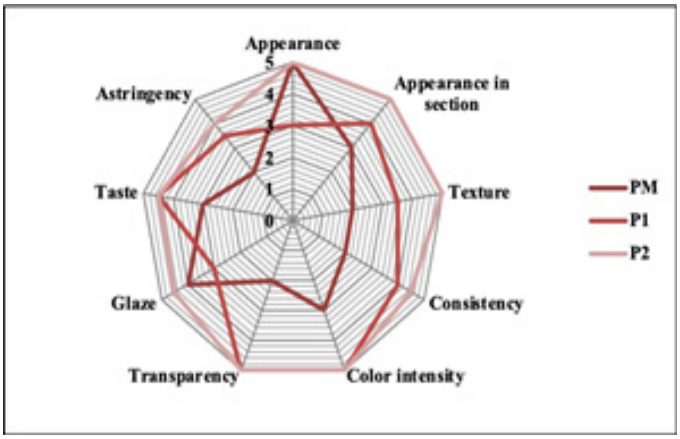

Figure 7: Sensory Profile of Red Wine Jelly

Figure 8 shows the red wine jelly proposed for sensory analysis.

(a) (b) (c)

Figure 8: Red Wine Jelly (a. – Sample Without Psyllium Husk Addition, b. – Sample With 2g Psyllium Husk Addition, c. – Sample With 4g Psyllium Husk Addition)

Conclusions

The demand for new healthy and sustainable foods is in a continuous process of growth. The manufacture of new foods or the implementation of new technological processes are not always perceived positively by all consumers. In this regard, the development of food innovations must take into account food neophobia. Food neophobia can be defined as reluctance to accept new or unknown foods.

Consumers' motivation for food neophobia is based on a wide range of mental traits, including the composition, naturalness or ethical values of the product, which are not always easy to assess.

While consumer research and marketing on the one hand paid special attention to those interested in new products with such concepts as the main user, on the other hand they paid relatively little attention to the neophobic consumer.

Wine innovations include a wide range of possibilities, from the addition of various extracts, to changes in process vinification to its combination with food. Given the growing importance of environmental concerns for consumers, the production of new or improved food is difficult to legitimize. if the ecological sustainability of these innovations is not taken into account.

The development of new products or production processes under an ecologically sustainable scheme is known as eco-innovation. Several studies have focused on wine innovation and also on the sustainability of wine, but the impact of these factors on consumer preferences should be studied simultaneously to develop comprehensive strategies.

It is widely accepted that in markets, production must focus on the consumer. In addition, studies have also shown that when the production of new products is specifically addressed, consumer opinion cannot be considered as a whole and the explicit preferences of those wishing to purchase innovative products must be specifically analyzed.

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Adriana E. Boeriu, Cristina M. Canja, Mirabela I. Lupu and Gavrila Calefariu. The first draft of the manuscript was written by Adriana E. Boeriu and Cristina M. Canja and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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