INFLUENCE OF FLAVOUR PERCEPTION ON WINE AND FOOD APPRECIATION

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Extended Abstract

This review was carried out with the aim of clarifying the perceptions that develop during a wine tasting and the mechanisms by which they can best be combined with a meal. The first part concerns the main sensory parameters involved in a tasting, that is, the senses with which a certain type of wine can be judged. The chemical and sensory interactions were then evaluated, talking about senses such as sight, smell and taste. Getting to the heart of the review, we described the factors that deeply affect our brain during a tasting, highlighting physical, chemical, biological and psychological factors, defining the neophobia of wine through parameters such as the Wine Neophobia Scale, including how the unconditional fear of tasting new wines is created in person. Furthermore, it was added a small part dedicated to consumer segmentation, analysing the figure of the consumer and his various classes from a marketing perspective to better illustrate the new segments of potential buyers in the wine market and the different age groups concerned. The main components of food and wine pairing were then evaluated and taking into account the different parameters of judgment, then defining the different approaches during a pairing. Despite the little research in this field, hopefully this review will be useful to better understand the psychological and non-psychological interactions that relate to food and wine harmonizations, with the awareness that research from now on can be increasingly broad and efficient, to enjoy the whole of a correct combination between food and wine.

Keywords : pairing food wine - senses - taste - perception mouth feel

Resumo

Esta revisão foi realizada com o objetivo de esclarecer as percepções que se desenvolvem durante uma prova de vinhos e os mecanismos pelos quais pode ser melhor combinada com uma refeição. A primeira parte diz respeito aos principais parâmetros sensoriais envolvidos numa degustação, ou seja, os sentidos com os quais um determinado tipo de vinho pode ser julgado. As interações químicas e sensoriais foram então avaliadas, falando sobre sentidos como paladar, olfato e paladar. Chegando ao cerne da revisão, foram descritos os fatores que afetam profundamente nosso cérebro durante uma degustação, destacando fatores físicos, químicos, biológicos e psicológicos, definindo a neofobia do vinho por meio de parâmetros como a Wine Neophobia Scale, que avalia o medo incondicional de degustar novos vinhos. Os principais componentes do emparelhamento comida e vinho foram então avaliados e levando em consideração os diferentes parâmetros de julgamento, definindo então as diferentes abordagens durante um emparelhamento. Além disso, foi acrescentada uma pequena parte dedicada à segmentação do consumidor, analisando a figura do consumidor e suas várias classes de uma perspectiva de marketing para melhor ilustrar os novos

segmentos de potenciais compradores no mercado de vinho e as diferentes faixas etárias em causa. Apesar da pouca pesquisa neste campo, espera-se que esta revisão seja útil para melhor compreender as interações psicológicas e não psicológicas que dizem respeito a harmonizações de comida e vinho, com a consciência de que a pesquisa a partir de agora pode ser cada vez mais ampla e eficiente, para se poder desfrutar cabalmente de uma combinação correta entre comida e vinho.

Resumo Alargado

Esta revisão pretende explicar e evidenciar, através de diferentes estudos científicos, as percepções que se desenvolvem durante uma prova de vinhos e os mecanismos com que esta pode ser melhor adaptada à refeição. A harmonização do vinho com a refeição sempre foi um tema de grande discussão, visto que nos deparamos com opiniões divergentes na maioria dos casos.

É por isso que, ao fazer isso, foi considerado adequado começar com uma introdução sobre o funcionamento de nossos sentidos principalmente envolvidos quando estamos nos preparando para provar um vinho. Queríamos analisar as principais interações químicas e sensoriais que levam o cérebro a escolher um alimento diferente de outro quando é acompanhado por um vinho adequado. Esta interação cria um envolvimento por parte do consumidor que usa todos os seus sentidos e em particular a sua visão, olfato e paladar. Por isso, são analisados e tidos em consideração os três sentidos necessários e fundamentais para uma avaliação completa de um vinho, estando directamente envolvidos na degustação de uma refeição, podendo portanto influenciar o julgamento final de ambos. e o outro componente de comida e vinho. Podemos analisar a vista que permite visualizar na mente o alimento que deve ser consumido e permite criar dentro do cérebro a expectativa de prazer que pode criar ao observar o alimento. Isso pode ser conseguido de acordo com o tipo de alimento, o vinho adequado para melhorá-lo e destacar suas particularidades. Continue então com o olfato que se torna decisivo para completar o conhecimento dos alimentos, começando a prová-los junto com o vinho que se torna com seu perfume o segundo passo para a degustação completa dos alimentos. Finalmente chegamos à conclusão de degustar a comida diluída pelo sabor que temos através de nossas papilas gustativas encontradas na língua que conduz o conhecimento do sabor diretamente ao cérebro que monta este concerto de sentidos para dar ao corpo o prazer de degustar aquele prato específico naquele lugar específico com certas luzes e sons. Em seguida, analisamos quais são os fatores que influenciam as preferências de comida e vinho e como eles se desenvolveram neurologicamente e ao nível das memórias e pensamentos que muitas vezes influenciam nossas escolhas, mas principalmente memórias porque se estas forem positivas e favoráveis sempre levam a siga as mesmas escolhas. Na verdade, uma situação particular que o consumidor quer evitar e de se deparar com uma surpresa desagradável no sabor de um alimento ruim ou impróprio ou de um vinho ruim ou ruim e essa situação leva o nome de

neofobia que é o medo de encontrar algo que pode criar um desânimo ao nível do paladar. Por isso o consumidor é guiado pela marca do vinho pelo conhecimento, mas principalmente pelo rótulo que define principalmente como o vinho é feito e quais as características que possui para que no momento em que saboreie saiba indicativamente que sabor pode ter. E em encontrar o que procura permite ao consumidor lutar contra o medo de não saber, Na verdade você sempre tenta seguir os caminhos mais explorados e conhecidos. Torna-se difícil para o consumidor médio abrir novos caminhos para novos sabores que muitas vezes podem esconder más surpresas que podem permanecer como memórias ruins que limitam escolhas futuras e aumentam a neofobia em relação a vinhos e sabores desconhecidos. Por fim, estudou-se a segmentação do consumidor ao qual se dirige o consumo de vinho. Eles analisaram os vários tipos de novos consumidores e suas idades e seus usos e costumes. Procurou-se estabelecer uma tabela dos vários grupos de consumidores, analisando os seus usos e hábitos no consumo de vinho. Procurámos estudar que grupos etários analisam o vinho quais são as exigências da massa de consumidores que procuram um vinho de qualidade média e principalmente económico mas como quem procura um vinho de qualidade média está a crescer um nicho de mercado muito interessante para o vinho cadeia produtiva que deve desenvolver as demandas do consumidor, mas principalmente antecipá-las e conduzi-las às escolhas de produção que devem sempre garantir a produção maiores lucros e assim você pode garantir a produção segura e a possibilidade de desenvolver novas linhas de produção criando dentro do consumidor as indicações e a vontade de provar novas linhas de sabores e cheiros. Fidelizar o cliente na escolha da marca ou linha que garanta aquelas certas qualidades que o consumidor procura. Só assim é possível garantir uma produção segura e a possibilidade de desenvolver novas linhas de produção, criando no consumidor as indicações e a vontade de provar novas linhas de sabores e cheiros.

Neste ponto queríamos analisar como o cérebro analisa o "sabor" que é a capacidade de sintetizar esses sabores que chegam aos neurônios através dos 5 sentidos e dos quais três definimos os mais importantes. O sabor é fundamental na combinação vinho-comida, pois é a forma mais importante de criar interação entre comida e vinho.

O vinho pode influenciar muito o sabor dos alimentos, pois é condicionado por diferentes percepções químicas, sensoriais e neurais, que cada indivíduo pode perceber de maneira diferente. Cada um de nós, de fato, experimenta pessoalmente sua própria habilidade, que é estudada pelas neurociências do gosto.

Foi possível evidenciar como a investigação neste domínio da harmonização comida-vinho tem-se centrado numa variedade de elementos alimentares e vínicos, tanto do ponto de vista culinário como sensorial, principalmente para a procura do mercado agroalimentar que se segue. a demanda dos consumidores que nas últimas décadas se tornou cada vez mais exigente.

Por este motivo, novos cenários foram abertos no campo da pesquisa sobre a harmonização comida-vinho com base nos diferentes tipos de consumidores para entender melhor como eles interagem entre si. Foi assim possível verificar que a área de consumo nas últimas décadas mudou a sua escolha de vinhos, passando de uma compra de massa económica para uma compra seleccionada, condicionada pelas sensações que o vinho desenvolve com a comida.

A condição de sociedade avançada e rica tem condicionado a escolha de uma melhor qualidade de vida principalmente na escolha de produtos naturais.

Isto tem consequentemente afetado a escolha do vinho emparelhado determinando assim a produção de vinhos não mais ligados à economia mas sim à sua qualidade e tendo-se destacado produções territoriais particulares que responderam ao pedido de um sector de média dimensão de consumidores que escolhem o vinho com cuidado e a paixão, criando um vácuo na produção em série e destacando alguns nichos de mercado capazes de satisfazer plenamente a vocação de um cabaz de consumidores exigentes e preparados que optam por comprar já não em supermercados, mas em adegas especializadas.

Nesta linha, o trabalho foi então concluído explicando os principais componentes do emparelhamento e as diferentes abordagens que fazem deste último um fator importante para valorizar, na melhor das hipóteses, uma simples refeição ou vinho. Este estudo confirmou como as percepções sensoriais se tornam um dos fatores determinantes para a produção de vinho que não acompanha mais a produção massiva mas sim a seleção de produtos que permitem ao consumidor médio alto se sentir protegido da origem, da marca e do nome do produto. que lhe permite distanciar-se da neofobia do vinho, que é o medo de descobrir sabores novos e contrastantes em novas marcas que só podem ser superados através do conhecimento e da publicidade em larga escala do produto que deve provar ter as garantias, os conteúdos e uma história que dão ao consumidor a certeza e a confiança de que não terá surpresas ao efetuar aquela compra.

Em conclusão, este trabalho torna-se muito importante para quem se depara com a produção de vinho, pois deve analisar e estudar como obter novas combinações de percepções químicas e sensoriais que cada indivíduo é capaz de reconhecer porque isso pode influenciar a sua própria capacidade gustativa e gustativa que o vinho pode criar com a combinação dos alimentos e determinar para as adegas a escolha das vinhas nas quais investir para as futuras quintas, antecipando as novas exigências que um determinado vinho pode obter.

Não tendo argumentos científicos aprofundados a este respeito até à data, a intenção desta tese foi aprofundar estas ideias, ferramentas e conceitos, e analisar esses conhecimentos adequados, para identificar os elementos-chave da combinação de vinhos e alimentos, e para facilitar um maior interesse e confiança por parte dos profissionais da restauração e da cozinha ao serviço da comida e do vinho.

Só aprofundando este aspecto será possível obter um enriquecimento de valor na cadeia alimentar e vitivinícola que certamente poderá projectar uma diminuição do valor acrescentado económico nos sectores do turismo / hotelaria, proporcionando novos conhecimentos e informações que podem conduzir à criação de novos. pedidos de vinho. promovido por profissionais qualificados que irão aumentar a satisfação gastronómica do cliente e das empresas produtoras.

Palavras-chave: emparelhamento comida vinho - sentidos - sabor - percepção sensação na boca

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Introduction

Wine is one of the oldest and most consumed beverages in the world. The reason for this statement comes from the wine's ability to "relax the language", making people feel comfortable in a social context. From the ancient Egyptians to the present day, passing through the Roman Empire, wine has passionate poets, writers and philosophers, thus becoming a source of ingenuity and inspiration. Its consumption has grown more and more with the advancement of the history of man, through which it has spread in all the areas where it was possible to cultivate its breeding. The wine is the identity of the area, delimiting the border through a micro and macro area to identify the vineyard itself, the climate the geographical location, the "terroir" (Rota & Stefi, 2012).

Wine has always been an element of conviviality and sharing and over the years, just like food, has transformed the natural need to eat without being hungry and drink without being thirsty, because it comes from reflection on the pleasures of the table and the desire to prolong it (Brillat-Savarin, 1960). It is precisely on this desire that over time we build the basis for what will become a real art: the art of tasting, that using the senses of man to "tell" wine, mainly of sight, smell and naturally taste.

As we know, tasting is of fundamental importance for an enologist, who, if he did a good job, during a tasting of a wine, the sensorial involvement makes the latter more appreciated, and above all recognizable, as identity card of a territory. The pairing of wine with a meal has always been a topic of great discussion, also because there are many different opinions. First of all, while a small part of people have a number of experiences and knowledge developed in the taste and general characteristics of food, most do not have a continuous or permanent experience of matching a wine to a daily meal. So a real fully developed ability to instinctively match appropriate wines with foods is lacking for the general population. Although in our days it is clear the importance of correctly matching a wine to the meal, there is still very little scientific research in this field.

The researchers have indicated the study on enogastronomy as a very important goal to pursue, to improve the quality of food experiences and the quality of the gastronomic tourism sector. Just think that the search for a selection of wines and appropriate food pairings allows operators in the sector to increase the company's profitability with a greater sale of wine, and also allows to increase the gastronomic satisfaction of the customer as part of the gastronomic experience (Van Westering, 1996).

Chapter 1
The neuronal processing of the senses

1. Brain anatomy and sensory transmission

Before beginning to analyze the main senses of man it is necessary to define well all the senses and their brain origins and inside the cerebral cortex in small areas, the visual, olfactory and gustatory functions differ.

As we know the brain is located inside our brain case, it weighs 1,150 kg in the man and 1,016 kg in the woman, is composed of billions of nerve cells connected to each other. It is divided into different areas where the stimuli we perceive from the outside are reworked and each of these plays a precise function. His greatest job is to receive data and give us information that allows us to perform actions and to feel emotions. These areas of the brain are connected to each other, and the latter are made up of nerve cells that form a lattice that unite search area.

Thanks to electrical and chemical impulses the brain can guarantee us to perceive what happens outside of our body, to feel pain, but, it is also able to memorize, to suffer stress and can also get sick. The nervous system consists of the brain that dominates it, but also the spinal cord and the nerves. It also includes neurons and glial cells. We have three classes of neurons: sensitives, motor neurons and interneurons:

- the former have the task of recognizing the stimuli of the environment, such as changes in brightness, sound, visual auditory, tactile, olfactory and gustatory;
- seconds control movement and language;
- third parties are the reflex mediators (De Lorenzi, 1933).

Glial cells ensure proper development of the nervous system until adulthood, but transmit no information with neurons. Neuronal processes take place thanks to axons that transmit information, and dendrites that instead receive it, both collaborate in the structure of the synapses.

The brain is formed by the brain stem and the brain hemispheres. The first is the seat of vital functions, like breathing, blood flow, and motor coordination. The second, where the cerebral cortex is contained, subdivided in 20 smaller areas, where the visual, auditory and olfactory functions differ. In addition, memory and language activities are involved (Liberles & Buck, 2006).

Neuroscience has made known the mechanisms and nervous system where neurons, mirror neurons, limbic system and memory are involved. Neurogastronomy, multidisciplinary and interdisciplinary, deals with the complex mechanisms that allow the brain to create flavors and how this fits into the culture of man.

Studies all areas of the relationship between man and food, starting from food, through the Chefs, sommeliers, culinary arts, molecular biology, agricultural technology, neuroscience, psychology, sociology.

The taste of a food or a drink (wine) strongly depends on the perfume, temperature, color and density, just because all the senses are involved in giving the right feeling of what we call "taste".

There are in fact neurobiological mechanisms that regulate flavors to odors. When we consume a meal, complex systems such as memory, emotions, motivations and the sense of reward are activated, signals interpreted by the frontal lobe of the brain that decides when to start or stop eating and how much (Mandolesi, 2016).

Even the sounds or music that accompanies the consumption of food can influence the pleasantness and satiating power.

Recent studies show that listening to a sound that heralds good food activates the gustatory cortex and the amygdala, involved in the emotional processing of expectations related to the food itself. That's why the same food is perceived more pleasant and more satiating if associated with a music or appropriate sounds as happens in ethnic cuisine.

Empirical observations have shown that listening to the sound of the sea makes oysters 30% tastier than listening to country sounds. There seems to be a close link between taste and sound, in which acute sounds would be related to bitter sweet foods, low ones to bitter tastes.

The word "senses" comes from "sense", man is able to "feel" activating some parts of the body that at the same time enter into operation with the brain. Man, unlike animals, has a greater sensory capacity, although many senses are developed in a less developed way. Consciousness and intellect give awareness and resolve many doubts about how to relate to the outside world (Camporesi, 2009).

The senses are: the sight with which it perceives the images and the colors, the smell for the scent, the hearing for the sounds, the taste with which it hears the tastes and the touch with which it touches the matter and feels the temperature and the characteristics.

Usually we see first and then judge. First we define a request to try a food or a wine and then we see it.

Despite this, the word "sense" takes on different nuances, since it also identifies orientation in space, direction, and that the latter becomes the means of some senses previously mentioned to be determined. In fact, we move around the world with all our sight, but also with hearing, smell and touch.

The taste, however, is a very particular sense, which often has a value more memorative than indicative. But it must be emphasized that "sense" has a value of "meaning".

The cognitive development of man allows us to ask questions and give us explanations about what happens outside our body and how to perceive feelings from the outside world because with the use of the senses man becomes aware of life.

So the in-depth knowledge of wine necessarily passes for a refined sensorial perception. The senses are of fundamental importance for an enologist and constitute for the latter the first means of qualitative analysis (Shepherd, 2011).

1.1 Sight

The first sense that gives us information about wine is sight. The latter can make us immediately understand if it is a red wine or a white wine, but in addition to color, can make us understand the health and conservation status of a wine, it is therefore the first sense that can give us concrete information about the quality of wine and consequently influence the consumer's purchasing attitude.

The view can be defined as the result of a series of phenomena that occur in rapid succession, that is, initially with the formation of a real image, reduced and inverted on the retina of the eye, the main organ involved. The signal that is received by the eye is transferred to the retina to get to the brain through the optic nerve.

However, what we see is not reality, but the reworking of the data perceived by the retina with our nervous system. Itis easy to understand that the brain not only processes images, but stores them, and sometimes from distortion of them creates the so-called "optical illusions" (Buller & McEvoy, 2012).

Neuromarketing studies have figured out how colors can affect product purchases. For example, the blue walls tend to make us relax and slow down the choice of a product, the red attracts customers and provokes excitement, the green stimulates positivity creativity and well-being (Shepard, 2015).

In restaurants we notice the great potential of geometric shapes. The dishes are always round and white, symbols of perfection and purity. Vision is able to determine positivity or negativity in our body, and neuroscience has understood how this sense can manipulate our choices. As for wine the characteristic that is perceived is mainly color and transparency (Meilgaard et al, 1999).

1.1.1 Wine aspect appreciation

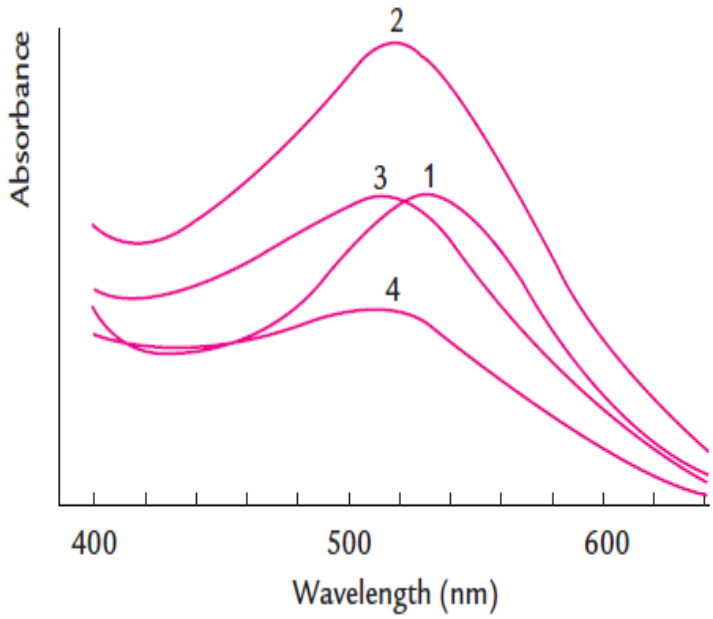
The hedonistic evaluation of color is very subjective since for a white wine an amber-yellow color can be considered a fault because it is connected to oxidation phenomena; on the other hand, for a red wine, the hue of the color can determine a different appreciation related to the aging period, on the other hand, the hue and intensity of the color can provide important indications on other sensory characteristics. The other aspect of wine related to the sense of sight is transparency; it is known that the presence of elements in suspension is a symptom of problems that can be of various nature, for the result of chemical-physical reactions (microbiological, chemical; He, et al., 2012).

Colour can also influence flavour, but only in a qualitative way, therefore colour can be an extremely important sensory factor in the acceptability of food. It has also been shown that the colour of wine (as well as that of any other beverage) can influence both the quantitative and qualitative aspects of aroma, perceived smell and taste.

Moreover, in terms of the influence of color on perceived quality judgments, the aspect (color) of wine, was judged as a fundamental parameter for the constitution of quality in general on Spanish red wines, in a study with expert tasters (Sáenz-Navajas et al., 2016), and in a qualitative study involving consumers with different levels of wine involvement (Charters & Pettigrew, 2007), although on the other hand it has been shown that the color of the wine was not one of the main drivers of the chemosensor judgments of the French and New Zealand Pinot Noir.

The evaluation of wine's color is mainly done by analysing hues and intensity. Tonality is a parameter of chromatic definition of a wine of fundamental importance, and is given by polyphenols such as anthocyanins and tannins (Bertamini et al., 1998). Intensity is a quantitative character of the color of the wine; it indicates exactly how intensely the color is perceived, which can range from faded to load. Itis a very important evaluation parameter because it can be an expression of technical accidents, but also a representation of the varietal characteristics of the vine or the soil. It can also indicate the level of ripeness of the grapes at harvest or the technique used to make the product (Ratti et al., 1981).

The appearance of a wine and its visual characteristics depend on how its particulate matter transmits, absorbs and reflects visible radiation. The pigments of a red wine, for example, reflect and absorb certain wavelengths of the visible spectrum (Fig. 1).



No.	Age (mo)	λ_{max} (nm)	A_{max}	Color density
1	0	531	8.05	12.20
2	4	520	11.80	18.60
3	16	515	7.95	13.45
4	28	515	5.20	9.40

Fig.1 Absorbance scans of a single cultivar port (*Touriga Nacional*, 1981) at different ages (from Bakker & Timberlake, 1986)

These cause a series of retinal stimuli in the human eye that make us feel red. A means to estimate the colour response concerns the CIE (Commission Internationale de l'Eclairage) system. This system provides for the transmission of light at three different wavelengths, namely at 445, 550 and

625 nm; from these data it is possible to obtain values for relative brightness "L", relative redness "a", and relative yellow "eb". These can be used in Hunter L * a * b * or CIELAB measurements. These scales have been used to measure wine colour, though several researchers have proposed changes to make the values more applicable to wine (Negueruela et al., 1995).

Anthocyanins are responsible for the red colour of grapes and wine. In particular in the grape we find five classes of anthocyanins and they differ from the number of hydroxyl and methyl groups on the B ring of the molecule, where the hydroxylation model of the anthocyanidin B ring mainly controls the stability of the tonality and the colour (Wenzel et all., 1987).

Free hydroxyl groups increase blue, while methylation increases redness. In addition, the presence of two hydroxyl groups side by side on ring B (o-diphenols) greatly increases their oxidation potential.

Therefore, wine with a high percentage of Malvina or Peonin, none of which possess o-diphenols, significantly improves colour stability. In most red grapes, Malvina is the predominant anthocyanin.

As it is the most red of anthocyanins, the red hue of the youngest red wine comes from Malvidin, which among other things represents the predominant anthocyanin in most red grapes. During maturation, these anthocyanin aggregates dissociate and lose their sugar and the iracyl (caffeic, acetic or coumaric), and this can lead to irreversible oxidation (browning), and to the conversion of the flavylium ion state to a hemiacetal form (colourless) (Bertamini et al., 1998).

1.2 Smell

When comparing several wines, it is easier to position oneself over the glasses than to raise each glass to one's nose. Swirling increases contact between air and the wine, promoting the release of aromatic compounds.

The first human sense active in this field, after the vision, especially related to food pairing wine, is the smell.

The sensory receptors are located within the sense organs, such as the eye, the ear or the language, giving rise to the subjective perception of lights, sounds and tastes that we describe with the senses (Cooke, 2013).

However, as already mentioned, smells trigger emotions, just think of the perfume industries that have been playing for several years on smells that can make people and places more attractive. A similar thing happens for restaurants, fast food and bakeries: we are attracted by the smell of butter that hovers in the air and we are going to buy a croissant, or the pizzeria that emanates the smell of yeast that makes it irresistible.

Odours often influence the definition of certain foods, even though the latter may be visually pleasing to us, their odour may make the map ear in our brains as pleasant or disgusting.

These remain in our memory and we define the mas such to continue in our lives. We can therefore speak of "olfactory memory". This concept also applies to the places and environments we frequent. Often pleasant smells make us come back the mind of places, and we can define the mac cording to the pleasure felt by our brain. A certain smell therefore has a memorative value.

This theory is expressed by Proust, from whom this syndrome derives, of which he explains in concept that a smell is reworked by our mind as a place or an event. Today we are able to categorize certain smells, which cause sensations to our body.
They are used by large perfume houses, and are applied by marketing in multiple stores, and also in advertising of fine wines, in order to attract attention by causing feelings of well-being reconciled to the sale of the product (Cavalieri, 2009).

To better understand the functioning and importance of this sense, we must explain how the olfactory region works. The latter consists of two small spots in the upper part of the nose where the volatile compounds reach the olfactory epithelium directly, through the nostrils (Jackson, 2016). To improve the revelation of the wine's odours, many tasters often draw air from their mouths by clenching the jaws and contracting the muscles of the cheeks, in order to let the air pass through the wine. This procedure increases the volatilization of odorant compounds, which this time reach the olfactory epithelium indirectly, that is, from the back of the throat. Odors are detected through two pathways. The first is the orthonasal pathway which involves odors that are sniffed in through the nose. The second is the retronasal pathway which is a pathway that connects the top of the throat to the nasal

cavity. In the orthonasal pathway, odors that enter the nasal passages and are detected by chemical receptors in the nose (https://www.thoughtco.com/olfactory-system-4066176).

In this context there is what we call “flavor”, generated by the combination of the retronasal smell with the taste and sensation in the mouth. In others terms, flavor is a complex combination of the olfactory, gustatory and trigeminal sensations perceived during tasting The compounds that reach the olfactory epithelium through the back of the throat generate "the retronasal smell". Any sensations detected later are called "aftersmell", and occur when once the wine has been swallowed, the volatile compounds continue to inebriate the oral cavities. (the liberated aromatic compounds flow up into the nasal passages). The significance of retronasal olfaction to flavour detection is easily demonstrated by clamping the nose. This limits the movement of volatile compounds from the oral cavity up into the nasal passages.

Only a small part of the aromatic molecules that reach the olfactory zones is absorbed by the mucosa that covers the epithelium (works like a real chimney of a fireplace) and in addition, among these molecules, only a fraction spreads through the mucus and reaches reactive sites on the neurons of the olfactory receptor (Jackson, 2016).

The olfactory epithelium consists of a thin layer of tissue that has about 20 million neurons, 10 on each side of the nasal septum. Receptor neurons are specialized nerve cells that respond to aromatic compounds. The support cells (and the glands underlying the epithelium) produce special mucus and different classes of odorant-binding proteins (Hérent et al., 1995; Garibotti et al., 1997).

Differentiating the basal cells produce extensions, called axons, which grow through openings in the skull (crib pink plate) and at the same time associate in bundles, until they connect with the olfactory bulb. Recognition is believed to occur on dendritic extensions, called eyelashes, which develop on the surface of receptor cells, which forms a bulge called the olfactory knob. These greatly increase the surface over which odours may react with proteins that bind odour on the receptor membrane.

As for the differential sensitivity of receptor neurons, the latter seems to concern the presence of a single family of proteins (odour-binding or G-proteins), produced by the olfactory epithelium. Although about a thousand G-proteins are produced, only one is synthesized by a type of receptor cell (Buck & Axel, 1991).

So the identity of the odour appears to depend on the specific combination of stimuli activated by different receptor proteins on distinct receptor cells, since these G-proteins carry different regions and each of these is specific to bind a certain odour. This may clarify why the perceived aromatic character of a compound can change with its concentration.

The reaction between a G-protein olfactory receptor and an odorant induces an influx of calcium, typical of most nerve stimulation (Murrell & Hunter, 1999). The evaluation of the odour of wine is often a very difficult and discriminatory aspect. The varietal, stylistic and aging characteristics

of wines are almost exclusively aromatic, those that make us talk about a quality wine. Therefore, it is its scent and flavour that gives wine most of its appeal to the market and the consumer. In most cases, only a few descriptors are usually needed to differentiate between particular types of wine (Lawless, 1984).

The volatile odorous molecules transform into images in our brain, through a "thalamic relay". In technical terms, these molecules inhaled through the nostrils, reach the receptor neurons in the olfactory epithelium and electrical signals are transmitted to the olfactory bulb, where an "olfactory image" is formed.

This image is sent to the primary olfactory cortex where a cortical microcircuit reformulates it as addressable memory to the contents. From here, signals are sent to the orbitofrontal cortex (OFC), where a dense network of multiple bidirectional connections, has links to parts of the brain related to behavior to emotions and memory, and precisely here perfumes become images.

The olfactory world is made up of thousands of volatile molecules but it has been shown that the number of recognizable odors that contribute in some way to the aroma of all foods is about 250. Studies with large odorant blends have shown that a subject's ability to detect single odors in these blends was incredibly small.

Perception of odorous objects also has other implications that illustrate smell as a synthetic sense (Weiss et al., 2012). Some research as shown that several mixtures of about 30 or more components of equal intensity, had the same smell, despite not having a single component in common.

This very particular discovery gave rise to a concept of a smell so called "white". According to this concept, the aroma of wine is characterized by a limited number of molecules (about 30) that act as buffer, because the differences in their concentrations are not reflected in different aromatic perceptions. These molecules are the same in white or red wines and only the so-called impact molecules, or families of molecules, can break the aromatic "buffer" (Ferrazzano, 2015).

In the case of food and wine, odours may be taken into account in:
- Perfumes: these are smells that enter the nose from the outside; they can be perceived more intensely by actively smelling the air, especially in the vicinity of the odorous source;
- Aromas: these are the olfactory stimulations coming from the mouth that reach the receptors through the retronasal cavities (Cavalieri, 2009).

During the food-wine pairing, the approach is completely different if our nose can pick up the strong scent emanated from the wine. In practice it -is a way to succeed in having a complete emotional involvement, even before tasting wine and food.

As regards the aroma, it means all the odours derived from grapes and also its precursors. In addition, the aroma also includes the smells deriving from the seared, sick, wilted or hyper-ripened grapes.Fermentative bouquets include aromatic compounds derived from alcoholic and malolactic

fermentation (i.e., bacterial fermentation), while transformation ones derive from procedures such as yeast autolysis (sparkling wines) aging in oak barrels and sur lies maturation (Weiss et al., 2012).

1.3 Taste

The wine, unlike of the other beverages, wine appears as a real food, and this is certainly due to the association, but also the care, of an almost permanent agreement with food and the type of choice of diners. While other drinks may suffice to themselves, the wine evokes the table and the conviviality and in the absence of the consumption becomes suspicious or difficult to value in the social context.

Therefore it is easy to guess that taste remains the main meaning involved in tasting a wine, it tells us everything we need to understand how a specific wine can be combined with a specific dish to fully enjoy a meal (Paolini, 1990).

Tasting plays, in this regard, a leading role in our conception of wine as culture and as art. Both in professionals and in educated amateurs, the experience of tasting derives from an almost scientific analysis of the properties and character of the wine, for the what are necessary technical bases, in chemistry and enology, and the knowledge of the territories is of help.

The taste, cannot be considered in an isolated way, since it is related to all the other senses. When we taste a food before we feel its taste all the other senses are activated. The taste of wine has an important impact on our mood and on the sensations we feel through our nerve endings (Pracchia, 2017).

It is interesting to explore how wine produces sensations and therefore emotions that are generated not only by taste, but also by the place where we taste a wine. A neuroscientific study showed how to taste the same wine in three different restaurants was received with a different taste. This is because the feeling and emotion of the place activates all the other senses and together they generate different emotions.

The taste is subjective, but can be distorted with external elements. And it is exactly what happens with the sense of sight, in a restaurant light can heal the structure of a wine and so also the perception of pleasure (Russo & Marin, 2020).

We realize that taste is a very limiting sense, just think that we have only four receptors in the mouth, so to effectively understand it is made through the other senses, especially the sense of smell. As for taste, synesthesia, in the course of human evolution, needed the support of other senses, for example sight, which recreates the taste even before a certain wine is tasted.
In doing so, man has been able thanks to the sight of cataloguing wines suitable for every diet (Jackson, 2016).

This has been fundamental in the development of man because it has allowed to teach future generations the way to relate with some types of wine even before the latter is tasted. It is important

to note that taste has a strong relationship with other senses as well as sight. Itis in fact thought that taste is not determined by the areas present on our tongue and that collaborate with the taste buds, but that the taste of wine resides in our brain through the olfactory experience. We remember a certain smell of a wine, this determines its taste. After storing a wine this remains in the brain, which creates pleasure even before it is inserted into the mouth (Paolini, 1990).

Let's imagine that a friend of ours invites us to take a glass of sweet wine as a particular sparkling wine, the mere thought of drinking that wine causes us an increase in salivation, caused by the anterior pleasure of our brain, for example to the word "champagne". However, our mouthfeel is able to determine not only the taste of the product, but also the consistency and temperature. We can define it as a "tactile language" able to relate to wine also in the sphere of touch. Our language detects five fundamental tastes and we can say that each of them creates a synesthetic relationship with other objects. We think for example when we taste a sweet wine, immediately our mind lead sus to consider yellow elements, such as candy. When we drink something pink we think of the color of strawberry. We can say that the taste is closely related to the sight, smell, and shape of the food. In the development of food and wine, in fact, they no longer serve dishes containing food to eat with its natural form, but it is modified by adding a particular wine to increase its taste through shape and color (Pracchia, 2017).

The taste is detected by the nerve receptors collected in the taste buds, that are the round depressions that are mostly found on the raised sides of the papillae. Taste buds are associated with three of the four classes of papillae, that is, they are tied to the papillae fungiform, the papillae foliate and those circumvallate, while those filiform have purely a tactile function (Fig. 2) (Shepard, 2015).

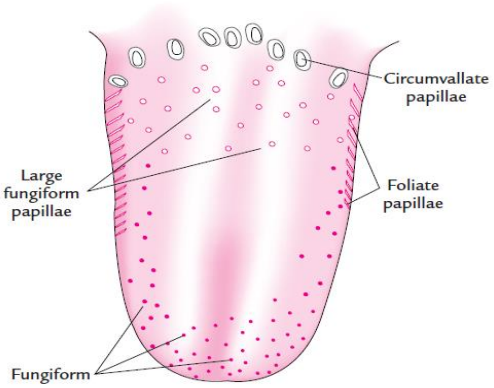


Fig. 2
Schematic drawing of the tongue indicating the location of the major types of papillae (from Jackson, 2000)

Receptor cells (gustative) remain active for a few days, and are then replaced by differentiation of adjacent neuroepithelial cells. Each receptor neuron culminates in a microvillus which has endings that possess multiple copies of different protein-related receptors. The membrane potential of the cell changes following a series of events when a tastant reacts with this type of protein, in fact the activation of the membrane causes the release of neurotransmitters from the base of the cell body (Nagai et al., 1996).

At this point the neurotransmitters, after diffusion through the synapse, cause a depolarization of the associated afferent nerve cells and the generation of a potential of action. Now each afferent nerve cell makes synapses with many receptor cells in several adjacent taste buds. The neurons that are in our mouths and that innervate our taste buds come from one of the three cranial nerves. The geniculate ganglion of the facial nerve provides nerve innervation and fungiform papillae on the anterior part of the tongue, while other nerve branches contact the taste buds which are located in the frontal region of the soft palate. The petrous ganglion of the glossopharyngeal nerve branches in the tonsils, the jaws, the foliar and circumvallate papillae and in the back parts of the palate (Shepard, 2015). Finally, the nodose ganglion of the vagus nerve innervates the taste buds of the epiglottis, larynx and upper oesophagus (Fig. 3). This type of nerve impulses pass first through the solitary nucleus of the stem of the brain, then into the cerebral cortex, where other neurons transmit signals to the hypothalamus, evoking "emotional responses" to stimuli.

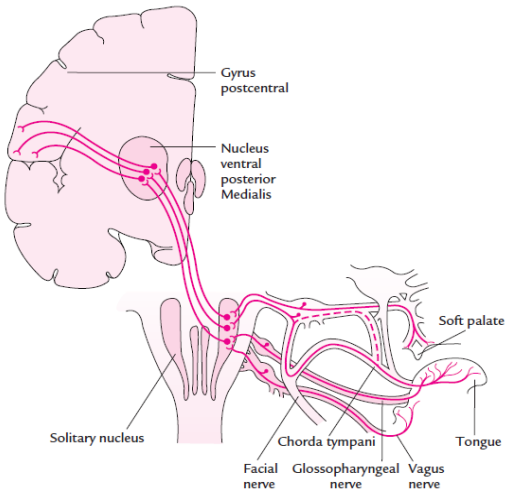


Fig 3
Diagram of the neuroanatomical pathway of taste fibers. Heavy lines show the paths mostcommonly taken. Most fibers travel from the chorda tympani to the facial nerve: other fibers travel in the vagus and glossopharyngeal nerves (from Neurological anatomy in relation to clinical medicine, third edition by Alf Brodal, copyright 1969, 1981 by Oxford University Press, Inc.).

The sense-perception of taste is directly related to the number of pores of taste on the tongue. Hypertasters, as the name suggests, are particularly sensitive to gustatory and tactile sensations, and the fungiform papillae of the latter are smaller, but have more pores than those of the hypotasters, often preferring foods with more subtle tastes. The genetic basis of taste sensitivity is now known to be controlled by a single gene. Other genetic factors are presumably involved as women tend to have more papillae and taste buds than men, as well as being more sensitive than men to bitter taste (Tepper, 2008).

Four perceptions of taste are known, but lately some researchers have proposed the expansion of the list including among the man other gustatory perception, called *umami* (glutamate response and 5 -nucleotides) (Rolls et al., 1998).

The first two sensations detected by our tongue are that of sweetness and acidity. We must say that there are no specific regions on our tongue that recognize tastes, but there are areas that are more sensitive to certain tastes: for example, sweetness and acidity (if detectable) are respectively more evident on the tip of the tongue and along the sides of the tongue and inside of

the cheeks, and the acute aspect of acuity persists much longer than perceptions of sweetness. As indicated, differences in the detection sequence can confirm specific taste sensations (Kuznicki & Turner, 1986). However, the duration of these sensations is not particularly diagnostic.

Persistence reflects more the concentration and maximum perceived intensity of the tastant than its category.

Although significant in some critical tastings, the purpose of noting sapid sensations is not as important as focusing on how they interact to generate the overall remove the spaces perceptions of balance, flavor, and body (Robichaud & Noble,1990).

There are differing opinions on whether taste and mouth-feel should be assessed with the first sip or during subsequent samplings. Another important physico-chemical factor affecting taste perception is pH. This can happen indirectly, by influencing the shape and biological activity of proteins, or directly by influencing the ionization of salts and acids. Structural modification of receptor proteins on gustatory neurons could significantly affect taste responsiveness (Shepard, 2015).
Reacting with proteins found in the mouth, tannins cause decreases in their potential bitter and astringent sensations. So the mouthfeel perception that develops when we talk about astringency is a complex of sensations such as burning and dust in the mouth, which are not localized in a specific point, but are perceptions uniformly present throughout the mouth (Cain, 1976).

Reaction with saliva proteins partially explains why the first sample is usually less bitter and astringent than subsequent samples.

The first taste more closely simulates the perception generated when wine is taken with a meal. If this is an important aspect of the tasting, it is essential that the tasting progress slowly. This permits stimulated salivary production to compensate for its dilution during tasting (Tepper,2008).
Other important perceptions are given by the nerve endings of the trigeminal nerve which are found throughout the nasal epithelium and which respond at low concentrations to a wide range of substances, while at higher concentrations they respond to all odorant molecules. These sensations contribute to the perception of flavor (Shepard, 2015).

Chapter 2
What can affect the mouth feel perception

2. How the brain process the flavour

Man knows the world and relates to it through vision. What we see has a very important role on our moods, on our way of moving within the environments and on how these last generates well-being or malaise. The way we perceives paces and objects is not obtained thanks to the senses, but they are the latter that enter into relationship with each other in order to obtain a relationship between man and what surrounds him.

While on the one hand the interest in food and its composition increases, on the other hand the mechanism by which the brain processes the taste of wine has been lost sight of. This type of approach to flavour through brain mechanisms has been called *neurogastronomy* (Shepherd, 2011).

First of all, we need to know that the flavour is not in the food, but is created by our brains from the food (Small, 2012).

Flavour is defined as a complex combination of the olfactory, gustatory and trigeminal sensations perceived during tasting (ISO5492). It is the set of substances which, induce stimuli detectable through the senses of taste and smell and this can also be aromatizing, that is given by all the substances that, added voluntarily to a food preparation or a wine , are capable of producing a stimulus detectable as taste/odour. The flavour of wine is the whole of the aromatic and odorous characteristics of wine which undoubtedly represents the most important sensorial aspect among those attributable to the varietal typicality of wines obtained from different grape varieties.

Second, the flavour is a "multi-modal sensation", since it involves all the senses of our organism (Spence, 2013). In addition, most of the flavour is due to the "retronasal" that develops when we throwaway the air we breathe to bring the volatile compounds from the mouth to the nasal cavity.

The flavour therefore has the power to create an illusion, and this makes the flavor "vulnerable" to many influences of food type. Now, to begin to better understand the bio mechanisms of wine taste, we must begin with the key role of the "retronasal".The nasofaringe is clearly open with the liquid in the mouth and closes during swallowing.

The volatile compounds responsable for the aromatic characteristics of the wine are numerous and of different nature. Many of them, the quantitatively more important ones, originate during the alcoholic fermentation and are therefore generally defined fermentation aromas (Spence, 2020b).

However, the aromatic characteristics of wines and their sensorial specificity are often strongly dependent on volatile components of other origin, sometimes less important from a

quantitative point of view but, in any case, capable of contributing decisively to the aroma of the finished product (Etiévant, 1991).

Many of these odorous substances come from grapes and are generally present in wine in very low concentrations. However, they can influence the olfactory characteristics considerably.

They are the aromatic component of wine which is most directly influenced by the grape variety used for wine making and are therefore generally definedas «varietals». Among these are some compounds of remarkable enological interest, such as terpenes, norisoprenoids, pirazines and sulphur compounds, notoriously able to influence in a determining way the aromatic characteristics of wine.

An interesting characteristic of some volatile compounds derived from grapes, in particular terpenes, norisoprenoids and sulphur compounds, is that they are largely present in the form of odorous precursors and are released during the vinification and/or ageing of the wine, resulting in increased aromatic complexity (Williams, 1993).

During ageing, due to the low pH, the fermentation esters degrade with considerable speed, so that their sensorial contribution becomes mostly negligible. As the aging progresses, therefore, the aromatic character of the wine is changed by passing to an aroma of mainly fermentative nature to a more complex one, strongly influenced by aromatic varietal components typical of the grape of origin.

Flavour is therefore a perceptive phenomenon that generates in the brain our imagination, imagination and relationship, thanks to the great sensory work combined with neurological-brain.

However, it is unconsciously expressed in many activities of our daily life. We can speak of a psychological phenomenon, which relates the subject to the object, creating personal feelings on the individual.

The flavour can be encoded as an external stimulus that activates the brain, which in turn, thanks to the past memory, gives us information. And this is where our senses come to the rescue. A famous philosopher, Friedrich Engels, said: "Our different senses can impress us thanks to their different qualities. Therefore, we must rely on our life, smell, sight, touch, taste and hearing, thus enjoying different experiences. However, these differences disappear as science and research progresses. The properties perceived through smell and taste are increasingly different, certain elements disappear, leading us to a change in our original perception. The auditory and visual perception is subject to different changes and touch and sight are complementary to each other. Finally, all the different sensual impressions can be combined together, managing to show us their different properties, thus establishing a deep relationship between them; this is the task of science" Itis easy to outline a thought aimed at the continuous change of the world, a continuous evolution that tends not to clarify the fundamental properties of knowledge of the external world.

Thus the flavour in this case when we taste a wine shows objective concepts, which tend to give concrete explanations. In fact, scientists have shown that the images that we perceive with our

eyes are reproduced in our brain in the form of memory, and this is due to the use of all the senses (Williams, 1993).

We can deduce how sensory changes lead to changes in the use of the senses. Itis easy to deduce that when we see a bottle of sparkling wine even without the use of hearing or taste we immediately perceive its sweetness. This principle is at the basis of the flavour that associates certain sensations perceived without the use of the predominant sense to define it. All these different regions show different information and demonstrate how the senses are connected to each other and how the brain is able to use these stimuli to understand certain emotions and information, creating the phenomenon of flavour (Shepherd, 2015).

Quantitative analysis of this process is currently being carried out, involving the biomechanics of wine in the mouth and the fluid dynamics of volatiles compounds in the respiratory tract, which is still at an early stage.

The so-called cephalic phase, which is the first phase, takes place completely in the brain, and consists mainly of the experience accumulated by the taster in general, and the anticipation of this wine or of a tasting in particular.

The expected taste of the wine is therefore entirely due to vision and imagination. Now, after the wine is poured into the glass, the aroma (bouquet) represents the first encounter with the olfactory sense, after which with ingestion, the wine is carefully placed in the mouth for maximum exposure to the senses (Williams, 1993).

The simultaneous activation of multiple sensory systems expands and their activation leads to what can be called a perceptive image of wine, this gives the illusion that its olfactory part comes from the mouth and is part of the taste. The latter is evaluated differently by expert tasters, for example expert tasters tend to breathe towards the lips to aerate the wine in the mouth, until expiating through the nostrils; still other sex alt the taste through movements of the tongue, to make the wine better to rest on the entire surface of the tongue, to bring it into contact with all the taste buds, and then mix the wine with saliva.

At this point, the central behavioral systems play a very important role: the average memory system the recognition; those of emotion mediate the sensitivity and the motivation systems calculate the continuation of drinking. During this time, meanwhile, the retronasal odor continues to flood the olfactory receptors with volatile substances in the mouth (Stevens, & Cain, 1993).

Only now that the prefrontal cortex decides when all the sensations reach their climax, it is completed with an automatics swallowing. At this point, in the post-swallowing phase, with the pharynx stills oaked with wine, we will have the so-called "longeur on bouche" since the volatile molecules are still carried in the cavity of the nose, contributing even more to the final evaluation of the wine. In summary, the phases of the tasting have traditionally been characterized by tasters. The growing knowledge of brain mechanisms and associated biomechanics of wine in the mouth and

birds in the respiratory tract provides a new enlarged framework for a deeper understanding of this more complex taste experience among all human foods (Jackson, 2016).

2.1 Factors influencing taste perception

In a tasting, there are several factors that can influence our ability to identify the elements of taste that make up the wine. Four main categories have been identified: psychological, physical, chemical and biological factors.

2.1.1 Physical factors

Among physical factors we should first mention temperature, even if after about a century of investigation, the role of temperature in the perception of wine taste is still unclear. The influence of wine temperature can be explained by saying that the fresh taste of white wines adds interest to the latter; fresh temperatures increase the pungent sensation and prolong the effervescence of sparkling wines and can also influence the sensation of sweetness of perceived sugars (Green & Frankmann, 1988) and the bitterness of alkaloids (Green & Frankmann, 1987), while on the other hand cool temperatures increase the perception of astringency, this is why red wines usually have a serving temperature ranging from 18 to 22 degrees C° and this is also the reason why the volatility of aromatic compounds is optimal in this temperature range by increasing the perception of the fragrance of wine. Another physical-chemical factor that can influence the perception of the taste of a wine is the pH in a direct and indirect way: it can happen in a direct way influencing the ionization of salts and acids, and indirectly influencing the shape and biological activity of proteins (Demiglio, & Pickering, 2008).

2.1.2 Chemical factors

Among the chemical factors that can influence our perception we must include sapid substances, which directly stimulate receptor neurons but not only, since they influence the perceptions of other tastants and other sensations (Voilley et al., 1991) Because sapid substances often have more than one sensory quality.

Acids, for example, can have both astringent and acidic properties, as well as tannins that can be both astringent and bitter, potassium salts that are bitter and salty at the same time, alcohol can have a sweet taste as well as showing sensations of burning and body in wine, and finally glucose can be sweet and slightly sour.

The interactions of sapid compounds are complicated by the fact that the changing nature of wine, causes a salivary flow that dilutes and changes the chemical nature of the wine itself, since the proteins of saliva (rich in proline) effectively bind tannin. Having said that, itis easy to understand why the sapidity of some cheeses can suppress the bitterness of red wines, therefore influencing the duration and intensity perceived.

As for sweetness, we can say that ethanol suppresses the astringency and acidity of some acids while on the other hand it enhances the sweetness of sugars, and has a very important impact on the volatility of aromatic compounds. In particular, it has been proven that at low concentrations (1%) fructose can influence acetaldehyde, decreasing its volatility and detection, while increasing the volatlity of ethyl acetate and ethanol (Nawar, 1971).

These effects can be caused by a change in the balance between volatility and solubility, because in mixtures, these "secondary" tastes can greatly influence the general perception of taste (Kroeze, 1982).

2.1.3 Biological factors

As for the biological factors related to our perceptions of wine taste, it has been shown that with the passage of time it is revealed a loss of sensory acuity related to age (Bartoshuk et al., 1986; Stevens & Cain, 1993) caused by the regression of the number of taste buds and sensory receptors. Acuity is defined as the ability to discern small differences in stimuli, in this case refers to tactile stimuli.The minimal individual variations of the gustatory acuity therefore explain why during a tasting some disagreements are created about the relative judgements of the wine.

This decline in sensory acuity can be measured as an increase in the detection threshold, which is the lowest concentration at which a substance can be detected. This problem may also affect the detection of sapid substances (Stevens & Cain, 1993). At the same time, a "sensory adaptation" is created due to prolonged exposure to a tastant. Also for this reason it is recommended to tasters to clean the mouth with a piece of unsalted bread, or simply with a little water between a sample and another.

2.1.4 Psychological factors

The role played by psychology in this field is fundamental; for example, color influences the perception of taste (Maga, 1974), as well as the evaluation of food (Clydesdale et al., 1992; Spirduso et al., 1995) and wine (Tromp & Van Wyk, 1977).

We must therefore understand that being the response to wine a complex cultural and multisensory stimulus, our perception of it is very influenced by everything. Various studies now show that a number of factors, starting from the color of the ambient lighting, the background music, the packaging, the weight of the bottle and the shop window where you buy, can exert a deep influence on the tasting experience.

This is because, as I cited before, Drinking Wine "involves more brain than any other human behavior" (Hoyle, 2017). Most studies suggest that these influences are learned associations (Clydesdale et al., 1992), although the results of Pangborn et al. (1963) suggest the contrary. Several aromatic compounds have been noted to possess a component of taste (Enns & Hornung, 1985).

Whether this results from stimulation of the taste buds at the back of the epiglottis, from the perception of improved sweetness (Frank & Byram, 1988), or from the integration of taste and gustatory inputs in the orbitofrontal cortex (Rolls et al., 1998). Aromatics added to a food or drink contribute more to its perceived taste than to its smel.

Cultural and family education also affects sensory perception, or at least the development of preferences. For example, the frequently mentioned affinity between regional cuisine and local wines is probably just the embodiment or the pleasure of being on holiday in an enchanting place. In this field, one of the problems understood as an "element of complexity" to the choice of wine, is that it is often combined with food, and only recently the literary and scientific interest on the enogastronomical matching is growing (Spence, 2020b).

Without a doubt the factor that complicates the food-wine matching is the existence of perceptual interactions between tastes that are present in food components, such as the release of masking, the adaptation and the suppression (Breslin & Beauchamp, 1997; Dubow & Childs, 1998; Mcburney & Pfaffmann, 1963; Wang, et al., 2019).

2.1.4.1 Neophobia

Among the psychological factors that can influence the perception of wine we can include Neophobia. The word Neophobia comes from the Greek "νέος", new, and "φόβος", fear, and literally means fear of all that is new. The term today is mainly related to nutrition and is used to define the attitude of aversion that a child assumes towards foods that are introduced into his diet/ diet.

A study by Bergamaschi, (2015), conducted on about 500 children, confirmed that there is a relationship between food neophobia and liking, in particular vegetables has been found to be the best predictor for food neophobia.

As far as wine is concerned, the range of new wines and new production styles is increasing exponentially, and so the competition increases accordingly, thus providing the habitual consumer with a wide variety of products.

Being wine a product that must satisfy many social, emotional, functional and health aspects in the life of the consumer, the production of "unknown" wines, and therefore the usual consumer is not used to drink, can become a problem for producers and wineries (Lockshin & Corsi, 2012).

2.1.4.2 WNS – Wine Neophobia Scale

Understand how consumers choose wine, eg. the influence of variety, brand, region, price and prizes has been the subject of many studies (Lockshin & Corsi, 2012; Lockshin, et al., 2006), but one factor has never been reported in detail, that is the availability/reluctance of the consumer to try new wines compared to what was familiar and traditionally available.

This type of consumer behaviour is known as Food Neophobia (FN), has been extensively studied, particularly since the development of The Food Neophobia Scale (FNS), which uses ten positive and negative phrases that are measured on a scale of 7 points, from a strong disagreement to a strong agreement, giving a maximum score of 70 points (Pliner & Hobden, 1992).

Strictly speaking, the FN can be seen as a psychological restriction that leads to consider unfamiliar flavors, foods, styles and ingredients (Backstrom, et al., 2003; Henriques et al., 2010). Food neophobes showed less acceptability and sympathy for both family and non-family food, but more aversion and avoidance for novel foods, while food neophiles had a positive and pleasant approach to new food (Arvola, et all., 1999; Henriques et al., 2010; Mustonen & Tuorila, 2010).

Research has shown that wine-related behaviour is subject to changes in the consumer's life. For example, a consumer's income and age are thought to be randomly linked to both long-term involvement and product involvement (Bruwer et al., 2011; Quester & Smart, 1998). It is interesting to note that men with a high knowledge of wine, were more inclined to try new foods and drinks than

women who reported a lower knowledge of wine and less wine consumption, (De-Magistris et al., 2015; Johnson et al., 2010).

Moreover, the perception of taste and quality of a wine by consumers can be evaluated only after the consumption of the product, therefore the purchase of a non familiar wine usually involves a certain degree of risk for wine buyers, especially for those wines with higher price ranges. The behaviour of wine consumers and the willingness to take a risk when buying a wine are influenced by complex factors initiated by the competence of consumers in the field of wines, their involvement and sensory preferences.

By The Food Neophobia Scale (FNS) was created the Wine Neophobia Scale (WNS), replacing the word 'food' with 'wine', using this tool as a tool to assess the reluctance or availability of wine consumers to buy new wines, unknown and various styles of wine.

As the intended measures of the WNS were similar to those of the FNS, the aim was to modify or adapt the FNS. A three-step process was adopted: (i) identifying elements of scale and analyzing using EFA (Exprloratory Factor Analysis) and CFA (Confirmatory Factor Analysis); (ii) validate by testing / retention of the proposed scale and (iii) apply the validated scale to 1000 consumers of Australian wine; WNS contained 8 articles, rated on a 9-point scale, giving a maximum score of 72.

Initially207 students and employees in the 19 to 60 age group were recruited to create a WNS model. These were told to compile a file that consisted of a modified FNS and the proposed 9-item WNS. Finally to test the reliability and the unidimensionality of the proposed WNS, were performed the Exploratory Factor Analisys and the Confirmatory Factor Analisys, to get to understand that EFA suggested that the file "I am very demanding about the wines I will drink" should be deleted by the WNS, modifying it to 8 elements.

After several tweaks to make the WNS scale as significant as possible, an ANOVA test has demonstrated significative results, with neophiles indicating the possibility to try new products, while neophobics tend to refer to familiar brands, always used and regularly drink the same type of wine.

A readjustment test was carried out later on about 1000 people. Once chosen the method is calculated the maximum and minimum score for each respondent to the test, all respondents who have obtained a score less than 27 were referred to as neophilic wine, and those with a score above 39 as a wine neophobic, and finally those who scored between 27 and 39 were referred to as "neither one nor the other".

Although there was an equal representation of men and women, no significant difference was identified, although previous studies have shown that men with a more in-depth knowledge of wine are more likely to taste new foods and drinks, compared to women who have stated that they have a lower knowledge of wine and make a lower consumption of wine (De-Magistris et al., 2015; Johnson & Bastian, 2007).

This research has shown that neophobia of wine, however, has increased with age. Respondent solder than 55 years have achieved a significantly higher WNS score (34.0) than their younger counterparts (32.2), showing a trend similar to that reported in some dietary studies (Fernandez-Ruiz et al., 2013; Henriques, et all., 2010).

In addition, a strong negative association between wine neophobia and education has been described: a higher percentage of neophiles with tertiary education (52.7%) than neophobes (34.2%) have been identified. Such a trend was also defined when the WNS average scores were compared between the candidate's education levels. The latter without tertiary education returned a significantly higher average WNS score (33.5) indicating that they were more neophobic than those with an education.

The fact that there is a kind of decreasing trend of food neophobia as education in creases has been documented in several studies on food.

The willingness to try new foods/wines increases with competence and knowledge, so doing wine experts will have a better chance to venture into the purchase of a new wine unknown compared to wine consumers with less exposure and involvement to wine (Hayes & Pickering, 2012).

And then there was a very strong association between neophobia of wine and income. In fact, it has been observed that those surveyed with a high income were neophilic and this could be a reflection of their ability to travel more and consequently be exposed to a wider range of wines.

Nevertheless, there is still a small number of neophobic wine interviewees with a high income, who can represent wine consumers who are rigid in their purchasing behaviour, thus relying on a reduced choice of wines, labelling wine neophobics as consumers loyal to the brand.

Although this scale has been validated as a research tool, providing useful data for the study, there is a need to deepent this study area in more detail, to determine the stability of any type of food neophobia, including that of wine. Last but not least, it can be said that the results showed a great potential of WNS , to be used as a tool for the selection of wine consumers, allowing the wine industry to design marketing strategies to improve the purchase of new unknown wines.

2.2 Consumer segmentation

In the past few years in the research and study of marketing in the world of wine and oenology, it has been possible to notice an increase in interest in what can be defined as the "psychology of wine" and how to be able to increase the range of wine consumers looking for to retain them.

Understandably, this new field of research in wine marketing has brought a growing awareness of how wide a variety of cognitive and perceptive factors influence the consumption, final consumers and therefore marketing of wine.

The perception of wine and the tasting experience itself by consumers have shown to be influenced in general by a little bit of everything: from the weight of the wine bottle, to the sound produced by its closure and the glass from which it is drunk, to the visual aspect of wine and the multisensory environment / atmosphere in which it is consumed, its price, its design, etc.

One of the problems that undoubtedly adds to the complexity of the choice of wine by the final consumer, is that often it is consumed along with food, and there is a growing literature on the art and science of flavour pairing.

One of the factors that can make food and wine pairing complicated has existed perceptive interactions between tastes present in food components such as adaptation, suppression and release of blends from masking (Breslin & Beauchamp, 1997; Wang, et al., 2019).

Hence, researchers working on disciplines such as packaging design, and on the sensory marketing of wine, have increasingly focused on researching the final consumer's response to wine, both in terms of the purchasing behavior of the latter or its perceptual response on tasting a wine.

Undoubtedly, there is a lot of psychology that influences consumer behavior and their final choice, as proposed by North American neurologist Gordon Shepherd, drinking wine "involves more of our brains than any other human behavior". However, a research field that is currently under discussion tends to focus on how the brain response changes as a result of greater experience in the wine sector (Castriota-Scanderbeg, et al., 2005).

Many researchers have also studied the impact that the wine label can have on the consumer's final choice. This branch of human psychology, too, can be crucial for developing new knowledge on how it affects consumer psychology. For example, it has been shown that using a brand such as an inverted triangle on the wine bottle label can arouse a sense of danger / fear in the consumer, so you need to help and promote a brand that needs to stand out from the rest of the bottles on the bottle. shelf (Velasco, et al., 2015).

Another research field demonstrates the correlation between the weight of the wine bottle and the price of all 275 bottles for sale in a branch of the Oxford Wine Company store in Oxford. In

doing so, two researchers Spence and Piqueras-Fiszman, (2012) found that the consumer pays an average of £ 1 more for each additional 8g of glass.

All this simply makes us understand how it could be easy with a few strategic moves to influence consumer behaviour but in any case it becomes important to also analyze the figure of the consumer.

One of the most important goals of marketing is to better understand the consumer that the wine producer has identified as a target.

Who are the regular consumers of wine, what are their needs, what are their buying habits?

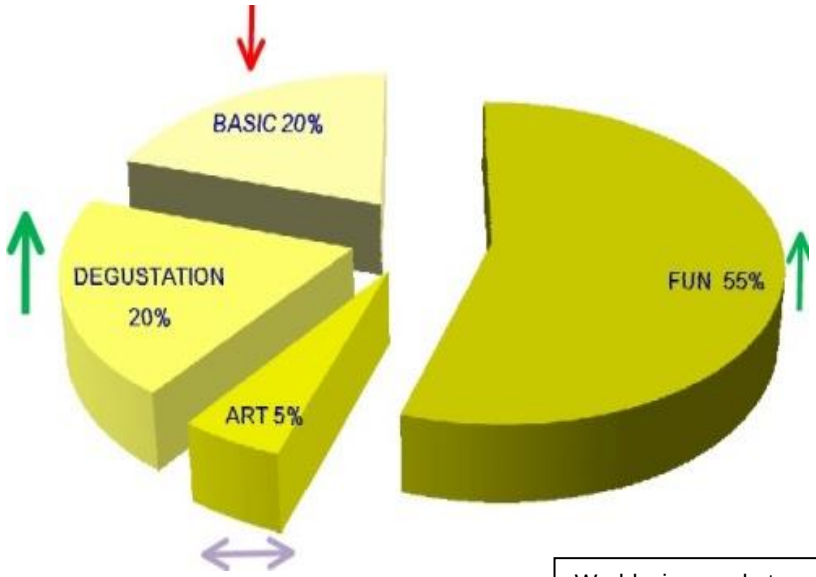
Only an adequate understanding of these elements can allow the wine producer to adopt the best distribution and communication strategy, suited to the needs of these consumers, and which will allow him a decisive competitive advantage over the competition.

We know that the segmentation of consumers on the market makes it possible to isolate groups of homogeneous consumers on the basis of their expectations, their behavior and their purchase motivations. In this sense, wine plays a different function in each identified segment and for a company the success factors are different for each segment.

Taking a cue from a 2014 study carried out on a "Solving Efeso" survey for Largo Consumo, regular wine consumers were classified according to their expectations and purchasing behavior with respect to wine and were therefore separated into different segments and the trend for each segment was then identified (https://www.largoconsumo.info/102008/DOCSolvingEfesomercatovino-1008.pdf).

The segments in which regular wine consumers have been classified are 4:

Basic, Fun, Tasting, Art.



World wine market: weight of the four segments and growth dynamics (from https://www.largoconsumo.info/102008/DOCSolvingEfesomercatovino-

For each of the 4 segments, the criteria that condition demand and structure supply are:

- Attractiveness criteria;
- Core target (relevant consumer characteristics);
- Type of marketing (sales channel);
- Production model (artisanal, industrial);
- For each segment, world demand and market trend were then Quantified;

Basic segment:

It is made up of typically male subjects over 50 years of age. For these subjects, wine still has a precise alimentary function in terms of accompaniment to meals and a supplier of liquid and calories. The wine is purchased on the basis of the price (which must be low) mainly in the large-scale retail trade or directly from the producer in certain less urbanized areas. This segment represents 20% of total consumption and is constantly decreasing.

Fun segment:

Wine has a distinguishing function and has a social function. This segment represents 55% of the total and the subjects are 25 to 35 years old. The price of the bottle is important but it is not the decisive element for the purchase. The wine is purchased in the Enoteca, at the large retailers or directly from the producer. The Fun segment is growing moderately.

Tasting segment:

It includes 20% of regular consumers. These subjects are very interested in the relationship between wine and territory of origin, they are looking for a cultural dimension, they focus on the taste and sensory characteristics of wine, they are experimenters. They are over 30 years old and buy the product via the web, directly from the producers and only partially in the wine shops. This segment is growing strongly.

Art segment:

It is made up of individuals over 40 years old and represents 5% of the total. In wine they are looking for a particularly satisfying sensorial experience and are looking for strong emotions. They are always looking for exclusive wines especially characterized by small runs and buy high-priced wines in the wine shop or on the web. This segment has no growth factors.

In summary: It is the Tasting segment that offers the highest level of growth by absorbing shares from the Art segment and, in part, from the Fun segment, which is also subject to moderate growth due to the structural and constant decline of the Basic segment.

As for the segmentation of new generations and people who approach the world of wine for the first time and who are over twenty years old, these subjects do not even touch the Basic segment but enter directly into the Fun segment and then move in the Tasting segment.

Therefore, the strongest growth dynamic is in the Tasting segment (20% world demand). The importance of the price factor is greater in the Fun segment than in the Tasting one. In the Tasting segment there is an increase in the range. The market has to divest from the Basic segment

We conclude that in the segmentation of the wine consumer it is also necessary to analyze the individual consumer and what his approach towards wine can be and that is why consumers can be distinguished according to the following Genome segments which are:

Overwhelmed (submerged) 19% by the number of options. They like to drink wine, but they don't know what to buy. They choose based on the aesthetics of the labels. They require information that is easy to understand at the point of sale. They are open to advice, but frustrated if they can't get information. If confused, they don't buy.

Image Seekers 18% Wine is a Status symbol. They are discovering wine and still have basic knowledge. They like to be the first to try a new wine. They are open to innovative packaging. They prefer Merlot. They check the wine list in the restaurants. They belong to the Millennials and are Males.

Enthusiast (enthusiastic) 10% Wine is entertainment at home with friends. They consider themselves informed about wine. They love to browse the wine sections of the shops. They live in cosmopolitan centers, in suburbs or rich countryside areas. They are influenced by the scores the wines get in the magazines and by any awards.

Every day Loyal (faithful, every day) 20% They love wine from well-known wineries. They prefer a night at home with friends rather than going out. Wine for them transforms a formal occasion into a more formal one. When they find a brand that suits them, they stay true to it. Wine is part of their daily routine.

Price Driven (guided by price) 21% They are convinced that you can buy a good wine without spending too much. The price is considered the discriminating element. They shop in different stores to find the best deals. They use coupons and know what is on offer before they go to buy it. When out for dinner, they order the house wine.

Engaged Newcomers 12% They don't know much about wine, they like to drink it. They are young, they belong to the Millennials. Wine is part of socialization. They are interested in learning more about wine.

CHAPTER 3
Main elements in pairing

3. The components of wine and food in pairing

In *The Wine and Food Pairing Process,* Harrington (2005) describes a "hierarchy of taste", based on both the art and science of pairing methodology, which can assist us in choosing when we make these types of combinations. Most popular wine tasteing texts on food-wine pairing do not provide a complete and clear view because they are full of confusing terminology, which uses different terms (or similar) for the same elements. Thus, it has been suggested to separate the broad terminology range into three categories: *main taste components, texture elements, and flavour elements*.

Several studies and a set of industry experts define these *components* as “very basic elements that correspond to basic sense perception on the tongue” (Rosengarten & Wesson, 1989), in this way, through a sensorial perspective, the components will be key elements for the combination: main perceptible components are described as sweet, salt, bitter, and sour.

Texture is the second main category, and It can be understood as the "structure" or "composition" and it concerns both wine (described as thin, velvety, medium-bodied, or viscous), +and food (described as grainy, loose, dry, oily, or rough).

The characteristic of the texture creates almost a bridge, a support between food and wine, thus acting as glue in the tasting. Just like components and flavours, textures can be used to provide similarity or contrasts in matching. Temperature also plays a fundamental role: a food served hot / warm can cause a pleasant sensation of contrast if combined with a wine served at a low temperature.

While many confuse them with the main components, the Flavours constitute a category of elements apart: they are present the “architectural elements” that add interest and complexity. They are related to our specific sensory perceptions in relation to food or wine, derived from sensations of aroma and taste. The most common flavour type categories include fruity, nutty, smoky, herbal, spicy, cheesy, earthy, and meaty (Rosengarten & Wesson, 1989).

The table represents a schematization of the main elements for wine food matching. As it can be noticed, wine has three primary sensorial components that find a correspondence with the main sensorial components of food.

Table 1. Hyerarchy of taste (Harrington 2005).

ELEMENT CATEGORIES	WINE	FOOD
Components	Dry – Sweet	Level of Sweetness
	Level of Effervescence	Level of Saltiness
	Acidity	Level of Bitterness
		Level of Acidity
Texture	Tannin	Fattiness
	Alcohol Level	Cooking Method
	Level of Oak	
Flavors	Overall body	Overall Body
	Flavor Type(s)	Flavor Type(s)
	Flavor Intensity	Flavor Intensity
	Flavor Persistence	Flavor Persistence
	Spiciness Level	Spiciness Level

Among the elements of the wine we find the level of sweetness, the level (and presence) of effervescence and the level of crispness or acidity. The wine also includes an evaluation of the level of tannin, the level of alcohol, the level (and the presence) of oak, and a general sensation of "body". The aging of oak wine can have an impact on colour, body, flavour and aroma, is included in the texture section of the wine as it is more likely to be a key factor for the body of the wine when pairing a wine with the body or power of the food product (Jackson 2016).As for the main food components in the table we can see that it includes the level of sweetness, bitterness, sapidity and acidity in a dish. As for the texture of food, considerations include the level of fat in proteins, the cooking method used and a general body (or texture) sensation of all foods included in the dish. Finally, as well as for wine, the parameters of flavour include the type, intensity and persistence of flavour, and the level of spiciness.

3.1 Different approaches to wine and food pairing

As we can understand, there is still much confusion when people talk about matching flavors, but an implicit aspect of most food-drink combinations is that the intensity of "flavour components" generally tend to be balanced.

One of the main reasons for the matching of aromas is that the combination should be perceived as better, or at least more appreciated, than one of the two aromas presented individually.

When it comes to the matching of flavors, it is now possible to consider the ways in which researchers and sensory experts have conceptualized what can help predict why a particular combination of food and drink could be a good combination.

Two types of approaches for food-wine pairing have been described (Spence & Carvalho, 2020): the first one based on intellectual/cognitive considerations and the other on the perceptual consequences of mating, where there is a certain degree of overlap between them.

As for the cognitive/intellectual approach to food-beverage pairing, we can say that a particular form of this type of approach involves the matching of those products that come from the same geographical region, just think of the matching of paella and Rioja wine in Spain, beer and sauerkraut in Germany, or much more geographically the Sancerre wine with the Crotin de Chavignol cheese, as both are products of the same French commune (Bromberger & Percival, 2007).

It is worth remembering that the very possibility of combining foods and drinks that may have originated from different parts of the world is a luxury reserved for the contemporary globalized food market.

Today, in high-level catering with drinks pairing menu and expert recommendations, cultural (which some call geographical) approaches to pairing continue to motivate particular combinations of food and drink. While some food-beverage pairings have been established because of tradition, the notion of deliberately choosing to match food and drink would seem to be a relatively recent invention.

According to Eschevins et al. (2019), match food and drink, mainly wine, is a traditional practice of French gastronomy. They write that: "wine-food pairing is part of the French Gastronomic Meal, registered since 2010 in the Intangible Cultural Heritage of UNESCO".

Buodo et al. (2019) have recently reported that conventional couples in fact generally result in greater pleasantness. Therefore, it would seem likely that both processing fluidity and simple exposure influence a taster's hedonic response to specific combinations of flavors. In other words, mating can be more welcome because it is elaborated more fluently together, but this should have no impact on the perceptive goodness of the correspondence between the stimuli themselves.

The second type of approach is based on the perceptual consequences of combining food and drink. The justification for this type of pairing lies in the perceptive experience of the taster. The perceptual results of coupling include: Similarity, contrast, harmony, emersion and modulation.

Similarity-based pairings involve the selection of two products because they share one or more perceptual properties (Eschevins et al., 2019): the food and drink may be paired because they have a similar aroma, flavour, taste, texture, or perhaps even just because they have a similar colour.

Perceptual contrast is referred to as balance, as when those in the world of fine wine speak of the well balanced contrast between sweetness and acidity. *Perceptual harmony* is defined as "how well sensations go together", and has often been shown to correlate with how much a particular food-beverage pairing is liked (Eschevins et al., 2018; Paulsen et al., 2015).

Some sommeliers (Eschevins et al., 2019) spoke about the possibility of "new characteristics" that emerge when pairing wine with food, and itis in this case that we speak of *perceptual emergence*. The latter refers to the situation where a new perceptive element (e.g., a new taste, aroma, flavor, texture or flavor) that is not present in either of the two component parts is created when combining certain food and drink products.

Table 2. Approaches to flavour pairing (adapted from Spence,2020).

PAIRING APPROACH	SPECIFIC APPROACH	NOTES
Cognitive/Intellectual	Conventional	By far the most common approach to pairing
	Complexity	Placed as a cognitive / intellectual category on the assumption that complexity cannot be directly perceived
	Quality	Placed as a cognitive / intellectual category on the assumption that quality cannot be directly perceived
	Process	E.g., pairing wine and cheese because both rely on fermentation
	Shared molecules	While the FPH* put forward as a means of prediction perceptual similarity, its failure means that FPH can only meaning fully exist as a cognitive/intellectual reason to pair elements
Perceptual	Similarity	This approach to pairing is addressed by the FPH
	Contrast	
	Harmony	
	Emergence	
	Modulation/Suppression	Tipically this approach to pairing involves the suppression of undesiderable element in the tasting experience
	Modulation/Enanchement	

*FPH = Flavour pairing hypothesis

In the context of the laboratory, it has been reported that certain combinations of smells may occasionally give rise to the perception of a different quality of smell. In this case, however, the odours of the components are no longer identifiable (Mitchell & Mcbride, 1971). Finally, *perceptual modulation* can be observed either as an improvement or as a suppression of a particular sensory property of food or drink. Once again, modulation may be a reason to pair food and drink, or not to.

It all depends on whether the element of the interested tasting experience is in itself desirable or not. The loss (or absence) of sensations often seems to be the result when pairing food and drink (e.g., wine and cheese)

For example, participants in a study of Madrigal-Galan and Heymann (2006) gave lower ratings on the perceived intensity of vegetable, mint and mushroom aromas in red wines when paired with various cheeses.

These researchers also reported that many of the cheeses attenuated the perception of oak and berry flavors also in wines. At the same time, the buttery aroma in wine was increased by the consumption of cheese.

The interest in research for food and wine pairing has grown in recent decades, but a lot of scientific research has been done which then proved to be very limited by empirical evaluations. However, these studies are found to be very important in determining the drivers of food and wine pairings in guiding professionals in the sector to improve consumer decision-making.

A very interesting research has shown how some combinations act as drivers in the hedonistic choice of a combination.

For the tasting sessions, two wines and two foods were chosen to be combined both crosswise, after having expressed a level of appreciation for the individual wines and foods. A Sauvignon Blanc and a fortified wine, Ruby Porto, were considered and the food items included dark chocolate and goat cheese. The results confirmed that the RP-dark chocolate combination, as well as the SB-goat cheese combination, had a strong impact on the perceived enjoyment of the combination.

This result indicates consumers who appreciate SB and goat cheese, as well as those who enjoy RB and dark chocolate consumed independently, will then receive more pleasure when the two are consumed together, because they have had better scores. and higher when these are matched to each other (Harrington & Seo, 2015). These results are, to some extent, in line with the idea that multimodal improvement is more obvious than uni-modal which is weakly effective (Calvert, 2001).

The relationship between food, wine pairings and consumer behavior was better understood by the results of a recent study that sought to identify the sensory attributes of appropriate pairings, then related to balance, consumer satisfaction, sensory complexity and expected price.

A total of 16 combinations of wine (Australian Shiraz) and food were then evaluated. It was noted that the appropriate pairings were positively correlated with the satisfaction, the sensorial complexity and the expected price to pay, and negatively with balance and a slight dominance of the wine was preferred, this is because the appropriate pairings increased the degree of satisfaction and of sensorial complexity on the single wine, but not on the food component. The pairing therefore produced changes in the perception of food and wine (Kustos et al., 2020).

The pairing also influenced the taste and flavor attributes of food and wine products, a confirmation of the complex nature of food and wine pairing (Bastian et al., 2010).

The consumers interviewed, however, also liked different pairs of combinations in each group, albeit in a heterogeneous way, despite the fact that there were increasing trends in satisfaction and

sensory characteristics with regard to the most appropriate combinations. This phenomenon confirms to us that it is important to evaluate food and wine combinations together with a correct consumer segmentation, and all this is perfectly aligned with the heterogeneous nature of consumers.

The pairing experience for the consumer has proved to be optimal if the wine is tasted before the food, so this could act as a driver for other research projects in order to design recipes and create courses that complement the wines, not vice versa. Measuring the complexity of food and wine could represent a valid driver of appropriate pairings and an underlying factor in explaining the consumer's preference beyond sensory attributes. Since the coupling of wine to a meal is a very complex phenomenon, instead of a single rating measurement scale, a combination of direct methods (evaluation of balance, appropriateness of pairing), and indirect methods would be appropriate and more effective. (sensory complexity and sympathy) (Kustos et al., 2020).

Conclusions

This study attempted to describe the main sensations that develop during a tasting and pairing a wine with a meal. This can greatly influence the taste of food, because it is conditioned by different chemical and sensory perceptions and also neural interactions, which each individual can perceive. In fact, each of us personally experiences his own ability, which is studied by the neuroscience of taste and flavor.

It was possible to highlight that the research in this field of food and wine pairing has focused on a variety of food and wine elements, both from a culinary and sensorial point of view.This is mainly due to the demand of the agri-food market that follows the demand of consumers who in recent decades it has become increasingly demanding.

For this reason, new scenarios have opened up in the field of research concerning food-wine pairing based on the various types of consumers to better understand how they interact with each other. It has therefore been possible to verify that the consumer area in recent decades has changed its choice of wine, passing from an economic mass purchase to a selected purchase, which was conditioned by the sensations that wine develops with food.

The condition of an evolved and wealthy society has conditioned the choice of a better quality of life mainly in the choice of natural products. This consequently conditioned the choice of the paired wine thus determining the production of wines that are no longer linked to economy but to its quality and particular territorial productions were highlighted that responded to the request of a medium-high sector of consumers who choose the wine with attention and passion, creating a gap in mass production and highlighting some market niches that are fully able to satisfy the vocation of a basket of demanding and prepared consumers who choose to purchase no longer in supermarkets but in specialized wine shops.

Along this line, this study has confirmed how chemical and sensorial perceptions become one of the determining factors for the production of wine that no longer follows the massive production but the selection of products that allow the medium-high consumer to feel protected by the origin, by the brand. , and from the name of the product that allows him to remove from him the neophobia of wine, that is the fear of discovering strange and contrasting flavors in new brands that can only be overcome through knowledge and large-scale advertising of the product that must show to have the guarantees, contents and a story that give the consumer certainty and confidence that he will not have any surprises in making that purchase.

In conclusion, this work becomes very important for those who face the production of wine because they have to analyze and study how to obtain new combinations of chemical and sensorial perceptions that each individual is able to recognize because this can affect their own taste and flavor capacity that wine can create with the combination of food and determine for the wineries the

choice of vines on which to invest for future farms in projection of the new requests that that particular wine can obtain.

Not having in-depth scientific arguments in this regard to date, the intent of this thesis was to deepen these ideas and tools, and these concepts and analyze those adequate knowledge, to identify the key elements of wine and food, as well as to facilitate greater interest and trust on the part of catering and kitchen professionals at the service of food and wine.

Only by deepening this aspect will it be possible to consequently receive an enrichment of value on the food and wine chain that could certainly project a drop in economic added value on the chains of the tourism / hotel sector, providing new knowledge and new information that can lead to the creation of new requests for wine. promoted by qualified professionals who will allow to increase the gastronomic satisfaction of the customer and those of the manufacturing companies.

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Tables

Figures