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# Gastronomic potential and pairings of new emulsions of vegetable origin



Escola Superior de Hotelaria e Turismo do Estoril



Experiencing Food:  
Designing Sustainable  
and Social Practices

2<sup>nd</sup> International Food Design  
and Food Studies Conference



AGRIO et EMULSIO

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**Research partnership between  
the Agrarian College of Santarém (ESAS)  
and  
the Estoril Higher Institute for Tourism  
and Hotel Studies (ESHTE)  
in the  
Agrio et Emulsio project - New Products  
Development**

# Objectives



**To assess the gastronomic potential and possible uses of 5 innovative emulsions prototypes**

**(which preserve expensive and seasonal raw materials and value surplus regional products)**

**processed differently, previously developed, using both sensory evaluation and the Foodpairing<sup>®</sup> tool**



CONTEXT

Pushed by the industry needs  
and also by the demand of  
consumers, **the use of surplus**  
**production**

(primary and food processing sectors)  
and

**by-products** are a **trend** and,  
objectively, play an important  
role in terms of local producers  
income;



<https://foodindustryexecutive.com/2019/04/its-only-waste-if-you-waste-it-turning-food-waste-into-brand-and-bottom-line-value/>

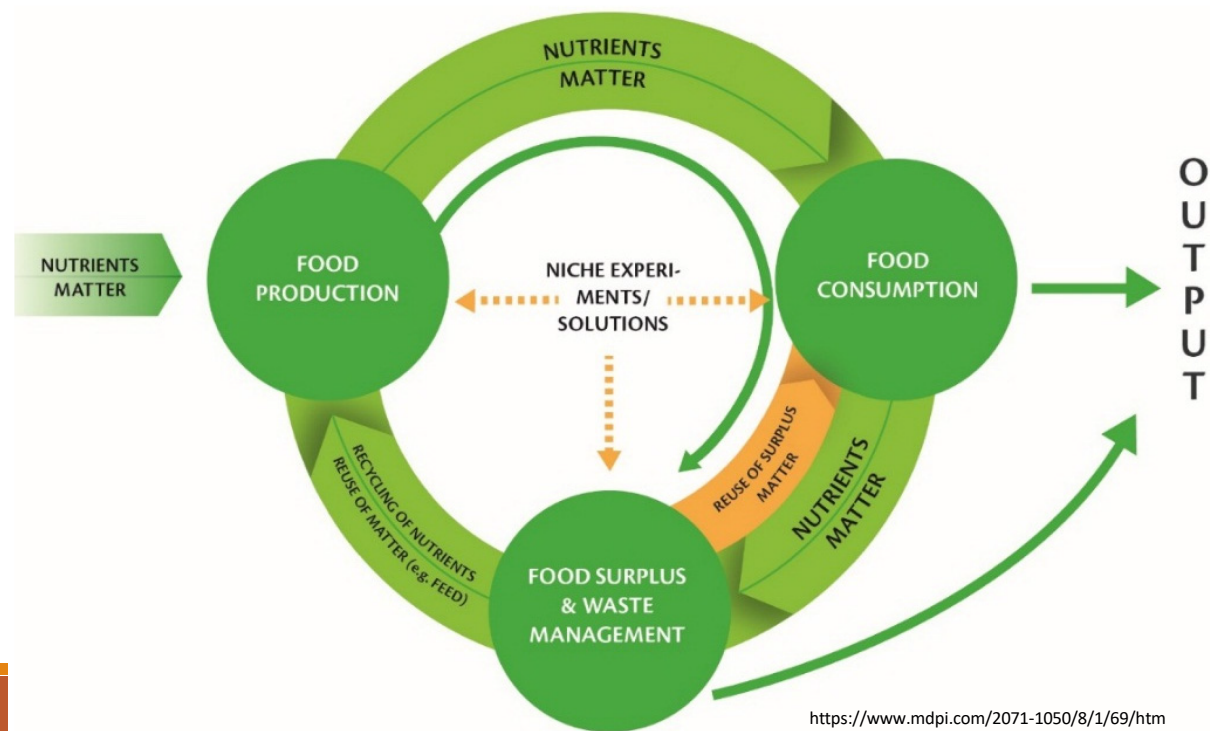
**SOURCE FOOD GROWN  
REGENERATIVELY,  
AND LOCALLY WHERE  
APPROPRIATE**



<http://www.sdg2advocacyhub.org/news/circular-economy-food>

**Local products valorization** constitutes one of the chains of the circular economy, which is targeted at making optimum use of natural resources, raw materials and products and re-using them;

These trends (challenges) provide an **opportunity for the development of new products** and the creation of **new market niches**



New possibilities may rely on providing new sensorial experiences and new applications of existent products with new formulas

**Emulsions in the form of Spreads (w/o) and Mustards (o/w)**



have, like traditional butter, **several applications:** breaded, toasted, crackers and other bases, and can be used as an **appetizer** or **accompaniment**  
Also, can be used for **preparing other foods** including cold meat, roast beef and grilled meat or fish



This versatility makes them **potential bases for new food products** both for its formula ingredients and potential gastronomic applications



Today, new lifestyles, higher incomes and consumer awareness are creating **consumer demand for a year-round supply of high-quality, diverse and innovative food products**

But, higher demand for new products is not a guarantee for their success

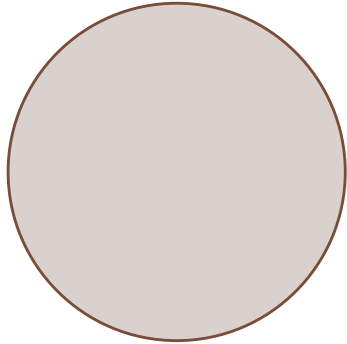
**Many factors contribute to the acceptability of new launched products both in the market and in the food service industry:**

**trends, price or brand, organoleptic attractiveness of the product; its convenience in use**

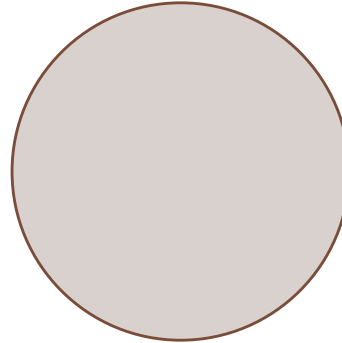


(includes technological suitability for culinary preparations for domestic consumers and also for professional in the catering/food service industry)

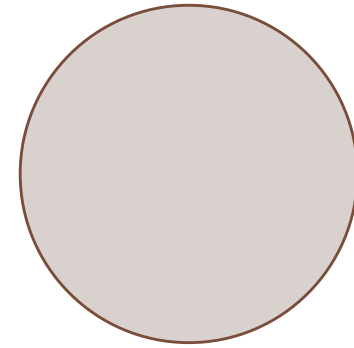
## TOOLS



**Sensory evaluation** is an important step in the food development process as it is the **potential gastronomic use assessment**



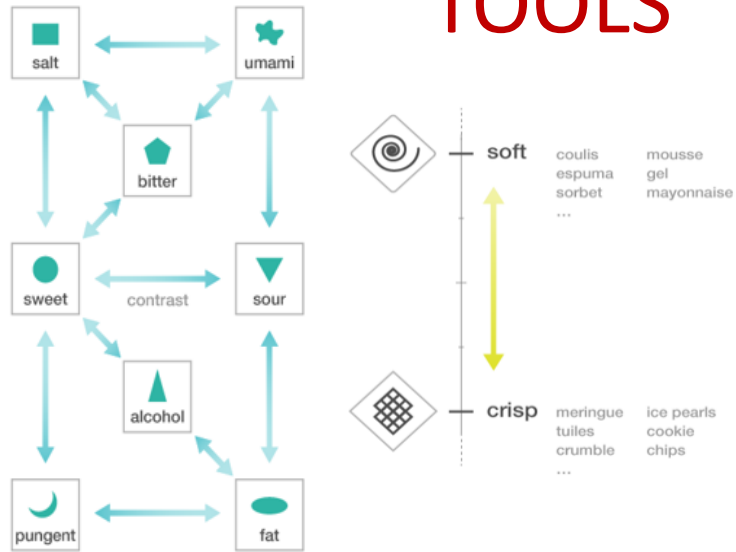
**Sensory characteristics** comprising appearance, odor, flavor and texture are included **within the important attributes** that contribute for the **perceived quality of food products**



**In a prototype food development stage the sensory acceptance assessment by food specialists may contribute to the understanding of the potential of the food being developed**

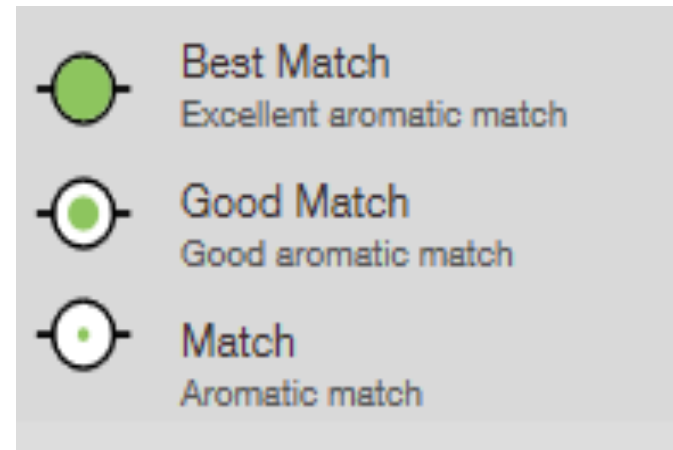


# TOOLS



The aroma profile of the culinary ingredients is the starting point of the Foodpairing® computer application

# FOODPAIRING®



The ingredients that do not have aromatic combination do not appear in the list of ingredients that can be added to the main ingredient, being impossible to add some ingredient that does not have aromatic combination

Ana Teresa Silva MSc student

## Specific objectives:

Characterize the sensory properties of 5 emulsions prototypes,  
Identify which ingredients and confections best suit the development of gastronomic applications

**Chefs and food experts**



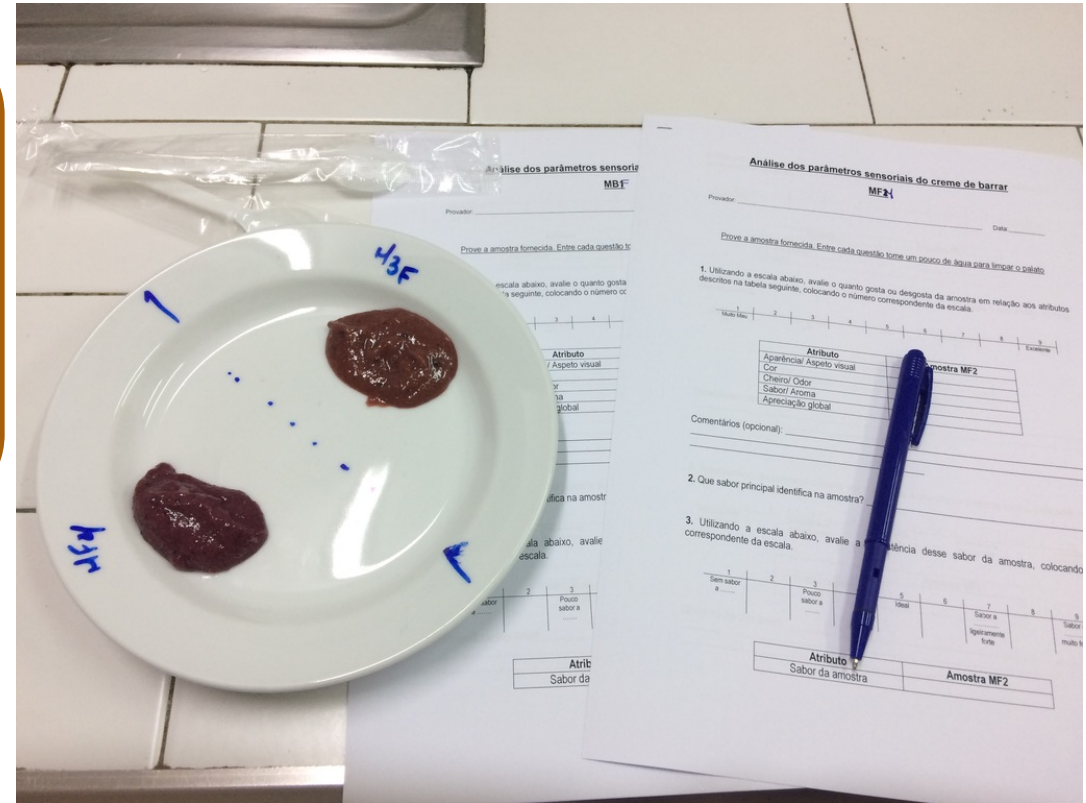
**Use Food Pairing tools to match ingredients with the emulsion for starters, main courses and desserts.**



(Development of recipes and technical sheets; their presentation in the plate and their consequent use, both in Food Service and for the final consumer)



(Consumer testing for some of the culinary applications developed)





# METHODOLOGY

# *Samples*

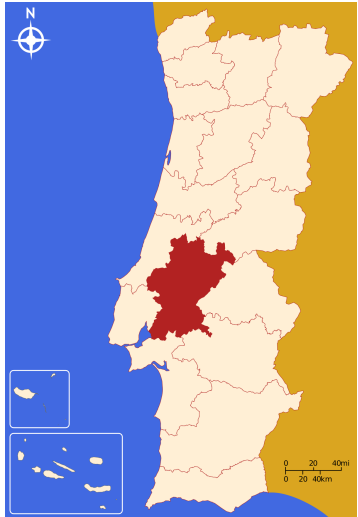


Five samples were analyzed:

**3 emulsions spread** with aqueous vegetable phase : **1 strawberry** and **2 bell pepper** (one red and one yellow) processed differently

**2 mustards** with red fruits and beet





were recently  
prototyped

are characterized for  
the addition of  
vegetables and/or fruit  
syrops, with no  
tradition of  
manufacture or  
consumption in  
Portugal



preserve expensive  
and seasonal raw  
materials and value  
surplus regional  
products

have nutritional  
quality



## These spread emulsions:

- have a vegan or lactovegetarian profile,
- can be used as substitutes for **butter** (fat phases using cocoa butter or coconut oil)



## Traditional mustards (in vinegar)

- are distinguished by **ingredients, flavors and unusual colors**
- (**beetroot, blueberry, raspberry**)





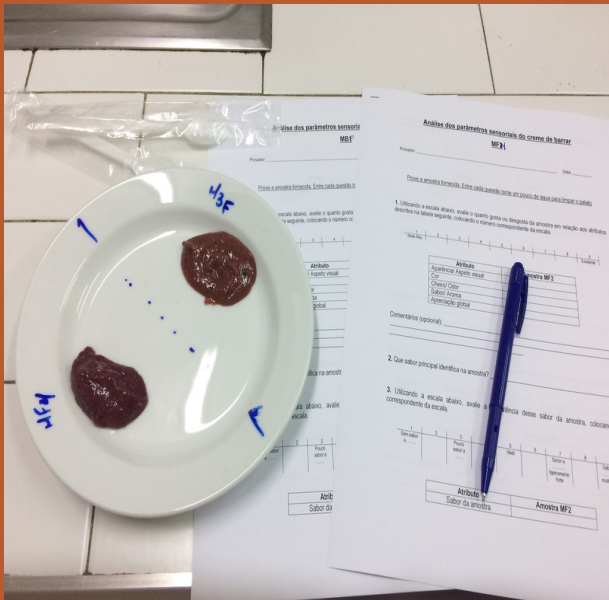
# Gastronomic potential evaluation

## Sensory evaluation

- Hedonic test
- Focus group of 9 food professionals
- Consumption potential
- Purchase intention

## Foodpairing assessment

- online Foodpairing® tool
- the main aroma of each sample was used
- the other ingredient (s) that composed the emulsions were selected
- the context of use of a possible delicacy: for **Food Service** or for **domestic consumption**
  - the order to appear in a possible menu
  - In the continuation one or more ingredients were selected from the presented results, calculated by the application algorithm, as being "best aromatic combination"



# Sensory evaluation

**The general attributes** were considered from the descriptors previously generated by the researchers.

The individual parameters selected were as follows:

- **visual appearance and color** (on appearance); **odor, taste, aroma, taste persistence**
- **texture, ointment and acidity** (for mustard fruity creams)

used a 9-point scale with defined terms situated between "poor" and "excellent"

used 9-point scale with defined terms situated between "extremely unpleasant" and "extremely pleasant".


An **overall** assessment item (using a 9-point scale with terms defined between "poor" and "excellent") was also presented

# Sensory evaluation

**Consumption potential**

**Purchase intention**

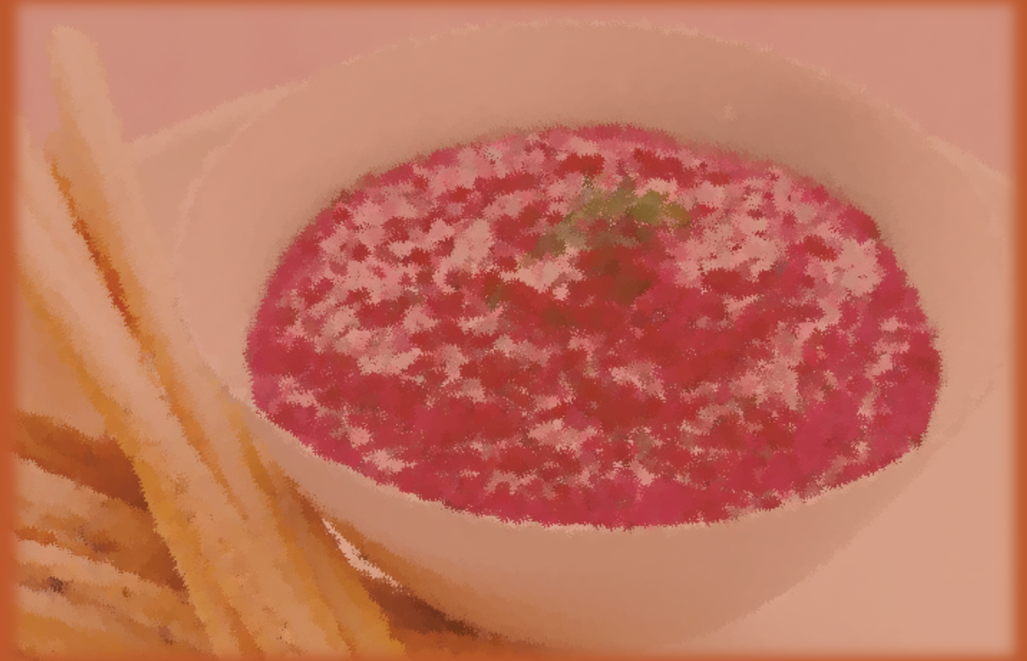
**the culinary potential of the samples *per se*  
and as a basis for other preparations**



a 5-point scale was used with definite terms between "definitely no" and "certainly yes"

a 5-point scale with definite terms placed between "definitely without application" and "certainly with application"

It was also asked to **identify the emulsion fat** in the case of the first 3 samples and **comments on the potential culinary applications of all creams**



RESULTS

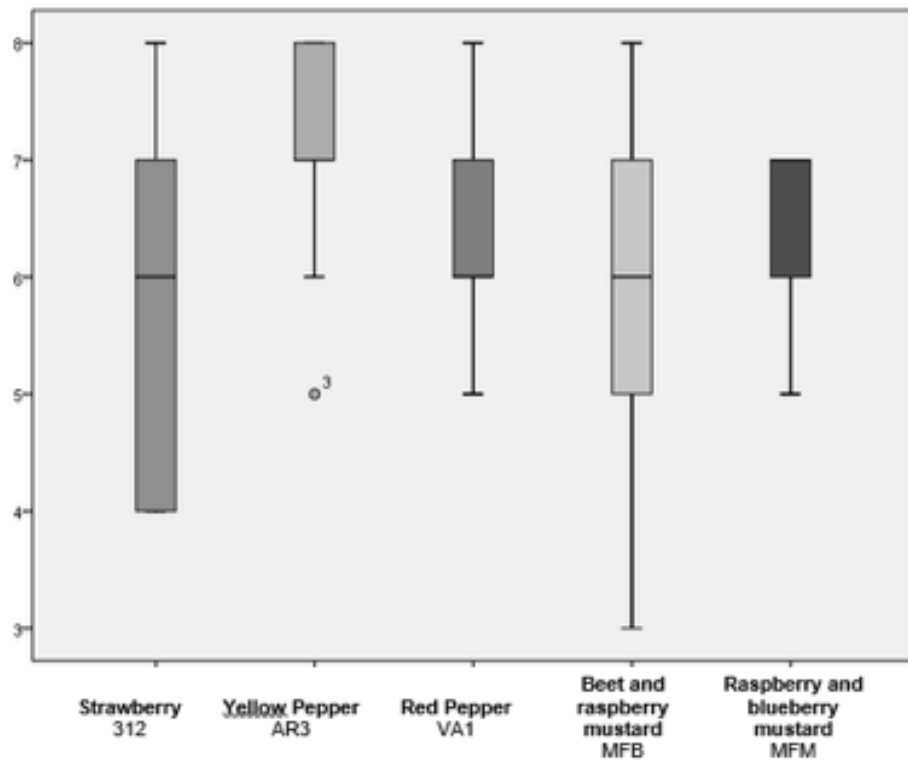
## Results of the hedonic evaluation

- the panel of experts appreciated positively all the creams, except for the strawberry emulsion
- These tasters preferred the yellow bell pepper spread on all aspects except for the aroma; in this parameter the preferred one was the red bell pepper cream



	Strawberry 312	Yellow Pepper AR3	Red Pepper VA1	Beet and raspberry mustard MFB	Raspberry and blueberry mustard MFM
Appearance	4,78±2,11	7,67±1,12	6,44±1,51	5,67±1,50	6,78±1,30
Color	4,33±2,00	7,78±0,83	7,00±1,41	5,33±1,58	6,67±1,50
Aroma	6,11±1,96	6,22±0,97	6,67±1,22	6,22±1,39	6,22±1,99
Flavor	6,22±1,79	6,78±1,20	6,44±1,01	5,33±1,73	6,33±1,41
Overall quality	5,67±1,5	7,00±1,00	6,22±0,97	5,78±1,64	6,44±0,88

Mean values



Box-plot of the values of the hedonic sensorial parameters of the samples analyzed by panel of experts

## Results of the hedonic sensorial evaluation

There was **less** dispersion in the views of the **overall appreciation** for the bell **pepper and raspberry mustard cream** samples and a greater dispersion for the strawberry emulsion and the beetroot mustard cream

**Fats used in the emulsions were always identified (data not shown) (cocoa butter or coconut oil) and apparently led to satisfactory aroma and flavor acceptance levels (>6).**

In relation to the **possible gastronomic use of the emulsions** (data not shown), none was pointed out as having great potential on its own, to be used alone, **but always as an ingredient of some composition**

**Strawberry cream**

has been suggested only for desserts or sweet compositions;

**the yellow bell pepper cream**

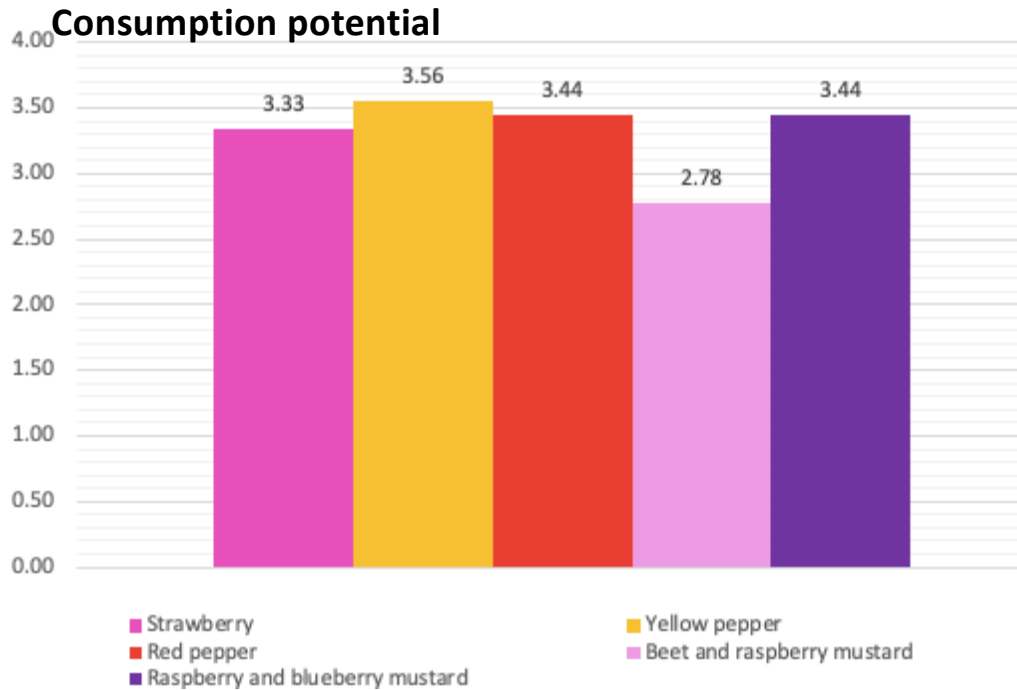
was singled out as a flavoring potential for a white rice or a cooked dough, to finish off risotto or curry such as roasted meat seasoning or sauces ingredient;

**the red bell pepper cream**

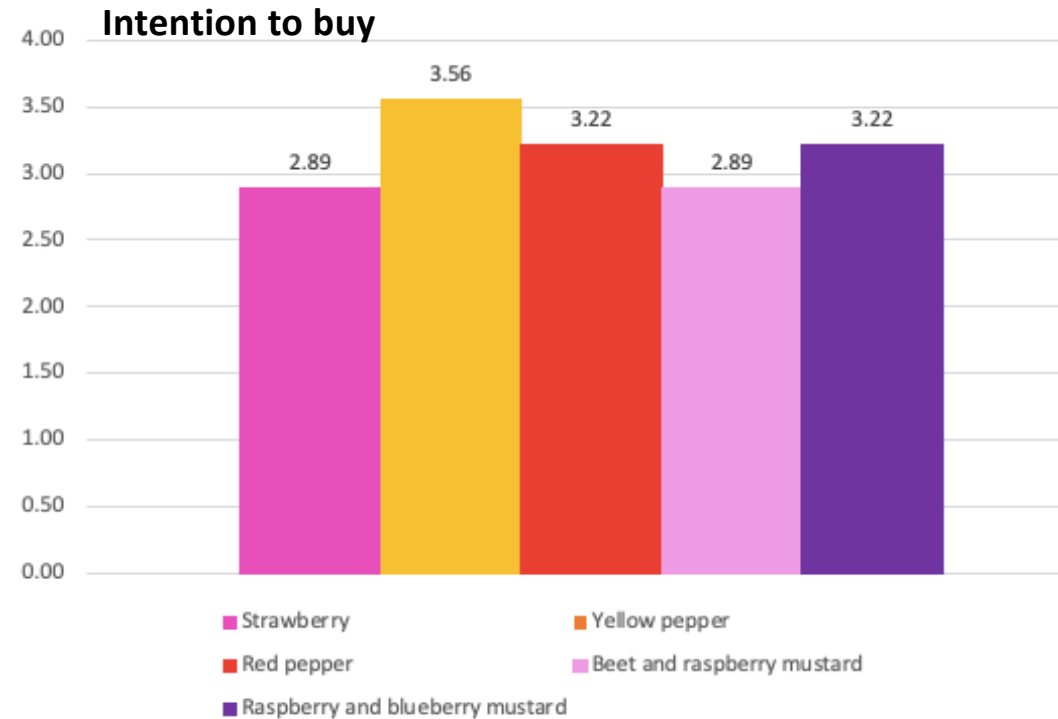
was the least appreciated in terms of culinary potential because it was compared to the mass of bell pepper and its consequent use;

**beetroot and raspberry and raspberry and blueberry mustard creams**

to be used as ingredients for vinaigrettes or for spreading on roasted meats, the latter being the second most appreciated in this sensory evaluation



Consumption potential of the samples analyzed by panel of specialists using a 5-point scale with definite terms placed between "definitely without application" and "certainly with application"



Purchase intention of the samples analyzed by panel of experts using a 5-point scale with definite terms between "definitely no" and "certainly yes"

- **on average, the yellow bell pepper spread was the sample that showed the best results**
- The red bell pepper emulsion and the Raspberry and blackberry Mustard showed intermediate results
- followed by the strawberry,
- **the worst result: beetroot mustard cream**

**However, all the samples revealed, on average, a positive consumption and intention to buy potential**



Meal course	Ingredientes point out in the Food Pairing tool
Sauce	egg yolk; olive oil, virgin; red wine vinegar; mustard
Couvert	cream cheese; cheddar sharp shiso; crab meat; pepper caiena; ciabatta; french fries
Vegetarian main course	Pasta; walnut; basil
Fish main course	Turbot; sake; soy miso; egg yolk; eggplant; cauliflower; onion; olive oil, virgin; blueberry vinegar; cilantro; raisin; garlic
Meat main course	Beef; olive oil, virgin; cognac
Garnish	Rice; pasta

Example of the combinations given by the Foodpairing® tool regarding the yellow pepper spread

## *Foodpairing possibilities*

There were **33 combinations of ingredients** with the Foodpairing® tool for the 5 prototypes considering a possible meal course

Given the extension of the results, a single example is provided for the combination of ingredients suggested for the **yellow bell pepper spread**



# CONCLUSIONS

Prototypes



New products with  
long shelf life

are alternatives for  
preserving expensive  
and seasonal raw  
materials and valuing  
surplus and by-products



**have potential multiple  
food applications  
(pairings; recipes;  
gastronomic uses)**



- The sensory results obtained in this study may be seen as an **important contribution to the future commercialization of the products**, since it gives us a perspective of the potential consumer acceptance
- In our opinion, the study also benefit from using individuals experienced in tasting food, **as they more easily were able to sensory characterize the new products and the possible culinary applications**

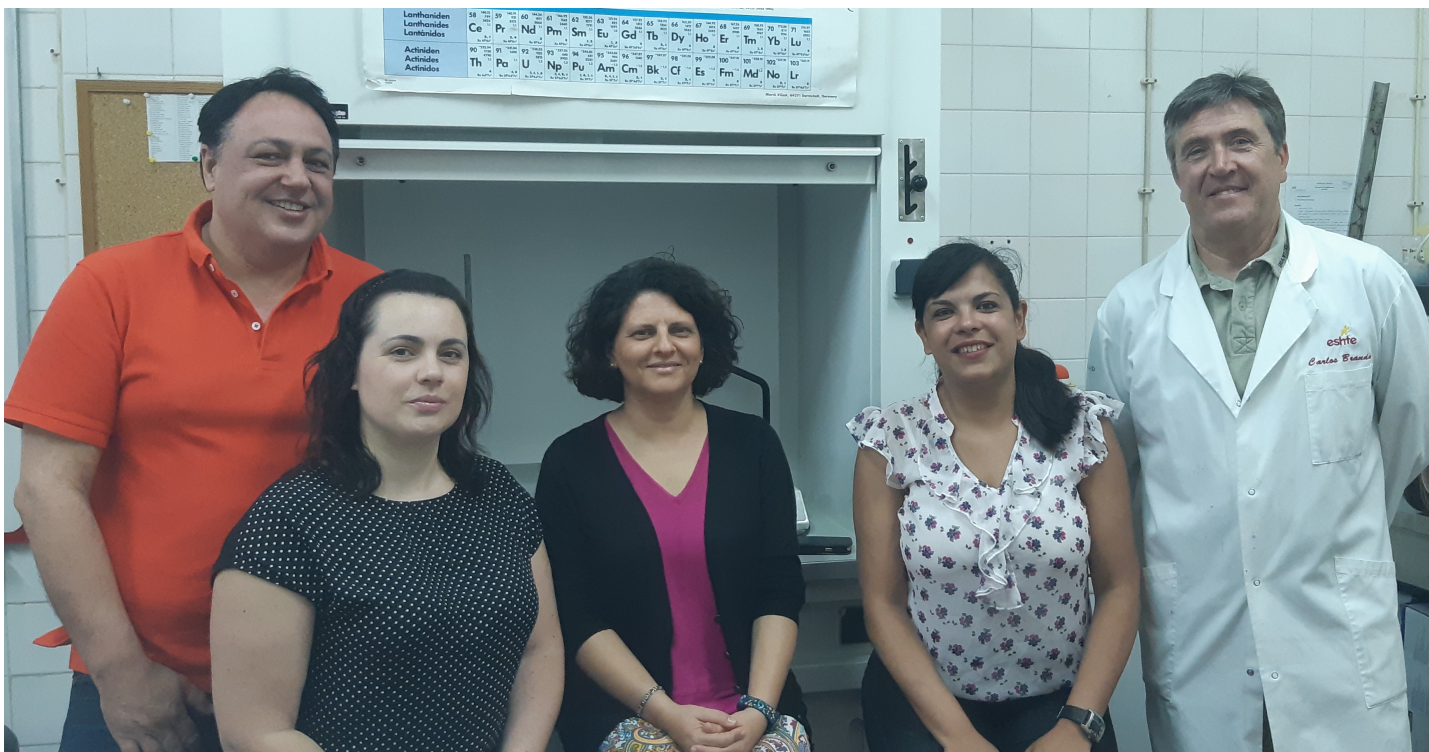
- The opinion of the chefs was quite important and useful, but not always coincident with the ingredients proposed by the application of Foodpairing®
- We are aware that the matching of ingredients in recipes **depends on a myriad of ingredient characteristics in addition to their flavor profile**
- Flavor is not necessarily the main role of ingredients, recipes also rely on ingredients to provide the final **textures** and the overall structure of a given dish (Ahn et al., 2011<sup>1</sup>):

Shared flavor compounds represent one of several contributions to add value, while shared compounds clearly play a significant role in some cuisines, other contributions may play a more dominant role in other cuisine;

(Western cuisines, for example, show a tendency to use pairs of ingredients that share many flavor compounds, supporting the so-called food pairing hypothesis)

<sup>1</sup>Ahn Y. et al., 2011. Flavour pairing and network principles of food pairing. *Scientific Reports*, 1, 1-7

- This tool together with the sensory results can be associated **with the work of a chef (or other food producer)** who demonstrates his experience and ability to generate recipes, techniques and confections, **knowing in advance which ingredients will have higher potential of combination**
- can be oriented towards the specific food products - emulsions and spreads tested
- Further studies will be carried on for the production of several recipes allied to consumer studies



Thank you

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