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AN INTERDISCIPLINARY APPROACH ON THE INFLUENCE OF PACKAGING DESIGN ON EMOTIONAL RESPONSE TO CHOCOLATE

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Abstract: *Emotions have been generally associated with food products but there has been little research on emotions related to chocolate package. Culturally, emotions may be described in different ways and every culture may have its own sensory lexicon, giving the possibility for feelings to be socially shared. By means of three analyses- sensory, semiotic and statistical – we designed 6 types of chocolate packages which allow chocolate consumers to describe their feelings while watching or consuming chocolate. The objective of this paper was to study the influence of packaging design of chocolate in attracting consumers' attention and generating hedonic and sensory expectations from a semiotic, statistical and sensory point of view. To demonstrate these, six images of chocolate packages with different design and color were presented to 123 consumers, who were asked to complete a questionnaire and to score their expected liking as against the chocolate presented. The first part of practice is given in experiment 1 and is referred to the perception of its image resulting from the statistical study conducted using a questionnaire applied to a number of 123 people. In the second practice the sensory analysis was performed for six kinds of chocolate: mint chocolate, milk chocolate, dark chocolate with coffee, dark chocolate with orange, luxurious chocolate and white chocolate, using 12 tasters.*

Key words: *word association, hedonic and sensory expectations, semiotic analysis*

1. Introduction

Word association can be used to study the influence of package design (shape, color, images) on consumer expectations of desserts, which could affect their product perception and purchase decisions [1]. Visual perception of a product packaging image conducts to symbolic meanings associated with sensorial characteristics of a food product [2].

One can affirm that the design packaging has a semantic symbolism which contributes to create a given expectancy about the product [3]. Nowadays we can remark a growing interest on the study of the emotional response to foods, due to both the potential for emotional responses to provide important information about products and differences between a set of products that go beyond traditional sensory and liking

variables. In many academic papers, questionnaire approaches have been used to assess emotional responding to foods by feelings and emotion - related terms that can be used [4]. Jaeger & Cardello [4] use the term *emotion words* to describe emotions (*fear, anger, shame, jealousy, sadness, energetic, alert, stimulated*, etc.), feelings (*inspiration, pity, respect, disappointment*, etc.), personal characteristics (*self-conscious, unfulfilled, helpless, encouraged*, etc. [5]), personality - based terms (*friendly, warm* [6]) or *masculine* and *sociable* [7]), as well as terms for image-based characteristics of products (*mild, free and whole* [6] or *comforting* and *luxurious* [7]) or associations that people may have in mind when responds to labels, images, on packaging of a food product.

Managing sensory expectations concerning products and brands, Charles Spence, ([3], [9], [10]) discussed in his paper about multisensory perception relates to the topic of crossmodal correspondences (e.q. a tendency for a feature, or attribute, in one sensory modality to be matched (or associated) with a sensory feature, or attribute in another sensory modality). He remarks that knowing about shape symbolism effects in the food sector may allow sensory marketers to set-up the appropriate associations in the minds of consumers through the shapes used on the packages.

Gastón Ares et al. states in the paper [11] that "sensory expectations are related to consumers' beliefs about the sensory characteristics of the product, whereas hedonic expectations refer to how much the product will be liked or disliked. If the sensory and hedonic expectations shaped by the packaging are high, consumers may be interested in the product and would choose to buy it. "

The objective of this paper is to demonstrate the influence of packaging design of chocolate in attracting consumer attention and generating hedonic and sensory expectations.

Talking about chocolate packages, some researchers remark that people match dark chocolate with angular shapes and milk chocolate with rounded shapes [9].

2. Material and Methods

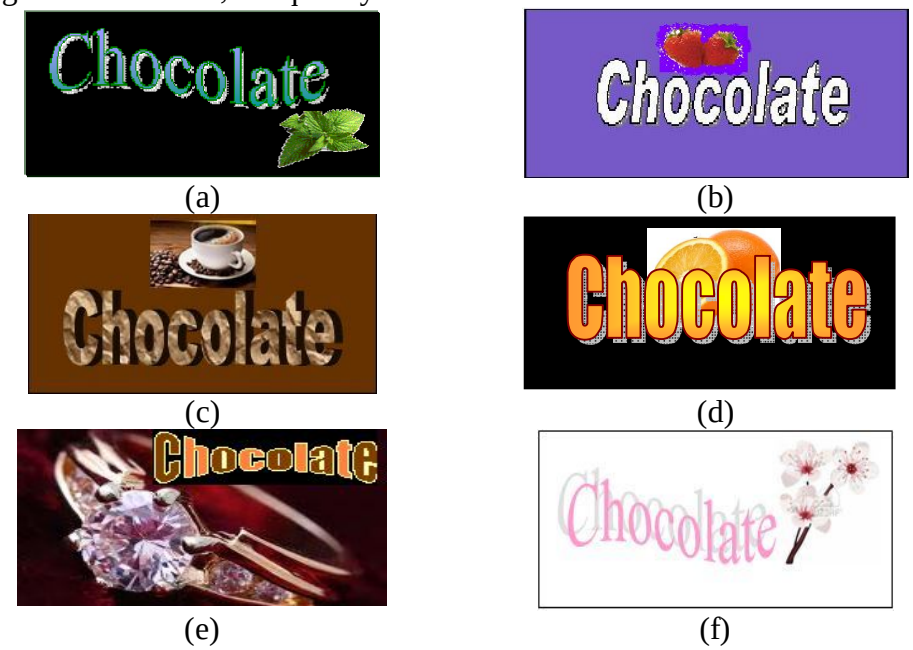
Chocolate is a complex multi-stage particle (sugar, cocoa, some components of the milk) with a continuous phase (cocoa butter, milk fat and emulsifiers). Its production and refining determine the particle size, consistency and viscosity, leading to specific textural and sensory characteristics. Depending on cocoa content, the main types of chocolate are: white chocolate, milk chocolate and dark semi bittersweet chocolate. These types of chocolate may be produced by conventional cocoa beans (product of mass and cost) and the specialty of cocoa beans (aromatic and expensive), or a mixture of these two types. Mixture composition, origin cocoa beans, and roasting treatment, and the types and quantities of additives used will significantly affect the final chocolate taste and price.

The first part of practice is given in experiment 1 and is referred to the perception of its image resulting from the statistical study conducted using a questionnaire applied to a number of 123 people from Suceava - Romania and the surrounding villages of Suceava, aged between 14 and 25 years, undergraduate students or graduated students of the Faculty

of Food Engineering, Stefan cel Mare University of Suceava, and students from Ciprian Porumbescu High-School of Suceava).

2.1. Experiment 1: **Questionnaire** approaches have been used to assess emotional responding to seeing the design of chocolate packages.

The questionnaire was based on 6 images describing six types of chocolate. The purpose of this questionnaire was to identify consumers' perception (thoughts, feelings, associations, words, descriptions) on the image of chocolate; frequency of chocolate consumption; what color is associated with chocolate; preference on packaging; preference on the type of chocolate (of 6 types); type of chocolate packaging association. Six simulated chocolate labels were designed by the authors. The objective was to create six chocolate labels capable of conveying some distinct messages. The labels comprised different combination of non-verbal elements. The labels were used as stimuli for a consumer survey, as in the paper [11]. The six designed model labels are displayed in figure no. 1.



(a) (b) (c) (d) (e) (f)

Figure 1. Model labels of chocolate used in the study. (a) Chocolate 1; (b) Chocolate 2; (c) Chocolate 3; (d) Chocolate 4; (e) Chocolate 5; (f) Chocolate 6.

2.2. Experiment 2: Sensory profiling

In the second practice the sensory analysis was performed for six kinds of chocolate: mint chocolate, milk chocolate, dark chocolate with coffee, dark chocolate with orange, luxurious chocolate and white chocolate. This study emphasizes on one hand the great popularity of this product related to its high consumption and on the other hand how consumers' perception of six types of chocolate packages can be statistically and semiotically analyzed to assess emotional responding to foods by feelings and emotion - related terms. The sensory analysis was performed using 12 tasters (undergraduate students of the

Faculty of Food Engineering, Stefan cel Mare University of Suceava – Romania).

Experiment 2 was performed in two stages, between 10-12 am and 15-17 in the afternoon, and the meeting time last for more than 2 hours. Consumers were told to take the portion of chocolate served and let it melt on the tongue some seconds. After tasting each sample, an approximately 3 minute –break was taken.

Chocolate mass is 100 g and its caloric content (as may be observed in Table 2) varies depending on the type of chocolate. Thus, a chocolate may have 400 kcal and 550 kcal per 100g based on its contents.

Table 2.
The nutritional value of the six types of chocolate

Type of chocolate	**Energetic values Kcal and KJ**	**Proteins (g) in 100 g**	**Carbohydrates (g) in**	**Fats (g) in 100 g**	Content of cocoa **(%)**
Mint chocolate	449 Kcal 1887 KJ	4.00	70.0	17 .0	51%
Milk chocolate	530 Kcal 2225 KJ	6.60	58.5	29.5	30%
Dark chocolate with coffee	547 Kcal 2289 KJ	6.12	46.8	37.9	> 50%
Dark chocolate with oranges	529 Kcal 2214 KJ	6.93	48.4	36.7	> 50%
White chocolate	540 Kcal 2255 KJ	4.80	63.0	29.5	0%
Dark chocolate with almonds	552 Kcal 2302 KJ	8.10	45.0	36.3	> 47%

The type of chocolate used in the study and ingredients are: *sample 1 - mint chocolate* (40% cream mint, cocoa-butter, emulsifier: soya lecithin and E 476, oil-mint, vanilla flavor), *sample 2 - milk chocolate* (sugar, cocoa butter, skimmed milk powder, cocoa mass, whey powder, milk fat, soy lecithin), *sample 3 - dark chocolate with coffee* (sugar, butter and cocoa mass coffee powder 2%, emulsifier: soy lecithin, flavors, natural vanilla extract and espresso), *sample 4 - dark chocolate with orange* (sugar, cocoa mass and butter, candied orange peel 10%, glucose syrup, emulsifier: soy lecithin, natural vanilla extract and orange), *sample 5 - dark chocolate with almonds* (sugar, cocoa mass, almonds 20%, cocoa butter, milk fat, flavor) and *sample 6 - white chocolate* (sugar, cocoa butter, whole milk powder, whey powder, fat soybean, soybean lecithin, flavor).

The sensory appreciation of food is made with five analyzers with which man is endowed by nature: taste, smell, sight, hearing, and tactile (touch) [17-21].

The analyzer consists of three segments: peripheral segment (includes the receiver and is designed to receive specific stimuli and in turn excitations), management segment (represented by those nerves leading to excitation of the sensory cortex center) and the central segment (represented by a certain place of the cerebral cortex that transforms stimuli received into sensations).

The technical equipment consists of: sample preparation room equipped with necessary appliances; the tasting room separated from the training room should be sound and heat proofed, provided with air conditioning system. Tasting room is equipped with: glass or earthenware crockery. Tasters were selected so as to meet certain physiological and psychological conditions, respectively, to avoid factors that

may influence negatively the well functioning of sensory analyzers, as well as attention and concentration.

The sensory analysis method applied in this study was the method of quality assessment by scoring the responds from 1 to 4 (as one can see in table 3).

Table 3
Scores of chocolate sensory quality ([16])

Sensory characteristics	Description of the products examined	Scores accor-ded
General appearance	Smooth, contoured designs.	**4**
	The surface is slightly matt	**3**
	Show small irregularities of form and design	**2**
	Matt surface with faint spots and drawings	**1**
Color	Uniform feature	**4**
	Too intense	**3**
	Too weak	**2**
	Presents uncharacteristic shades	**1**
Odor	Well-defined characteristic	**4**
	Highly expressed	**3**
	Less clear	**2**
	Foreign uncharacteristic	**1**
Taste	Pleasant, typical assortment	**4**
	Very sweet	**3**
	Poor bitter	**2**
	Unpleasant, uncharacteristic	**1**
Flavor	Specific to chocolate	**4**
	Highly expressed	**3**
	Poorly expressed	**2**
	Missing, uncharacteristic	**1**
Texture	creamy	**4**
	sticky	**3**
	oil	**2**
	brittle	**1**

Tasters' choice was analyzed to assess their sensory abilities and tasting experience and their training as well. Tasters did not feel hungry an hour before tasting, so they did not eat or drink while the test was being carried out, except for water, were not allowed to smoke or use perfumes, deodorants and cosmetics that might affect the sensory analysis.

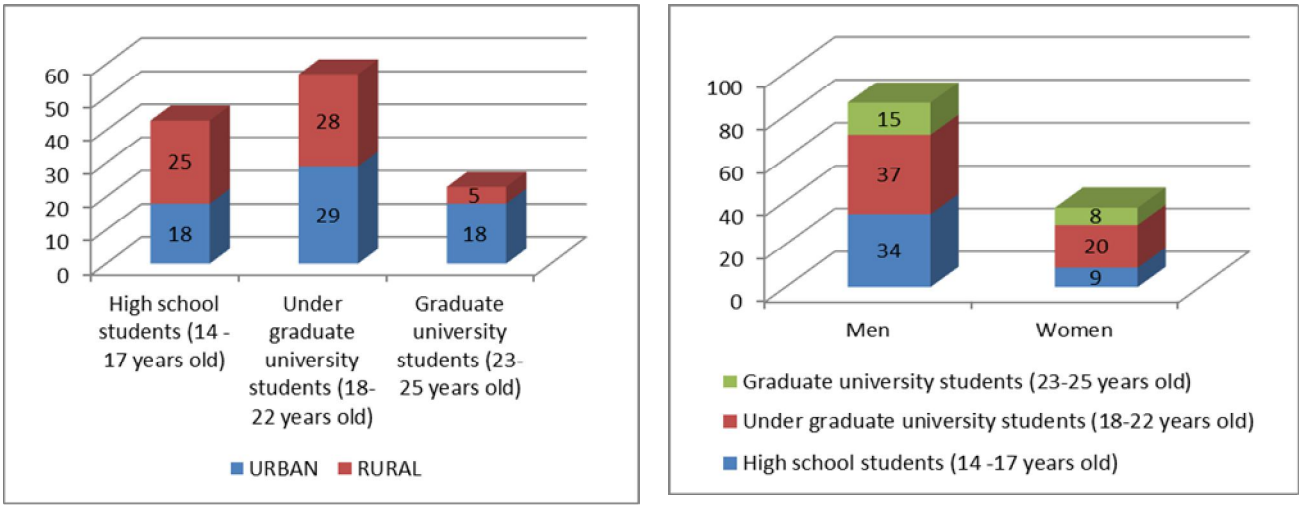
To remove the residual taste, drinking water has been used. Samples were prepared in the same manner for all tasters and were distributed in equal amounts in the same dish. The temperature at which the examination was made was identical in all samples analyzed ranging between 20-24 Celsius degrees.

The team leader presented the chocolate samples analyzed, purpose, sensory characteristics to be tested, the order and manner in which the analysis was to be made**.**

3. Results and discussion

3.1 Experiment 1

The analysis of the demographic characteristics of the respondents revealed some very useful conclusions for the study under analysis: 65 respondents living in urban areas and 58 living in rural areas, the sex ratio of respondents is 86 females and 37 males, having an average education level: 43 high school students, 57 under graduate university students and 23 graduate university students (as one can see in the figure 2).



(a) (b)

Figure 2. Respondents' demographic characteristics: (a) Urban / rural; (b) Men / women

The answers to the question: *What color can be generally associated with chocolate?* are shown in the figure 3:

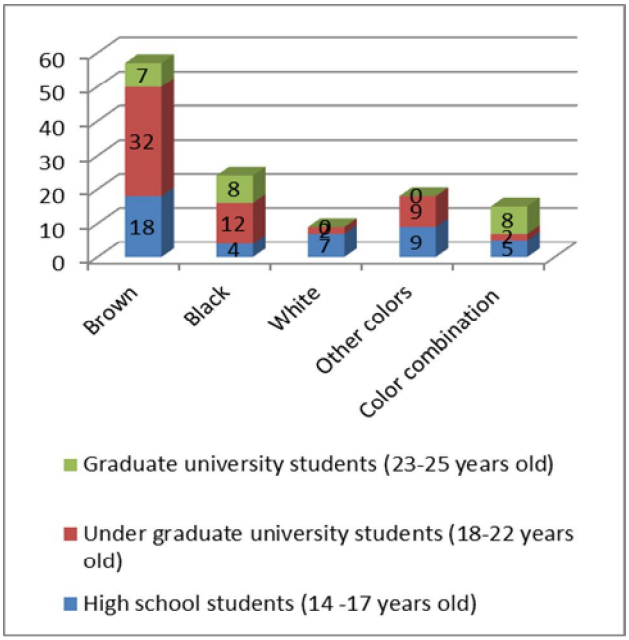


Figure 3. Color association with chocolate labels shown in fig. 1

"Colors in a food label are usually used to differentiate between products and make them more attractive to consumers. Attractive colors are able to catch consumers' attention even when seen from a long distance" [11]

According to the results in figure 3, chocolate is associated by most people with brown (46%) and black (20%). A low percentage is held by "other colors" such as pink, purple, red, green and yellow, the last one being especially chosen by students who associate chocolate color with cream.

The results of the semiotic analysis of the images of the six chocolate labels are presented bellow:

- Chocolate 1 - The main image of the label referred to a dark chocolate with mint. The feelings and emotions conveyed by mint leaf are associated to calm, tranquillity and freshness. The dark from the fundal may suggest the idea of an elegant and luxurious product [11]
- Chocolate 2 - The visual perception of this label is mainly influenced by some chocolate types similar to Milka © brand with strawberry. The background color is lilac, generally associated with femininity, dreamlike states and relax [12]; what draws the viewer's attention at first sight is the plastic sign of heart-shaped and red-colored strawberries.

They are considered a symbol of Venice, the Goddess of Love, of purity and sensuality, of fertility and abundance. Therefore, the perception mechanism and the powerful message conveyed by strawberries can be easily deciphered by the semiotic analysis of these iconic signs: if one tastes this particular type of chocolate, they will feel like a goddess, happy and loved.

- Chocolate 3 – The viewer's attention is caught by a white cup of coffee, "surrounded" by coffee beans, centrally placed, based on a strong chromatic contrast between white and brown color, conveying the idea of special moments somebody can share with. Coffee beans function as strong smell and taste stimuli, being associated with dynamism and energy. Moreover, they have a double function: from the hedonic point of view, coffee -chocolate stands for the "perfect match", the ultimate taste combination, and semiotically they work as indices for taste and ingredients. All these non-verbal iconic elements speak for themselves, conveying the message that it is a refreshing dark chocolate which signifies invitation, special and pleasant moments to share with, friendship, etc.
- Chocolate 4- The image is based on a strong color contrast between black and orange, inferring the idea the product would have a positive effect on health, taking into consideration the ingredients used oranges and a high content of cocoa. Orange functions semiotically from a double perspective: visually- the color itself and olfactory the fruit. As such, orange is considered one of the healing colours. It is believed to increase the craving for food. From this point of view it works as a strong stimulus. Moreover, the plastic sign of orange color and fruit corresponds to desire, pleasure, domination, optimism, stimulating enthusiasm and creativity. The use of orange color in the word *chocolate* written with special orange shade characters, as against a dark background, emphasizes once more the high quality sensory characteristics of this product. Orange communicates optimism and energy [11]
- Chocolate 5 - The use of a non-conventional image (rings have been used throughout history on many levels to convey a similar message to that signified by the wedding ring, generally being perceived as a marriage proposal, commitment, used on special happy occasions) conveys the message that it is an authentic and elegant product, meant to a targeted group of people. Rings stand for high esteem, whether that be wealth, marriage or power, being a universally understood symbol. In this context, it carries respect, authenticity, high quality product.
- Chocolate 6 - The focus in this image goes straight to the beautiful white cherry flower, conveying freshness, naturalness, calm, relaxation, peace and purity. The background is white, the name of the product written in pink, stylised characters, reinforce the idea of pure and natural, light or low-calorie product [11]. As regards the cultural significance of cherry blossom, it symbolizes friendship and transience of human life. In this context, it stands for a high quality product, with special nutritional values.

Word association – The answers to the question: *What are the first words, descriptions, links, thoughts or feelings that come to your mind when you look at these chocolate images?* are shown in figure 4. The results of word associations made by studying the six types of chocolate labels are

expressed by: feelings, descriptions, at the morphological level by positive adjectives and nouns; most people associated the chocolate image with the sensations caused iconic signs: fruit, colors, characters, and ways of spelling, as you can see in the figure 4.

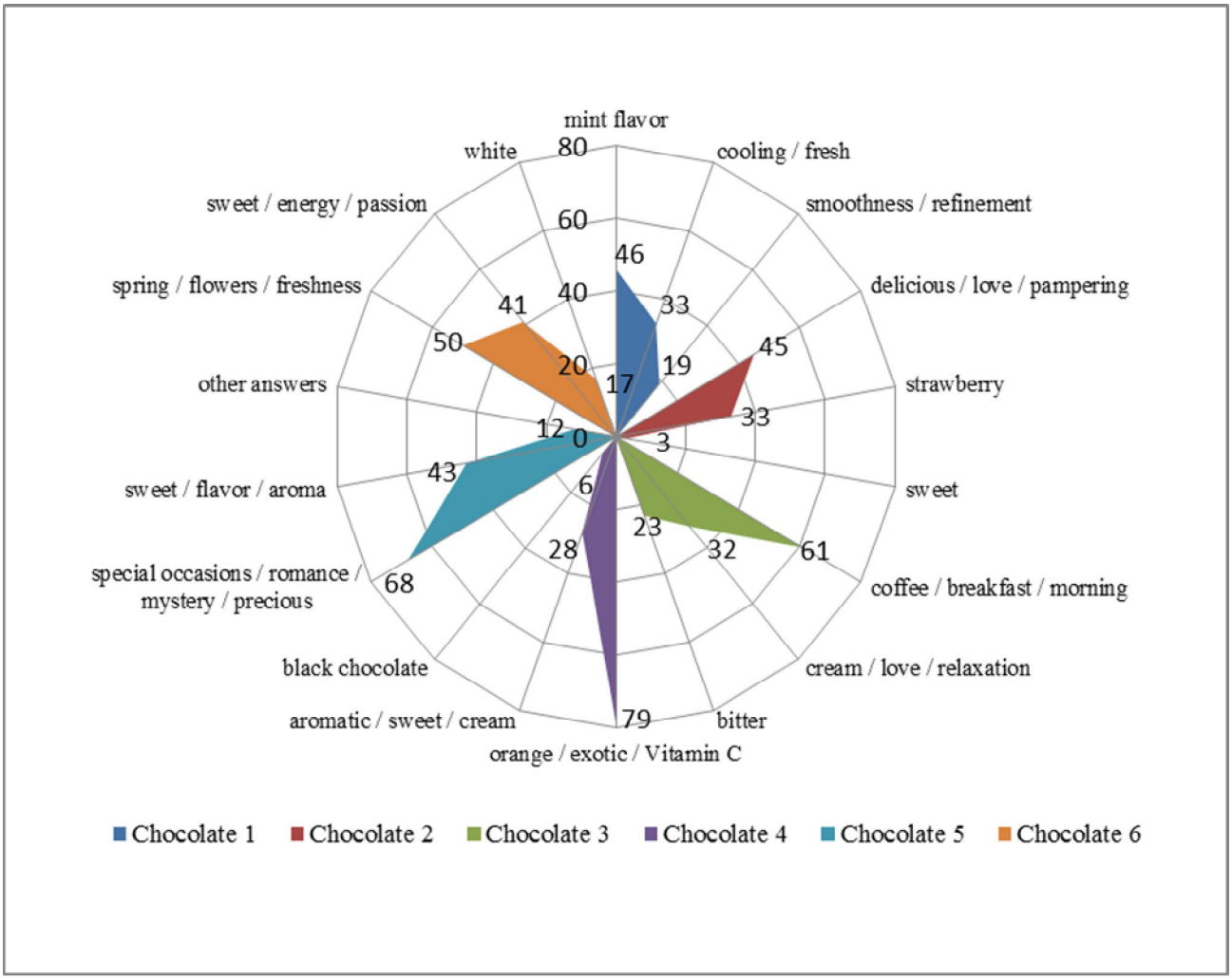


Figure 4. Word association with chocolate labelling models

The answers to the question *What type of chocolate do you associate the following design package with?*are shown in figure 5.

Thus, one can see that the package 5 (a) is associated by a large number of respondents with bittersweet chocolate filled with mint, whereas the chocolate package 5 (b) is mainly associated with milk chocolate type and filled with strawberry or white chocolate type, the package 5 (c) is associated with dark chocolate and filled with coffee, the package 5 (d) is associated predominantly with dark chocolate filled with orange cream, the package 5 (e) is associated mostly with aerated chocolate type with milk and bittersweet, as a luxury

chocolate package and the package 5(f) is associated by most people with white chocolate with milk respectively.

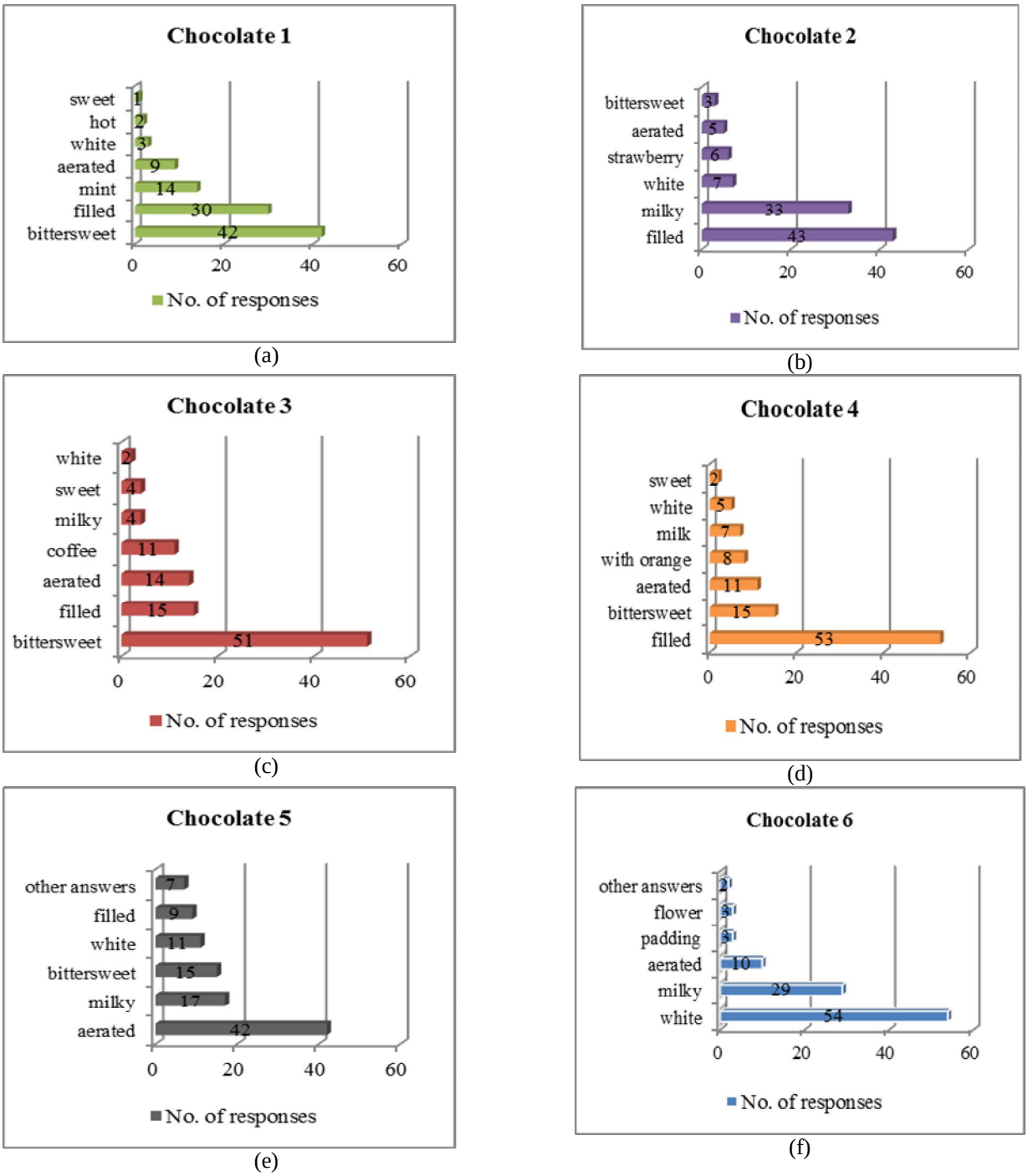


Figure 5. Types of chocolate associated with design packages

The hedonic scores regarding the six chocolate labels (figure 1) is shown in figure 6.

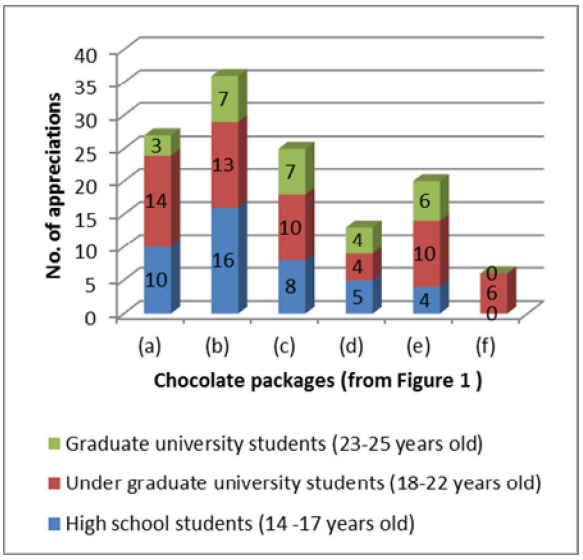


Figure 6. Classification of appreciations on chocolate packages' design

The chocolate 2 (fig. 1 (b)), which displays a *similar background with the Milka chocolate brand,* was the most appreciated (by 36 respodents).

Means scores given by people participating in the study can be seen in the table 1.

Using the one - way ANOVA, we obtained the values of Fisher ratio F= 0.22 < F critical = 3.07 (P=0,79 > 0.05) thus we can affirm that there are significant differences between the 3 groups of people (high school students, undergraduate and graduate student, respectively) in the way of appreciation the design of the six chocolate packages (presented in fig. 1).

Table 1

The overall assessment of chocolate packages

Model labels of chocolates used in the study	Mean scores given by:			Total mean scores	Standard deviation of total mean scores
	High school students	Under - graduate university students	Graduate university students		
(a) Chocolate 1	7.23^{a} ± 2.26	8.05^{a}±1.96	7.13^{a}±2,00	7.47	0.51
(b) Chocolate 2	8.07^{b}± 2.27	8.12^{b}±1.69	7.39^{b}±2,51	7.86	0.41
(c) Chocolate 3	7.81^{c}± 2.40	8.05^{c}±1.96	8.39^{c}±2,18	8.09	0.29
(d) Chocolate 4	7.95^{d}±1.96	7.48^{d}±2.20	7.17^{d}±2,36	7.54	0.39
(e) Chocolate 5	8.09^{e}±1.87	8.12^{e}±1.95	8.09^{e}±1,83	8.10	0.02
(f) Chocolate 6	7.67^{f}±2,04	7.74^{f}±2.19	8.04^{f}±2,45	7.82	0.20

Data are presented as mean ± standard deviation. The same letters within a row indicate no significantly different among means (P < 0.05).

The biplot association for the hedonic scores regarding the six chocolate labels (from figure 1) is shown in figure 7. The biplot (proposed by Gabriel (1971; 1981)) [12 - 15] displays the observations and variables in the same plot, in a way that depicts their joint relationships.

The biplot data result in a matrix, Y (of order n x m), that can be represented in 2 dimensions (or 3) as the product of a two matrices, A (n x 2), and B (m x 2), where

the rows of A represent the observations (the scores – from 1 = minimum to 10 = maximum) given by people in a 2 dimensional space, and the columns of B represent the variables (the six labels of chocolates proposed in the study).

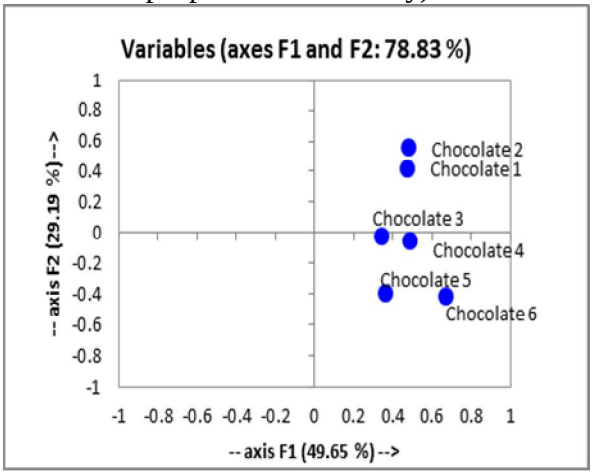
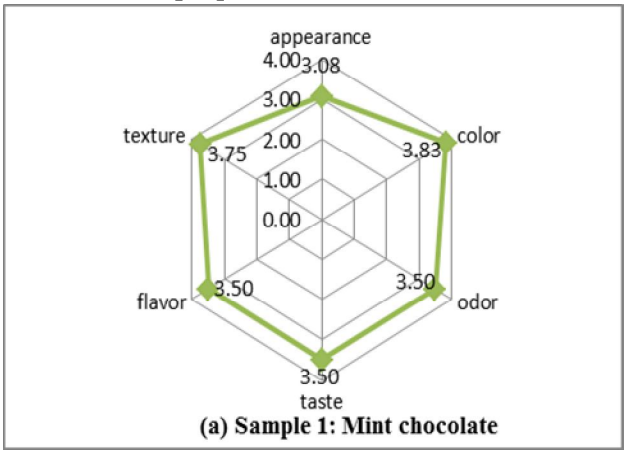


Figure 7. The biplot association of the hedonic responses regarding chocolates' labels

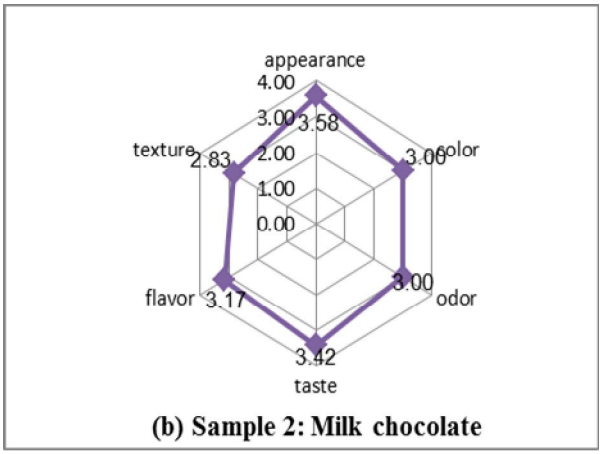
The configuration of points is essentially as scores the first two principal components. The variables are plotted as vectors from the origin. The angles between the vectors represent the correlations among the variables [12].

3.2 Experiment 2.

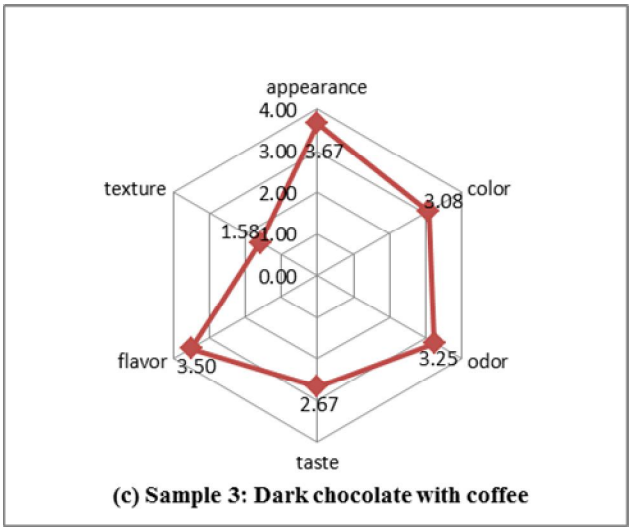
Chocolate has the following quality features [16]: appearance (exterior - gloss surface without blemishes, scratches or air pockets (bubbles), interior - unfilled chocolate mass to be homogeneous, matte (not glossy) without air bubbles, chocolate filled, filling or addition is evenly distributed and have homogeneous consistency), color (uniform variable depending on composition, light brown to dark brown); consistency (relatively hard and brittle at break); taste and odor (pleasant, aromatic, characteristic chocolates without foreign taste or odor) and, respectively texture (should give the feeling of oily product, does not cause teeth grinding). The representative features of the analysis are: general appearance, color, odor, taste, aroma and texture (at a temperature of 20 ± 2 ˚ C). The sensory profiles of the 6 types of chocolate studied are shown in figure 8:



(a)

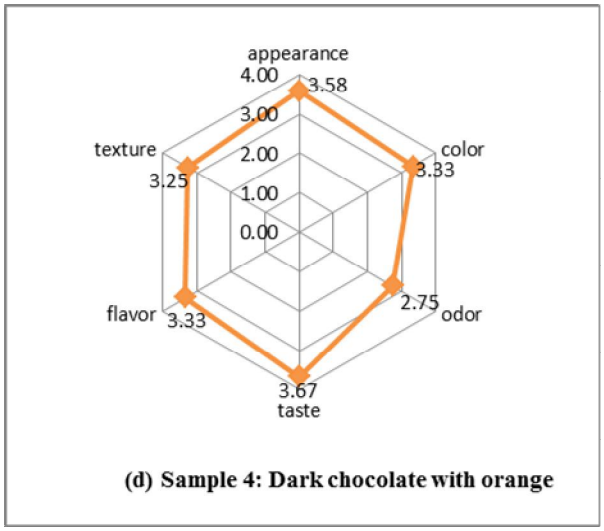


(b)



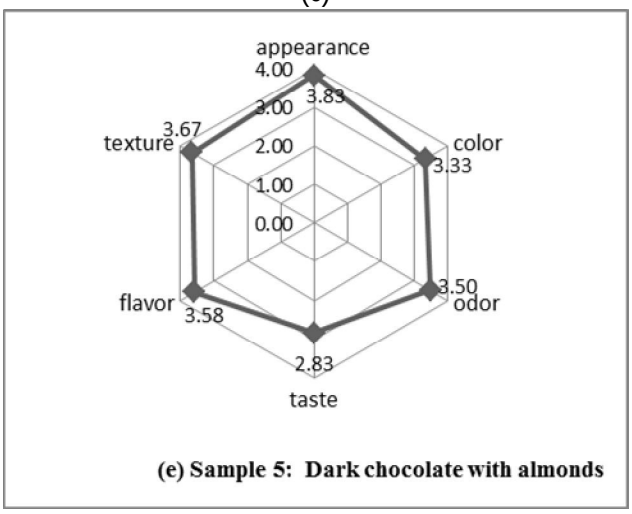
(c) Sample 3: Dark chocolate with coffee

(c)



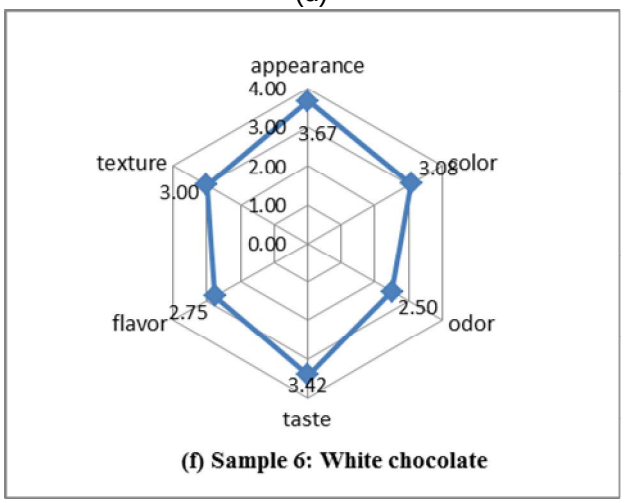
(d) Sample 4: Dark chocolate with orange

(d)



(e) Sample 5: Dark chocolate with almonds

(e)



(f) Sample 6: White chocolate

(f)

Figure 8. Sensory profiles of the six types of chocolate

As we can see in Figure 8, from the analysis of the six types of chocolate studied using six sensory descriptors: appearance (general aspect), color, odor, taste, and flavor and, texture respectively, we obtain the following remarks:

• the general appearance has a variation scored between 3.08 to 3.83, which means that the six types of chocolate describe a smooth, slightly matt, embossed clear-cut (significant differences for the 6 types of chocolates in terms of assessing the overall appearance is determined using one-way ANOVA method, Fisher ratio F = 2.36> F critical = 2.35 and the probability of error is P = 0.0487 < 0.05 = α);

• the variation of the color scores is between 3.00 to 3.83, which means that the six types of chocolate describes a solid color, but some of their assortment characteristics such as the color of mint chocolate is too high (no significant differences for the 6 types of

chocolates in terms of color is determined using one-way ANOVA method, Fisher ratio F = 1.72 < F critical and the probability of error is P > 0.05);

• the variations of the odor scores are from 2.50 to 3.50, which means that the 6 types of chocolate describe odor varied from specific odor to the strong odor characteristic assortment expressed (in the case of chocolate mint) specified in less odor as if white chocolate, (significant differences for the 6 types of chocolates in terms of odor is determined using one-way ANOVA method, Fisher ratio F = 2.56 > F critical and the probability of error is P = 0.0351 < 0.05);

• taste has a variation scored between 2.67 to 3.67, which means that the six types of chocolate described taste varies from pleasant taste, characteristic types, to a very sweet taste (for example milk chocolate) and the weak bitter taste as house coffee or chocolate (significant differences for the 6 types of chocolates in terms of taste is determined using one-way ANOVA method, Fisher ratio F = 2.78 > F critical = 2.35 and the probability of error is P = 0.024 < 0.05=α);

• flavor has a variation scored between 2.75 to 3.58 which means that the six types of chocolate described a specific flavor of the product (no significant differences for the 6 types of chocolates in terms of flavor is determined using one-way ANOVA method, Fisher ratio F = 2.14 < F critical and the probability of error is P > 0.05);

• texture has a variation scored between 1.58 to 3.67 which means that the six types of chocolate describe the texture varies from brittle (in the case of dark chocolate coffee), an oily texture (in the case of milk chocolate) a sticky texture (white chocolate), chocolate with a creamy texture and luxury chocolate mint filling, so in terms of texture are significant differences (F=9,49 > F critic = 2.35).

From the figure 9, one can remark that sample 1 and sample 5 obtained more than 20 points in assessment session by scoring sensory quality chocolate.

By comparing the 6 types of chocolates in the experiment 2, the most preferred chocolate types were: dark chocolate with mint, followed by dark chocolate with almond (luxurious chocolate).

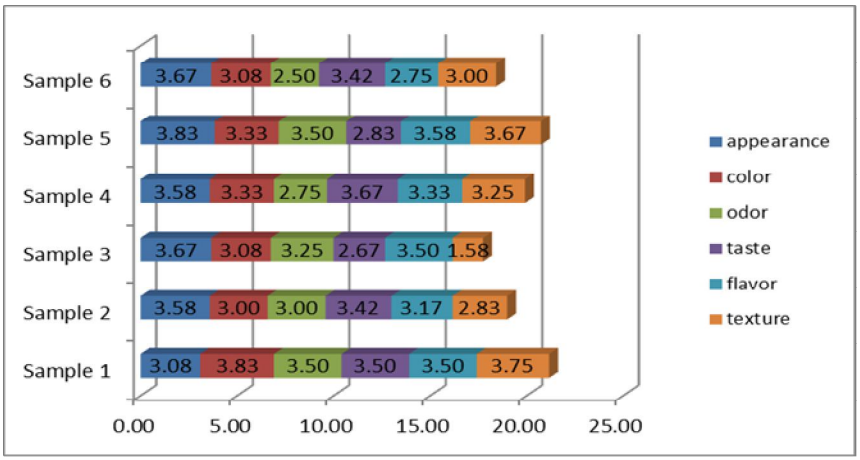


Figure 9. Total scores resulted from assessment by scoring sensory quality chocolate

4. Conclusions

This research based on an interdisciplinary approach – sensory, statistical and semiotic - shows that people, if properly questioned, are capable of identifying a circumscribed range of terms within the sensory lexicon that describe emotional aspects elicited by chocolate. Such an analysis emphasizes how important is the influence of food package design (shape, color, images) on consumers' expectations, which could affect their product perception and purchase decisions. Visual perception of a product packaging image conducts to symbolic meanings associated with sensorial characteristics of a food product.

The sensory analysis reveals itself to be particularly helpful in characterizing chocolates, allowing the delineation of different sensory profiles according to the type of chocolate.

It facilitates the comprehension of human behavior, how this one is influenced by taste/olfactory and visual stimuli in eliciting interior feelings and expectations.

From a semiotic point of view, all the non-verbal iconic signs analyzed speak for themselves that is they convey the proper message intended to. Charged with cultural significance and symbolism, iconic and plastic signs stand for positive feelings and attitudes and high quality products as well underlining that they play a huge role in human communication.

The results of word associations made by studying the six types of chocolate labels are expressed by: feelings, descriptions, at the morphological level by positive adjectives and nouns; most people associated the chocolate image with the sensations caused by iconic signs: fruit, colors, characters, and ways of spelling.

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