

THE IMPACT OF COLORS AND VARIOUS SENSORY INTERPRETATIONS ON CONSUMER PERCEPTION OF FOOD QUALITY

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RESEARCH ARTICLE

Abstract

Our analysis confirms that the senses are not independent of each other, and what we see can have repercussions on other perceptions and sensory interpretations related to color, taste, smell and touch. Everything that passes mainly through the visual channel certainly affects a series of sensory evaluations. Color and aroma cause us to perceive what we taste differently, evoking emotions that will influence the consumer's decision. The study was designed to provide an overview of empirical studies that investigated the influence of color on the perception of the psychosensory quality of the classic lemonade with mint and lemon, consumed from colored containers. Thus, the scientific approach to these perceptions provides a psychological explanation regarding the quality level of the tested food.

The colors of the serving containers of some food products on the perception and health of consumers are explained by mechanisms, which cannot be mutually exclusive. Thus, consumers rely on color as an explicit signal for health. Colors are indirectly associated with health, triggering mental simulations that influence health assessments. The color factor, as an important psychosensory attribute of food quality and as a result of anodyne emotional connections, allows the identification of health-risk behaviors. Color has a significant impact on various qualitative sensations and interpretations, which allows its strategic use as an element of attractiveness regarding food consumption, thus, approximately 90% of the initial product evaluations are based on color.

These evaluations provide suggestions for further research that will contribute to a better understanding of how packaging color can help consumers make informed food choices, with a positive impact on health.

Keywords: lemonade, mint, lemon, color, flavor

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INTRODUCTION

In today's dynamic environment, consumer choices are influenced by numerous factors, among which visual ones, represented by the color of the packaging, the nutritional label and even the serving containers play a key role in shaping perceptions of the quality of food and beverage products (Steiner & Florack, 2023, Song et al., 2021).

Strategic integration of colors and flavors in the design of solid or liquid food products is essential to improve the sensory experience of food and to determine consumers to accept a non-preferred product. Changing the color of food and beverages changes consumers' expectations, as well as their perception of taste and aroma.

The underlying mechanisms of these studies are based on color as an explicit signal for health (Halez et al., 2022, Marques Da Rosa

et al., 2021), on socio-cultural beliefs for evaluating health (Turnwald et al., 2022), and on color-triggered stimuli on psycho-emotional states with an impact on health (Kunz et al., 2023).

Although much research has focused on the impact of changing the color of the product itself, there is now a growing body of scientifically credible research evaluating the extent to which the color of the container from which food and beverages are served affects consumer perception and behavior regarding serving and consumption, based on taste and aroma (Spence, 2018).

In particular, in the case of soft drinks, such as lemonade, the perception of psychosensory quality can be influenced by factors such as the shade of the serving glass, its brightness and contrast (Steiner & Florack, 2023). Color not only affects consumers' expectations of taste and freshness (Plasek et

al., 2020), but can also influence the perception of superior nutritional quality, being a key element used in marketing strategies to attract and convince consumers (Steiner & Florack, 2023).

Spence (2018) in his analysis of the impact of the color of the serving container on the perception and eating behavior, focusing on the growing body of empirical research on the impact of the background color of plates, bowls, mugs, cups, glasses, pots and cutlery on and through which food and drinks can be viewed, both before and during consumption, concluded that the color factor modulates various aspects of our perception and eating behavior. Such effects have been demonstrated in various situations and with a wide variety of products, both familiar and unfamiliar, but without omitting the recording of apparently contradictory results exemplified by the fact that some consumers claim that eating from a blue tray reduces consumption, while others have suggested that eating from a blue plate leads to increased consumption (Spence, 2018).

Understanding how the color of the glass influences the perception of the taste and aroma of a classic lemonade drink involves a complex analysis of the interaction between the visual and gustatory senses. The perception of taste, according to neuroscience data, is not an isolated process, but the result of a multisensory integration in which sight, smell and even touch play an essential role.

Some studies have shown that red or orange glasses can intensify the perception of sweetness, even if the lemonade has the same amount of sugar. This phenomenon is explained by the fact that certain colors are subconsciously associated with sweet or fruity flavors. On the other hand, blue or green glasses can give the impression of a more refreshing and less sweet drink, since these colors are often associated with freshness and naturalness.

The shape and nature of the glass (glass or transparent plastic) also contribute to the perception of the quality of the lemonade. For example, tall and narrow glasses can create the impression that the drink is more refreshing, while wider and shallower glasses can emphasize the perception of density and richness of taste. In addition, the transparency of the glass allows for visual assessment of the color and consistency of the lemonade, thus influencing taste expectations. Another interesting aspect is the influence of the

brightness and saturation of the colors of the glass. Darker tones can be associated with a stronger and more intense taste, while pastel or light tones can suggest a more delicate and subtle taste. Also, the texture of the glass (smooth, matte or with embossed patterns) can influence the overall sensory perception, creating a different drinking experience.

Therefore, the color and design of the glass not only influence the perception of taste, but also the overall consumption experience. Understanding these mechanisms can be leveraged in the food and beverage industry to create more attractive products and increase consumer satisfaction. Exploring these subtle links between the visual and gustatory senses gives us a deeper insight into how we perceive and appreciate the taste of a beverage.

In this context, measuring the level of consumer knowledge regarding the impact of colors and the different psychosensory interpretations on the perception of the taste and aroma of lemonade becomes essential to understand how they interpret and evaluate products (Schnurr, 2019) leading to results on the frequency of consumption of that product and the degree of familiarity with classic lemonade (Song et al., 2021).

Our study has as its general objective the analysis of how consumers perceive and interpret visual information related to color in relation to the psychosensory quality of lemonade. In order to achieve this objective, several specific objectives were established:

1. Assessing the influence of factors: serving container hue, brightness and contrast in relation to the psychosensory quality of a classic lemonade-type soft drink

2. Measuring the level of consumer knowledge regarding the impact of colors and the different psychosensory interpretations on the perception of taste and freshness of lemonade

3. Exploring the factors that can moderate the level of understanding of the importance of the impact of colors on the perception of the quality of foods with functional potential on health and on consumption behavior.

This study was designed to make an important scientific contribution to improving the level of understanding of the impact of color on the perception of the quality of foods with functional health potential. Color thus occupies a defining position on the perception of the overall quality of foods, which allows it to change the perception of taste and aroma,

which will influence consumer preferences and perceived sensory attributes. At the same time, it facilitates the increase of interest in food research on the impact of colors, through the role of color indicators, on the perception of the quality of foods and beverages in order to reduce health risk behaviors.

Improving the behavior of purchasing and consuming nutritionally balanced foods can be achieved through adequate nutritional education (Chen et al., 2022), implemented since primary schools, using color codes in order to increase the degree of knowledge and information by applying an appropriate methodology. Such studies have a positive impact on the formation of healthy eating behaviors, reducing risky eating behaviors (WHO, 2023; ISPO, 2023), and contributing to a better understanding of informed food choices.

MATERIAL AND METHOD

The variables monitored in this study are represented by the identification of the refreshing, citric/aromatic and sweet character of a soft drink, type classic lemonade with mint and lemon, distributed in glasses of different colors, served at the same temperature and concentration of lemon juice, sugar and mint. The degree of influence of color on the perception of the psychosensory quality of classic lemonade with mint and lemon with importance in informed food choices, according to needs, by consumers was monitored.

The evaluation criteria in this study were related to the following items:

ItL_1 managing the color of the lemonade serving container while keeping constant the factors of temperature and concentration of lemon juice, sugar and mint

ItL_2 evaluating the psychosensory properties as variables dependent on the color of the container

ItL_3 investigating the effect of the color of the serving container on the evaluation of the quality of lemonade

ItL_4 observing the psychological effect produced on the subjects taken into the study – children aged 12-15 years.

The study material was represented by a classic lemonade-type soft drink obtained from still water, lemon, sugar and mint.

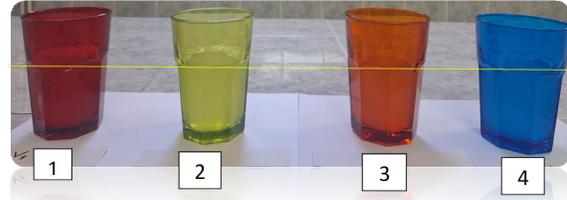


Fig. 1. Experimental variants

Each glass was labeled using a serial number: 1, 2, 3, and 4, respectively. The color of the glass corresponding to each serial number was randomly determined, as follows: 1 – red glass, 2 – green glass, 3 – yellow glass, and 4 – blue glass.

The working hypothesis was to determine whether these colors could have a greater impact on the perception of the taste and aroma of classic mint and lemon lemonade.

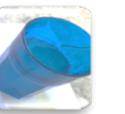
RESULTS AND DISCUSSIONS

The analysis of the results regarding the measurement of the level of knowledge and the impact of colors and different psychosensory interpretations on the perception of the taste and aroma of classic lemonade with mint and lemon becomes fundamental for understanding how consumers interpret and evaluate the quality of food products.

The results led to the observation that classic lemonade with mint and lemon, through a nutritional promotion appropriate to the age group (children 12-15 years old), also supported by the degree of familiarity with this product, could increase the frequency of consumption of soft drinks with nutrifunctional value to the detriment of processed juices.

Table 1

Distribution of the taste of classic lemonade with mint and lemon depending on the color of the container

	V1	V2	V3	V4
				
Intense refreshing taste	5.63%	33.8%	19.72%	45.07%
Pleasant refreshing taste	18.31%	30.99%	19.72%	35.21%
Lemon taste	29.58%	22.54%	39.44%	12.68%
Characteristic refreshing taste	45.07%	21.13%	11.27%	23.94%
Average	24.65%	27.12%	22.54%	29.23%
SD	16.77%	6.23%	11.95%	14.01%

The data on the distribution of the taste of classic lemonade with mint and lemon depending on the color of the serving container supports the significant impact of colors on the psychosensory perception of food products.

Classic lemonade with mint and lemon consumed from the blue glass (V4) (table 1) was perceived as having an intense refreshing taste in the highest proportion (45.07%) and the consumption of lemonade from the red glass (V1) was perceived as having an intense refreshing taste in the lowest proportion (5.63%).

The pleasant refreshing taste (table 1) was perceived in the highest proportions in the case of the consumption of lemonade from the blue and green glasses (V2) (35.21% and 30.99% respectively). The weakest pleasant refreshing taste was observed in the case of the consumption of lemonade from the orange (V3) and red glasses (V1) (19.72% and 18.31% respectively).

The most intense lemon taste (table 1) was recorded in the case of lemonade consumed from the orange glass (V3) (39.44%) and the least intense lemon taste was perceived in the case of lemonade consumed from the blue glass (V4) (12.68%).

The characteristic refreshing taste was perceived in the highest proportion in the case

of lemonade consumed from the red glass (V1) (45.07%).

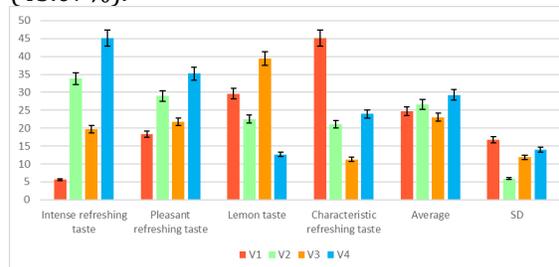
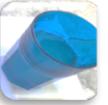


Fig. 1. The influence of the color of the classic lemonade serving container on the perceived taste

The proportion of cooler tones, blue and green (V4 and V2) are associated with a more intense refreshing taste and a pleasant refreshing taste. Warmer tones, orange and red suggest a characteristic refreshing taste (figure 1).

Exploring the mechanisms of taste perception as a function of color can be exploited in the food and beverage industry to create more attractive products and increase consumer satisfaction with food quality (Zampini, et al., 2007). Thus, by optimizing visual attractiveness and by controlling sensory parameters such as taste and aroma, the choice of products with functional potential on health and consumption behavior can be supported, especially among children.

Table 2
Distribution of the flavor of classic lemonade with mint and lemon depending on the color of the container

	V1	V2	V3	V4
   				
Intense flavour	25.33	22.19	47.27	5.21
Pleasant lemony flavour	27.15	18.97	45.17	8.71
Characteristic flavour	28.81	22.34	40.64	8.21
Fruity flavour	35.63	18.32	38.02	8.03
Average	29.23	20.46	42.78	7.54
SD	4.50	2.11	4.21	1.58

The color of the glass from which the classic lemonade with mint and lemon was consumed showed both intensification and moderation of the aroma, generating expectations that influenced the perception of this multisensory parameter composed of taste, smell and texture (hossain et al., 2025).

The most intense aroma (table 2) was perceived after the consumption of the classic lemonade

with mint and lemon from orange glasses (V3) (47.27%). The lowest aroma intensity was perceived when the lemonade was consumed from blue glasses (V4) (5.21%).

The same trend was observed in the evaluation of the pleasant lemony aroma (table 2). The orange color of the glass (V3) led to the perception of a pleasant lemony aroma of the lemonade with mint and lemon (45.17%).

The fruity aroma was perceived after consuming lemonade with mint and lemon from red and orange glasses (V12 and V3) in a proportion of 35.63% and 38.02%, respectively. Table 2 shows a reliable association of the color of the serving glass of classic lemonade with mint and lemon with the perceived aroma.

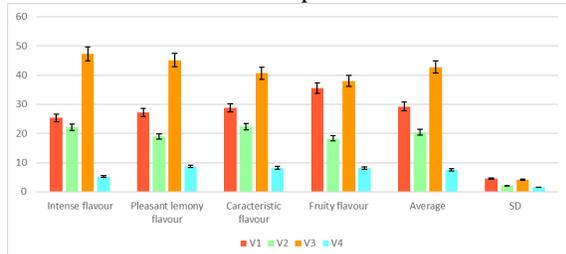


Fig. 2. The influence of the color of the classic lemonade serving container on the perceived taste

The proportion of warmer tones, red and orange (figure 1) are associated with a more intense, more lemony and fruity aroma. The green color of the glasses from which the classic lemonade with mint and lemon was consumed was appreciated similarly in all four aromatic variables without significant differences in the associated physiological responses. Blue tones led to a lower perception of the aroma of the classic lemonade with mint and lemon (figure 1).

Aroma perception is a complex integration of sensory input transmitted through a combination of chemical receptors activated by both taste-active and aroma-active metabolites, with the specification that the taste-active ones (usually primary) are non-volatile, but the secondary metabolites (flavonoids and limnoids) are aroma-active (reuss et al., 2020).

CONCLUSIONS

The influencing factor, color, certainly leads to different psychosensory perceptions and interpretations of taste and aroma.

Both in the case of the serving container and in the case of the color of the food, color leads to changes in consumers' beliefs regarding taste and aroma, due to the tendency to create associations of specific colors with specific products and associations with particular tastes.

The colors red and orange can be attributed to a sweet, fruity taste and convey superior taste sensations compared to the taste sensations generated by green and blue.

Colors such as blue and green can be attributed to a refreshing taste, convey the sensation of a cool-invigorating food, while also

conveying to the consumer the idea that it is a product with a high level of added value. The color green induces the idea of freshness and naturalness.

Changing the color of food and beverage serving containers changes people's expectations, as well as their perception of taste and aroma.

The use of color as a qualitative parameter requires understanding the theoretical basis of colorimetry and the consistent and meaningful implementation of research on reducing health-risk eating behaviors. should be added if the results and discussion part is long.

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