SUSTAINABLE PAIN PERDU

Advanced Molecular Gastronomy TFCS9025

Laura Munar Acosta

D22126826

Table of contents

1. Introduction

Food waste is defined as *"any food, and inedible parts of food, removed from (lost to or diverted from) the food supply chain to be recovered or disposed (including composted, crops ploughed in/not harvested,*

anaerobic digestion, bio-energy production, co-generation, incineration, disposal to sewer, landfill or discarded to sea).” (Girotto, et al., 2015). Essentially, any food that is produced for human consumption and leaves the food supply chain is food waste.

More importantly, food waste is a global problematic with environmental, social, and economic impact. Food waste contributes to Green House Gas emissions, soil depletion, disruption of biogenic cycles, among others (Girotto, et al., 2015) (EPA, 2022). Social impacts of food waste are related to the ethical dimension of the global food security. Moreover, economic impacts are due to the costs related to food wastage and their effects on farmers and consumer incomes (Girotto, et al., 2015).

The Environmental Protection Agency (EPA) estimates that Ireland generated 770,300 tonnes of food waste in 2020 (EPA, 2022). Nevertheless, the Irish Government has committed to reduce food waste by 50% by 2030, as part of the UN Sustainable Development Goals (Government of Ireland, 2023). The biggest producers of food waste were the households (31% in 2020), which represents a deep-rooted in the Irish culture problem (EPA, 2022). In fact, food waste costs the average Irish household about €60 per month or €700 per year (EPA, 2022).

According to an EPA survey in 2020, Bread is Ireland’s most wasted food with 41% of people reporting they throw away it (EPA, 2020). Aldi Ireland research in 2022 corroborated EPA’s survey with bread being the most discarded item (62%), followed by vegetables (55%), fruits (52%) and dairy (31%) (Hoare, 2022). The research also found that food being past its use by date is the most common reason it is thrown out (48%), followed by people not getting around to using it (43%) (Hoare, 2022).

On the other hand, cooking with molecular compounds can be part of the solution on the food waste problem. This type of cooking is rising its popularity and it is called “Note-by-Note” cooking. The advantages of this novel technique are energy efficiency and environmental sustainability (This, 2016). Since the cooking implies only using the compounds (either pure compounds or mixture) to prepare the dishes (This, 2016) (Burke, et al., 2021).

This report sets a precedent on the potential impact Note-by-Note can have on the food waste problematic. A “*Sustainable Pain perdu”* dish was developed with the use of chemical compounds, taking as an inspiration that bread, fruits, and milk were in the top 5 of most wasted food products in Ireland. The “*pain perdu*” or also known as French toast is a recipe that became popular in France in medieval times when food was sparse (Business Post, 2023). It is an ancient solution for food waste since it gives

a second chance to stale bread. The “*Sustainable Pain perdu”* formulation was done to emulate the bread, the milk, and the fruits (orange) that are part of the recipe. Giving an example to the Irish households for alternatives with their food before it becomes food waste and to the scientific community of the great value of the Note-by-Note cooking techniques.

2. Aim and Objectives

Aim:

The aim of this report is to present the development process and outcome of an entire recipe made purely with compounds and inspired with the theme “food waste”.

Objectives:

- Outline the preliminary research for developing the recipe.
- Present the iterative formulation process.
- Summarize the raw materials and methodologies for the dish.
- Analyse and discuss the results.
- Comment on the further development steps on the process.

3. Materials and Methods

The preparation of the “*Sustainable pain perdu”* recipe was divided in four components: (1) Sponge bread, (2) Milk syrup, (3) Orange sorbet, and (4) Orange

tuille. Further information on the exact ingredients used can be found in the Appendix 8.1.

3.1. Sponge bread

Accordingly, *Table 1* presents the correlation used to do an accurate skim milk replacement. Finally, the ingredients for the recipe are shown in *Table 2*, and the procedure in (See *Figure 3* for reference).

Table 1. Skim milk replacement percentages.

SKIMMED MILK REPLACEMENT	**PERCENTAGE (%)**
Casein	33%
Whey	8%
Lactose	59%
TOTAL	**100%**

Table 2. Sponge bread raw materials' list.

SPONGE BREAD	**PERCENTAGE (%)**	**QUANTITY**	**UM**
Water	23,7%	237	**g**
Casein	2,0%	20	**g**
Whey	0,5%	5	**g**
Lactose	3,5%	35	**g**
Olive oil	18,0%	180	**g**
Albumin	4,0%	40	**g**
Soybean lecithin	0,1%	1	**g**
Castor sugar	31,0%	310	**g**
Corn starch	17,0%	170	**g**
Salt	0,1%	1	**g**
Vanillin	0,1%	1	**g**
msk Baked bread flavour	-	5 drops	
msk marshmallow flavour	-	5 drops	
TOTAL	100,0%	**1000**	g

Table 3. Sponge bread methodology.

SPONGE BREAD			
STEP	**DESCRIPTION**	**EQUIPMENT**	**NOTES**
1	Hydrate and dissolve soybean lecithin with a quarter of the water		
2	Use half of the water and whisk it vigorously with the albumin, until stiff peaks are formed		
3	Use the final quarter of the water to incorporate the corn-starch, casein, whey, and lactose. Combine the previous hydrated soybean lecithin.		
4	Whisk the oil and the sugar until the sugar is completely dissolved		
5	Mix carefully the three previous batters and add the Vanillin and the flavourings		
6	Transfer the final batter to a pan and bake it	Electrolux skyline oven. (See Figure 1)	30 min, 170°C 1/2 steam

Figure 1. Electrolux skyline oven

3.2. Milk syrup

The milk syrup was formulated using the *Table 1* as milk replacement. Malic acid and orange flavouring was used to imitate orange flavour. The ingredient quantities are stated in *Table 4* and the methodology in *Table 5*.

Table 4. Milk syrup raw materials' list.

MILK SYRUP	PERCENTAGE (%)	QUANTITY	UM
Water	72,00%	576	g
Casein	3,00%	24	g
Whey	1,00%	8	g
Lactose	5,00%	40	g
Sucrose	15,00%	120	g
Lactic acid	4,00%	32	g

Orange flavour		drops to taste	
TOTAL	**100,00%**	**800**	**g**

Table 5. Sponge bread methodology.

MILK SYRUP			
STEP	**DESCRIPTION**	**EQUIPMENT**	**NOTES**
1	In a pan, boil the water, sucrose, whey, casein, lactose, and citric acid	Pan	10 min or until the sucrose is completely dissolved
2	Let it cool and add the orange flavour.		
3	Reserve for further preparations		

3.3. Orange sorbet

Table 6 presents the ingredients and quantities of the recipe and *Table 7* the methodology for the orange sorbet.

Table 6. Orange sorbet raw materials' list.

ORANGE SORBET	**PERCENTAGE (%)**	**QUANTITY**	**UM**
Water	75,5%	377	**g**
Xanthan gum	0,4%	2	**g**
Fructose	7,5%	38	**g**
Malic acid	1,5%	8	**g**
Glucose syrup	15,1%	75	**g**
Orange flavour		drops to taste	
Orange colouring		drops to colour acceptance	
TOTAL	100,0%	**500**	**g**

Table 7. Orange sorbet methodology.

ORANGE SORBET			
STEP	**DESCRIPTION**	**EQUIPMENT**	**NOTES**
1	Mix all the ingredients together with a whisker		10 min or until complete homogeneity
2	Reserve in the freezer	Freezer/Blast chiller (Figure 2)	Minimum 2h before serving

Figure 2. Reference image of the Blast Chiller Equipment (*Sagi Blast Chiller)*

3.4. Orange tuile

The orange tuile is a reference of the orange peel in the dish's concept. Table 8 describes the ingredients used and Table 9 the methodology to prepare it.

Table 8. Orange tuile raw materials' list.

ORANGE TUILE	**PERCENTAGE (%)**	**QUANTITY**	**UM**
Water	90,00%	18	**g**
Corn starch	10,00%	2	**g**
Orange flavour		drops to taste	
Orange colouring		drops to colour achieved	
TOTAL	100,00%	**20**	g

Table 9. Orange tuile methodology.

ORANGE TUILE			
STEP	**DESCRIPTION**	**EQUIPMENT**	**NOTES**
1	Combine the ingredients	Bowl, whisker	
2	In a pan with hot olive oil, fry 5g of the batter	Pan	Pour it carefully and allow it to fully cook before flipping the side
3	Take away from the oil, drain the excess with towel paper and reserve		

4. Results

The sponge bread methodology is represented in Figure 3.

1. Skim milk replacement

2. Eggs white replacement (Albumin and water)

3. Baking process

4. Final result close up

Figure 3. Graphical representation of the sponge bread process.

Additionally, individual results from 2 elements of the dish can be found in Figure 4 and . And the final plate presentation is shown in Figure 6.

Figure 4. Orange tuille result.

Figure 5. Final sponge cake.

Figure 6. Sustainable pain perdu: Note-by-note.

5. Discussion

To create a sponge bread made only with compound ingredients, it is imperative to consider which are the key elements for replacing. In this case the key elements that were going to be replaced were: flour, eggs, and milk. The texture and consistency of any sponge bread is critically influenced by them. As for the flour replacement which consists mainly of protein (10-12%) and starch (70-75%), corn starch was used (Lin, et al., 2019). Moreover, the egg replacement was divided according to the role in the sponge bread: (1) Air in the baked product (whites' role) and (2) emulsifier between the water and oil phases (yolk role). Hence, albumin white powder was used to fulfil the first aspect and soybean lecithin the second. As for the milk replacement, it was found that the composition of skim milk powder is 0.5% fat, 35.5% protein, 51% lactose, 8.5% ash and 5% moisture (Patel & Chen, 2005). Hence, an approximation of this components was used and is presented in Table 1.

The key steps for the sponge bread preparation are shown in Figure 3. The methodology used was critical on the development of the dish. In this case, the air incorporation in the albumin played the most important role since without it the result would be a flat and dense cake and would make difficult to soak the bread on the milk syrup. Furthermore, the baking process needs to be done at low temperatures because it allows the bread to rise properly. For higher temperatures the cake can have darker colours on the crust and lack of volume, let alone to under-baking batter on the inside.

On the other hand, the orange sorbet formulation used Xanthan gum as a thickening agent, fructose and glucose syrup as sweeteners, malic acid for the sourness of the fruit and orange flavouring and colouring for appearance and taste. These ingredients were used in order to give a familiar taste to the sorbet, since sugar in fruits is mainly fructose and glucose.

Figure 6 presents the Sustainable pain perdu dish. The main objective as for the "food waste" theme was being able to show how the traditional French toast can also be prepared with molecular ingredients or compounds. There was no need to use flour, eggs, milk, or oranges in this preparation. Irish households can take this product as an inspiration on how many things they can do with more sustainable efforts at their homes.

To do that, the representation of how the plate is displayed is important to the goal of the dish. Since bread is the most wasted food in Ireland, it is at the centre of the plate. To create a spotlight on the issue, angel hairs made from caramel were placed on top of the bread. It gives the bread a sense of a cage or prison, which is where the Irish households can be with their food waste habits. Ireland's inhabitants are in an infinity loop where they buy food and it ends in the trash, this loop is keeping them captive from other realities like from developing countries. For example, over 100 million people in Africa is considered as malnourished (Save the Children, 2023). More food waste represents more money wasted, more inequality in the world, and less resources overall.

In contrast, the three dots leading to the orange sorbet represent the path Europeans need to take to break the cage they are in. At the end of this path is the orange sorbet (representing the orange pulp) with some of the orange tuille (representing the orange peel). The colour orange is normally associated with passion and positivity, it can represent fire, fearlessness, and freedom (Robinson, 2017). All these emotions are needed for a more sustainable world. So, there is not only one side of the story in this dish. Sustainable pain perdu is the portrayal of how we are right now in cages, wasting over €700 per year due to food waste (EPA, 2022). However, with enough passion and positivity people can reach their freedom state by giving another way to prepare products like bread, milk, and fruits before they spoil.

6. Conclusions

Sustainable pain perdu was successfully created using only molecular compounds and ingredients. The plate was created to create awareness about the food waste Irish households are generating every year. The final methodology and ingredients were achieved through four iteration weeks.

Note-by-note illustrate a futuristic and novel way of cooking. Which gives an example on the specific amount and type of ingredients that are needed to create a full course meal. When trying to cook with the wanted compounds from a raw material, sustainable recipes can be created, and no waste is generated. Moreover, further developments should focus on how this cooking technique can help people with specific diet needs.

7. References

Burke, R., Kelly, A., Lavelle, C. & This, H., 2021. *Handbook of Molecular Gastronomy: Scientific Foundations, Educational practices and Culinary Applications.* 1 ed. s.l.:CRC Press.

Business Post, 2023. *The History of French Toast. Food&Wine.* [Online]
Available at: https://www.businesspost.ie/food-and-wine/#:~:text=In%20France%2C%20French%20toast%20is,before%20that%20had%20gone%20stale.
[Accessed 01 05 2023].

Charley, H., 1950. Effects of baking pan material on heat penetration during baking and on quality of cakes made with fat. *Food Res,* pp. 155-168.

EPA, 2020. *Unwrapping Ireland's food waste: Bread is Ireland's most wasted food, with 41% of people reporting they throw away bread.* [Online]
Available at: https://www.epa.ie/news-releases/news-releases-2020/unwrapping-irelands-food-waste-bread-is-irelands-most-wasted-food-with-41-of-people-reporting-they-throw-away-bread-.php
[Accessed 01 05 2023].

EPA, 2022. *Food Waste Statistics for Ireland.* [Online]
Available at:
https://www.epa.ie/our-services/monitoring--assessment/waste/national-waste-statistics/food/#:~:text=Food%20waste%20is%20a%20global,10%25%20of%20greenhouse%20gas%20emissions.
[Accessed 01 05 2023].

Girotto, F., Alibardi, L. & Cossu, R., 2015. Food waste generation and industrial uses: A review. *Waste management,* Volume 45, pp. 32-41.

Government of Ireland, 2023. *New National Food Waste Prevention Roadmap can help reduce food waste by 50% by 2030.* [Online]
Available at: https://www.gov.ie/en/press-release/8cab2-new-national-food-waste-prevention-roadmap-can-help-reduce-food-waste-by-50-by-2030/
[Accessed 01 05 2023].

Hoare, P., 2022. *Food waste: What are the most common items we dump in our bins?.* [Online]
Available at: https://www.irishexaminer.com/news/arid-40992530.html
[Accessed 01 05 2023].

Lin, J., Gu, Y. & Bian, K., 2019. Bulk and surface chemical composition of Wheat Flour particles of different sizes. *Hindawi Journal of Chemistry.*

Patel, K. & Chen, X. D., 2005. The Temperature Uniformity During Air Drying of a Colloidal Liquid Droplet. *Drying Technology,* Volume 23, pp. 2337-2367.

Robinson, J., 2017. *COLOUR SEMIOTICS AND WHAT THEY MEAN IN OTHER CULTURES.* [Online]

Available at: https://buzzwordcreative.co.uk/colour-semiotics-and-what-they-mean-in-other-cultures/#:~:text=In%20Japanese%20and%20Chinese%20cultures,to%20be%20lucky%20and%20sacred.
[Accessed 05 05 2023].

Save the Children, 2023. *The Devastating Effects of Child Starvation & Malnutrition in Africa and the Middle East.* [Online]
Available at: https://www.savethechildren.org/us/what-we-do/emergency-response/helping-starving-african-children
[Accessed 05 05 2023].

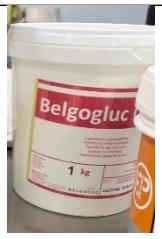
This, H., 2016. *Note by note Cooking: The future of food.* Paris: Columbia University Press.

8. Appendices

8.1. Ingredient list

Table 10. Ingredients list

INGREDIENT	REFERENCE PHOTO
MSK Orange Oil Drop 30ml	
MSK Marshmallow Flavour 30ml	
MSK Baked Bread Flavour 30ml	

SOSA Orange POWDERED	
MSK Malic Acid	
BP Micellar Casein	
Belgogluc Glucose syrup	
SOSA Xanthan Gum	
SOSA Albuwhip	
MSK Lactose Powder 1kg	

BP Whey Powder pure	
Gem cornflour	

9. Logbook

SUSTAINABLE PAIN PERDU

LOGBOOK: Laura Munar Acosta

MODULE CODE: TFCS9025

MODULE TITLE: MOLECULAR GASTRONOMY

STUDENT NAME: LAURA MUNAR ACOSTA

FOOD PRODUCT: SUSTAINABLE PAIN PERDU

WEEK NO.:1
WEEKLY AIM: First approach to molecular gastronomy cooking
DATE: 20-03-23

OBJECTIVES:

- Perform the first cooking approach of the recipe.
- Evaluate learning opportunities and critical points during the cooking.
- Perform sensory analysis to evaluate de product.

Materials and Method (Ingredients, Equipment and Method)

- **Ingredients**

Table 11. Ingredients for sponge bread

TRIAL #1 SPONGE BREAD	**PERCENTAGE (%)**	**400**	**G**
Water	23,7%	94,8	**G**
Milk proteins	6,0%	24	**G**
Oil	18,0%	72	**G**
Egg white powder	4,0%	16	**G**
Soybean lecithin	0,1%	0,4	**G**
Sugar	31,0%	124	**G**
Corn starch	17,0%	68	**G**
Salt	0,1%	0,4	**G**
Vanillin	0,1%	0,4	**G**
TOTAL	100,0%	400	

Figure 7. Ingredients used in the preparation.

- **Equipment**
  4 medium size bowls
  1 Weighing scale
  1 Food mixer
  1 non-stick pan
  1 Convection oven
- **Methodology**

Table 12. Methodology for sponge bread

SPONGE BREAD			
STEP	**DESCRIPTION**	**EQUIPMENT**	**NOTES**
1	Weigh and mix milk proteins, egg white powder, corn starch, salt, and soybean lecithin. Set aside	Bowl, weighing scale	
2	Weigh and mix oil and sugar. Whisk it until sugar dissolves	Bowl, weighing scale	
3	Weigh and mix half of the water with 1) and 2)	Bowl, weighing scale	
4	Gradually add the rest of the water and combine homogeneously the batter		
5	Add the colour and the flavouring and continue mixing		10 min
6	Transfer the dough to a non-stick pan and bake it for 20 min at 180 °C		20 min, 180°C 1/2 steam

- **Sensory analysis**
  Due to time constraint, the sensory analysis was not carried out. However, informal reviews were taken in consideration for the following week.

Results and discussion

A)  B) 

Figure 8. A) Batter before going to the oven. B) final baked sponge bread.

Figure 9. Transversal cut of the sponge bread.

During the preparation of the recipe, the corn starch presented some difficulties mixing it with the batter (See Figure 8). Additionally, Figure 9 presents a flat a dense final texture of the sponge bread. Although no sensory analysis was performed due to time constraint, some consumers tried the sponge cake and the overall feedback was: too dense product, grainy texture and good but strong olive oil flavour.

Conclusions

A first approach of the note-by-note cooking was performed with a sponge base cake. The texture of the product requires attention to better appeal the consumers, however the taste is not far away from the expected.

Recommendations

Whip the albumin first with water to have a lighter final texture. More whisking time to the oil and sugar should be added.

MODULE CODE: TFCS9025

MODULE TITLE: MOLECULAR GASTRONOMY

STUDENT NAME: LAURA MUNAR ACOSTA

FOOD PRODUCT: SUSTAINABLE PAIN PERDU

WEEK NO.:2
WEEKLY AIM: Improve the texture of the sponge cake.
DATE: 26-03-23

OBJECTIVES:

- Implement changes in the procedure for a better texture of the sponge cake.
- Prepare the milk syrup for the cake.
- Perform sensory analysis to evaluate de product.

Materials and Method (Ingredients, Equipment and Method)

- **Ingredients**

Table 13. Ingredients for sponge bread

TRIAL #2 SPONGE BREAD	**PERCENTAGE (%)**	**400**	**G**
Water	23,70%	94,8	**G**
Casein	2,00%	8	**G**
Whey	0,50%	2	**G**
Lactose	3,50%	14	**G**
Olive oil (mainly oleic acid 83%)	18,00%	72	**G**
Albumin	4,00%	16	**G**
Soybean lecithin	0,10%	0,4	**G**
Sugar	31,00%	124	**G**
Corn starch	17,00%	68	**G**
Salt	0,10%	0,4	**G**
Vanillin	0,10%	0,4	**G**
Baked bread flavour		5 drops	
TOTAL	100,00%	400	

Table 14. Ingredients for milk syrup

TRIAL #2 MILK SYRUP	**PERCENTAGE (%)**	**200**	**G**
Water	56,00%	112	**G**
Casein	3,00%	6	**G**
Whey	1,00%	2	**G**
Lactose	5,00%	10	**G**

Sucrose	31,00%	62	**G**
Citric acid	4,00%	8	**G**
Orange flavour		drops to taste	
TOTAL	100,00%	200	

- **Equipment**
  4 medium size bowls
  1 Weighing scale
  1 Food mixer
  1 non-stick pan
  1 Convection oven
- **Methodology**

Table 15. Methodology for sponge bread

SPONGE BREAD			
STEP	**DESCRIPTION**	**EQUIPMENT**	**NOTES**
1	Hydrate and dissolve soybean lecithin with a quarter of the water		
2	Use half of the water and whisk it vigorously with the albumin, until stiff peaks form	Bowl, weighing scale	
3	Use the final quarter of the water to incorporate the corn-starch and dissolve it. Use 1) for more moisture	Bowl, weighing scale	
4	Use 3) and mix the casein, whey, and lactose together.	Bowl, weighing scale	
5	Whisk the oil and the sugar until the sugar dissolves	Bowl, weighing scale	10 min
6	Mix 4) with 5) and then gently incorporate the whipped egg whites (2). Add the Vanillin and the flavourings		
7	Transfer the final batter to a pan and bake it	Oven	20 min, 180°C 1/2 steam

Table 16. Methodology for milk syrup

MILK SYRUP			
STEP	**DESCRIPTION**	**EQUIPMENT**	**NOTES**
1	In a pan, boil the water, sucrose, whey, casein, lactose, and citric acid	Pan	
2	Let it cool and add the orange flavour.	Bowl, weighing scale	
3	Reserve for further preparations	Bowl, weighing scale	

- **Sensory analysis**
  Sample 923: Only sponge bread
  Sample 432: Sponge bread soaked in syrup

https://forms.gle/ph6RX9oke6bLbf868

Nine panellists perform the sensory evaluation. Water was available for rinsing between samples.

Results and discussion

The sponge bread loaf presented a better appearance and consistency compared to the previous week. However, it took 20 min to dissolve the granulated sugar with the olive oil and that represented a time constraint. As seen in Figure 10, two types of samples were presented to the panellists in the sensory analysis. The first one (sample 923) has the plain sponge bread and the second one was the sponge bread soaked in the milk syrup (sample 432).

Figure 10. Sponge bread samples presented to the panellists. Left: sample 923 and Right: sample 432.

The texture of the sponge bread was scored as a “slightly spongy” for the crumb and the crust “slightly crumbly.” Additionally, the panellists accepted the colour of the sample, since they all scored it as the middle point of the scale for the crumb and crust. Finally, the product exerted a positive response to the panellists with all the answers between “Like very much” and “Like slightly”.

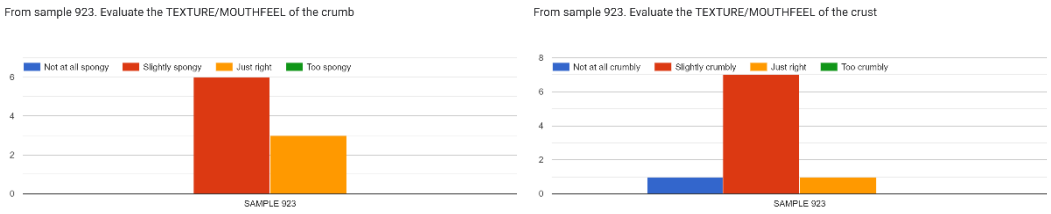


Figure 11. Sensory results for the sponge bread texture: crumb and crust.

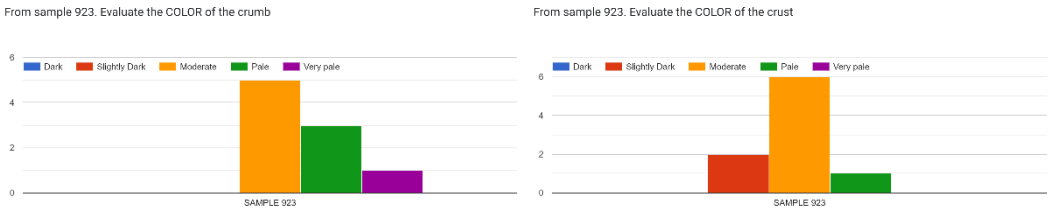


Figure 12. Sensory results for the sponge bread colour: crumb and crust.

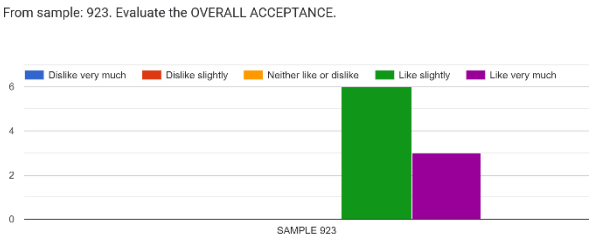


Figure 13. Sensory results for the sponge bread overall acceptance.

On the other hand, the aim to present the consumers the second sample was to evaluate the flavour and overall acceptance of it. Where the flavour had a most answers in the positive side of the scale and the overall acceptance was uneven distributed. This is attributed because the soaked sample lost its form. However, Figure 15 shows that overall, the participants preferred the second sample and gives an input on how to improve its appearance to have an even more positive response.

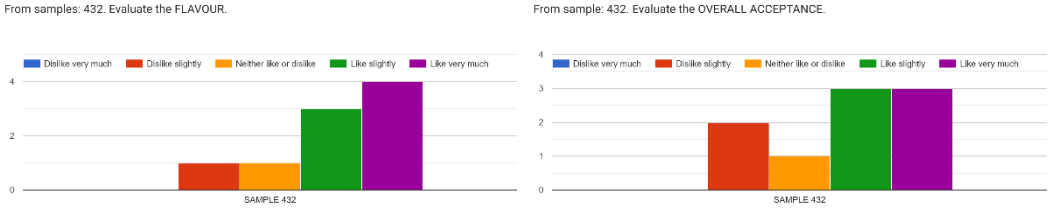


Figure 14. Sensory results for the sponge bread soaked in milk syrup flavour and overall acceptance.

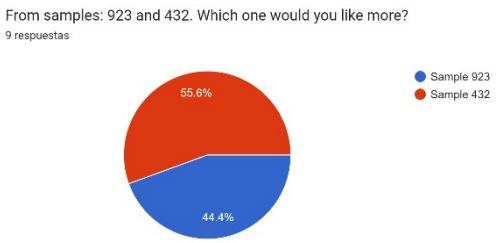


Figure 15. Duo test for sponge bread presentation preference.

Conclusions

The sponge bread methodology improvement was successful, presenting an even cake with good colour and texture according to the panellists. However, the use of granulated sugar represented a time constraint during the preparation. Finally, even though the appearance of the soaked sample did not appeal the consumers, they preferred this sample over just the sponge cake.

Recommendations

The use of castor sugar is recommended to improve time management during the preparation of the recipe. Additionally, pan-fry the soaked sample can be an option for a better appearance.

MODULE CODE: TFCS9025

MODULE TITLE: MOLECULAR GASTRONOMY

STUDENT NAME: LAURA MUNAR ACOSTA

FOOD PRODUCT: SUSTAINABLE PAIN PERDU

WEEK NO.:3
WEEKLY AIM: Prepare the sponge cake for the showcase and perform first trial of the other elements of the dish.
DATE: 17-04-23

OBJECTIVES:

- Improve sponge cake flavour and presentation.
- Make the first trial of the orange tuille.
- Prepare the first trial of the sorbet.

Materials and Method (Ingredients, Equipment and Method)

- **Ingredients**

Table 17. Ingredients for sponge bread

TRIAL #3 SPONGE BREAD	PERCENTAGE (%)	1000	G
Water	23,70%	237	**G**
Casein	2,00%	20	**G**
Whey	0,50%	5	**G**
Lactose	3,50%	35	**G**
Olive oil (mainly oleic acid 83%)	18,00%	180	**G**
Albumin	4,00%	40	**G**
Soybean lecithin	0,10%	1	**G**
Castor sugar	31,00%	310	**G**
Corn starch	17,00%	170	**G**
Salt	0,10%	1	**G**
Vanillin	0,10%	1	**G**
Baked bread flavour		5 drops	

Caramel flavour		5 drops	
TOTAL	100,00%	400	

Table 18. Ingredients for milk syrup

TRIAL #3 MILK SYRUP	**PERCENTAGE (%)**	**800**	**G**
Water	72,00%	576	**G**
Casein	3,00%	24	**G**
Whey	1,00%	8	**G**
Lactose	5,00%	40	**G**
Sucrose	15,00%	120	**G**
Lactic acid	4,00%	32	**G**
Orange flavour		drops to taste	
TOTAL	100,00%	800	

Table 19. Ingredients for orange tuille

TRIAL #1 ORANGE TUILE OP1	**PERCENTAGE (%)**	**800**	**G**
Water	90,00%	720	**G**
Corn starch	10,00%	80	**G**
Orange flavour		drops to taste	
Orange colouring		drops to colour achieved	
TOTAL	100,00%	800	

Table 20. Ingredients for orange sorbet

TRIAL #1 ORANGE SORBET	**PERCENTAGE (%)**	**500**	**G**
Water	75,47%	377	**G**
Xanthan gum	0,38%	2	**G**
Fructose	7,55%	38	**G**
Malic acid	1,51%	8	**G**
Glucose syrup	15,09%	75	**G**
Orange flavour		drops to taste	**G**
Orange colouring		drops to colour acceptance	**G**
TOTAL	100,00%	500	

- **Equipment**
  4 medium size bowls
  1 Weighing scale
  1 Food mixer
  1 non-stick pan
  1 Convection oven
- **Methodology**

Table 21. Methodology for sponge bread

SPONGE BREAD			
STEP	**DESCRIPTION**	**EQUIPMENT**	**NOTES**
1	Hydrate and dissolve soybean lecithin with a quarter of the water		
2	Use half of the water and whisk it vigorously with the albumin, until stiff peaks are formed	Bowl, weighing scale	
3	Use the final quarter of the water to incorporate the corn-starch and dissolve it. Use 1) for more moisture	Bowl, weighing scale	
4	Use 3) and mix the casein, whey, and lactose together.	Bowl, weighing scale	
5	Whisk the oil and the sugar until the sugar dissolves	Bowl, weighing scale	10 min
6	Mix 4) with 5) and then gently incorporate the whipped egg whites (2). Add the Vanillin and the flavourings		
7	Transfer the final batter to a pan and bake it	Oven	20 min, 180°C 1/2 steam

Table 22. Methodology for milk syrup

MILK SYRUP			
STEP	**DESCRIPTION**	**EQUIPMENT**	**NOTES**
1	In a pan, boil the water, sucrose, whey, casein, lactose, and citric acid	Pan	
2	Let it cool and add the orange flavour.	Bowl, weighing scale	
3	Reserve for further preparations	Bowl, weighing scale	

Table 23. Methodology for the orange tuille

ORANGE TUILE OP 1			
STEP	**DESCRIPTION**	**EQUIPMENT**	**NOTES**
1	Mix the ingredients	Pan	

2	In a pan with hot olive oil fry 5 g of the batter		
3	Fry the mixture until it is completely cooked and let it drain		

Table 24. Methodology for the orange sorbet

ORANGE SORBET			
STEP	**DESCRIPTION**	**EQUIPMENT**	**NOTES**
1	Mix all the ingredients together with a whisker		10 min or until complete homogeneity
2	Reserve in the freezer	Bowl, weighing scale	Minimum 2h before serving

Results and discussion

Figure 16. Orange tuilles result.

Figure 17. Final sponge bread for the showcase

As seen in Figure 16 and Figure 17, all the elements of the dish were successfully developed (missing image from the orange sorbet and milk syrup). The flavour profile was accepted for the naïve consumers, even though no formal sensory analysis was conducted. The sponge bread and sorbet were kept frozen until the showcase, the milk syrup in the fridge, and the orange tuilles in an airtight package.

Conclusions

All the elements for the dish were prepared and the final step for the last week is to assembly and present the dish.

Recommendations

For the final assembly of the dish, is recommended to pan-fry the sponge bread soaked in the milk syrup for better appearance and Maillard reaction.

MODULE CODE: TFCS9025

MODULE TITLE: MOLECULAR GASTRONOMY

STUDENT NAME: LAURA MUNAR ACOSTA

FOOD PRODUCT: SUSTAINABLE PAIN PERDU

WEEK NO.:4
WEEKLY AIM: Display the note-by-note dish for the showcase.
DATE: 21-04-23

OBJECTIVES:

- Assembly all the elements of the Sustainable pain perdu and present the final dish.
- Prepare caramel sauce for presentation purposes.

Materials and Method (Ingredients, Equipment and Method)

- **Ingredients**

Table 25. Ingredients for caramel

TRIAL #3 SPONGE BREAD	PERCENTAGE (%)	200	G
Castor sugar	100,00%	200	**G**
TOTAL	100,00%	200	

- **Equipment**
  1 non-stick pan

- **Methodology**

Table 26. Methodology for caramel

CARAMEL			
STEP	**DESCRIPTION**	**EQUIPMENT**	**NOTES**
1	Put the sugar on the pan and dissolve it slowly at low heat. Stir occasionally preventing burnt spots	Pan	

Results and discussion

For the assembly of the dish, the sponge bread was the element with a bigger role since it is the most wasted food product in Ireland. To do that, sugar angel hairs were done with the caramel to give height and impact to the plate. Finally, the sorbet and the orange tuille were located to impart the colour attribute of the dish and to catch the eye of the observer.

Figure 18. Sustainable pain perdu: a Note-by-note approach.

Conclusions

Successful note-by-note development was carried out for 4 weeks, to create an homage to the traditional French toast without using any type of bread, milk, or fruit.