Back to Nourish: A Future Rooted in Nature

Note by note

Molecular Gastronomy

TFCS9025

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Introduction

It is a fact that, despite all the efforts made by different initiatives, such as the UN's 2023 Goal 12, "Responsible Consumption and Production" (UN, 2025), we are currently facing several issues related to ecological stability. These challenges are mainly due to overpopulation and the substantial demand for natural resources and production systems (Sharma, Humphreys and Holden, 2018). As a response to this overexploitation across different parts of the world, a movement known as “Back to Nature” has emerged. This concept involves management philosophies that aim to reform current practices to be more sensitive to nature conservation values, while still maintaining a productive function (Gamborg and Larsen, 2003).

In Ireland, much of the land is limited for agriculture due to poor soil drainage. As a result, fertile areas risk overuse. However, poorly drained soils could be repurposed for environmentally beneficial uses to help reduce this pressure. For instance, the dairy industry in Ireland has been stimulated by various regulations aimed at expanding the sector. While this growth has economic benefits, it also risks increasing both national and global greenhouse gas emissions. Interestingly, one study shows that using poorly drained soils for dairy-related purposes could lead to a net reduction in global environmental impact. This offers a way to repurpose underused land while mitigating negative effects (Sharma, Humphreys and Holden, 2018).

Another example is the case of lavender and lavandin in the production of essential oils, where the waste material is often burned. However, research has shown that residues from these plants can be used to amend soils and crops affected by wilt diseases, offering an alternative that supports soil restoration (Yohalem and Passey, 2011).

Similarly, the agri-food industry in Ireland has been identified as a leading emitter of carbon monoxide per company. To counter these effects, the circular economy and eco-innovations are promising approaches to reducing the environmental footprint (Castillo-Díaz *et al.*, 2023). Notably, Ireland has introduced an effective intersection between the Circular Economy and artificial intelligence. By operating on principles of restoration, reduced consumption, and waste elimination, while still promoting economic development, technologies such as Convolutional Neural Networks are being used to sort compostable materials from waste streams, thereby optimizing food waste management (Pathan *et al.,* 2023).

In summary, to illustrate how we can give back to nature what we have taken, the dish “Back to Nourish: A Future Rooted in Nature” was created under the lens of the culinary movement Note-by-Note which consists on using pure compounds to produce foods but also to contribute food security by combating waste of ingredients, water or energy. As a branch of Molecular gastronomy, this report aims to explain the phenomena occurring during the culinary transformations in order to understand the physical systems behind the proposed formulation (Burke, This and Kelly, 2016; Chandran, 2018).

This dish invites reflection on time, nature, and our responsibility to nourish the Earth as it nourishes us: we take, but we must also give back. Presented in an hourglass-shaped glass, it symbolizes the urgency of time and the delicate balance between consumption and regeneration, a **metaphor for the circular economy** and the need to restore harmony between humans and nature as food for the future.

On top, a rose water cream-cake and lavender crumble represent the flower and the lavender, symbols of potential and blooming, evoking the beauty that emerges when we choose regeneration. These elements also reference the earlier examples of **repurposing lavender waste** and the Irish **dairy industry's potential for improvement through more sustainable land use.**

As with all things in nature, these elements are not permanent. They will eventually melt and fall, returning and nourishing the garden at the bottom, which symbolizes the soil. Inside, a vibrant edible garden flourishes, represented by a cocoa crumble (soil), matcha cream-cake (leaves), and coral tuiles (leaves), capturing biodiversity and the roots of life. The initial inspiration for this concept is illustrated in Figures 1 and 2, being a reminder that the future of food begins with returning to our roots, embracing natural cycles, and crafting a future where food heals, nourishes, and respects the planet.

Figure 1. *Concept inspiration (Evergreen Garden Care, 2025)*

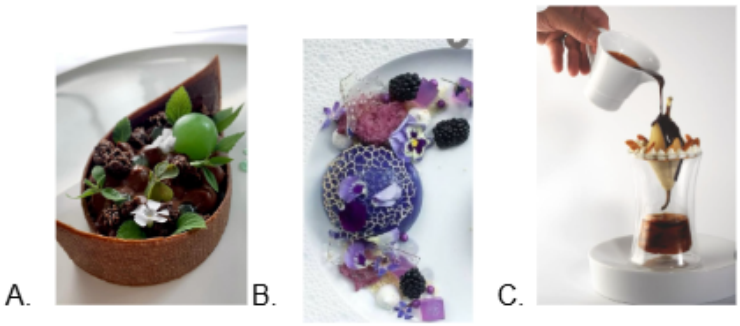


Figure 2. *Dish inspiration. A. Inspiration for the garden at the base. B. Inspiration for the flower and lavender at the top. C. Inspiration for the hourglass*

Aims and objectives

The primary aim of this project is to **develop a Note-by-Note dish inspired by the concept Back to Nourish: A Future Rooted in Nature**. The dish is presented in an hourglass-shaped glass, with the base representing a garden composed of soil and leaves, and the top featuring a white flower and lavender. The purpose is to highlight responsible consumption and production in the food industry through cases like the repurposing of soil in the dairy industry, soil amendment using lavender residues, and the principles of the circular economy.

To represent the idea of repurposing in the dairy industry, the flower on top, made of cream-cake, will eventually melt and fall, nourishing the soil below, which is made of the same ingredients but transformed into leaves. This symbolizes giving new life to the same resource in a different form. Similarly, the lavender on top will fall and become part of the soil, representing how lavender residues can be used to amend the earth (this is why both are made of crumble).
Altogether, the dish functions as a visual and edible metaphor for circularity, regeneration, and the need to restore harmony between food systems and nature.

Objectives:

- Research and integrate Molecular Gastronomy techniques to produce elements that complement each other by using pure compounds.
- Explore methods to create a cream-cake without using milk or cream cheese as part of the Note-by-Note principles.
- Explore techniques to create a crumble with a texture that resembles both soil and lavender flowers.
- Explore methods to create edible leaves for the garden.
- Explore techniques to shape the cream-cake into a flower-like element.
- Test and adjust the flavors to evoke the freshness and vibrancy of a garden.
- Plate the dish in an hourglass-shaped glass in a visually appealing way.
- Explain the phenomena occurring during the culinary transformations to understand the physical systems.

Final materials and methods

Materials

The ingredients for the soil and lavender crumble are listed in Table 1. Table 2 contains the ingredients for the flower and leaf cream-cake. For the leaves made of coral tuiles, refer to Table 3.

Table 1. Ingredients soil and lavender crumble

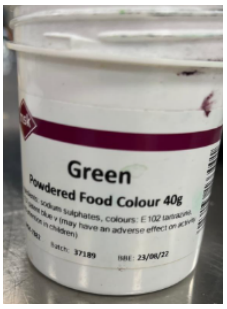
Ingredient	Quantity	Units	Brand	Picture
Corn Flour	30	g	Gem	
Water	15	g	-	-
Powdered Gluten	6	g	Weizengluten	
Sugar	20	g	Gem	
100% Pure Coconut Oil	25	g	KTC	
Cocoa powder	5	g	CITAVO	

Purple gel concentrate	0.5	g	Cake decoration	
Dark Chocolate flavoring	0.5	g	SOSA	
Baked bread flavor	0.5	g	MSK	
Lavender flavor	1	Drop	Sosa	

Table 2. Ingredients flower and leaves cream-cake

Ingredient	Quantity	Units	Brand	Picture
Micellar casein	25	g	MY PROTEIN	

Whey protein	5	g	Sports Supplements Limited t/a Bulk™	
Skimmed milk powder	10	g	Millac value	
Sugar	40	g	Gem	
Iota carrageenan	2	g	MSK	
Soy lechitin	0.5	g	SOSA	
Water	250	g	-	-

“Vanilla” flavor	2	g	Eurovanille	
Rose water concentrate	1	Drop	Sosa	
Lactic acid	2	g	MSK	
Green colour	0.3	g	MSK	
Matcha	3	g	SOSA	

Greena flavor	1	drop	MSK	

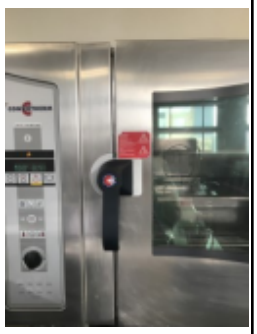
Table 3. Ingredients Coral Tuiles

Ingredient	Quantity	Units	Brand	Picture
Corn Flour	15	g	Gem	
Water	100	g	-	-
Sunflower Oil	30	g	Mediterani	

Green apple colorant	7	Drops	Mallard ferriere	
Carvone flavor	1	drop	MSK	
Salt	1	g	-	-

Table 4. Equipment

Ingredient	Quantity	Brand	Picture
Bowl	2	Kitchen equipment	
Whisk	1	Kitchen equipment	

Baking tray	1	Convotherm	
Saucepan	2	Paderno	
Non-stick frying Pan	1	Kitchen equipment	
Oven	1	Convotherm	
Spherical silicone molds	1	Paderno	
Madeleine tray	1	Quantum	
Knife	1	Tefal	
Measuring jug	2	Kitchen equipment	

Methods

Procedure for soil and lavender crumble

The recipe was based on vegan crumble recipes proposed by Olive Magazine (2020) and Callebaut (2021), replacing oats or almonds with components that provide a stronger structure to the matrix: gluten and corn flour (Kissr and Kurdistan, 2024). Likewise, substituting the fat from the margarine with coconut oil, and adding the desired flavor and color.

1. Place the coconut oil in a saucepan until it melts.
2. In a medium mixing bowl, combine the melted coconut oil, water, corn flour, gluten, sugar, and mix by hand until a dough forms.
3. Divide the mixture into two equal parts.
    a. To one half, add cocoa powder, dark chocolate flavoring, and baked bread flavoring to create the soil component. Mix until creating a homogeneous dough.
    b. To the other half, add purple gel concentrate and lavender flavoring to represent the lavender element. Mix until creating a homogeneous dough.
4. Transfer the dough onto a baking tray and bake in a pre-heated oven at 180°C for 12 minutes.
5. Once baked, remove the tray from the oven and let cool completely.
6. After cooling, crumble by hand until it reaches a texture similar to soil-like crumbs.

Procedure for flower and leaves cream cake

The recipe was adapted from “Cheesecake without Cream Cheese” (Kinney, 2025). The Greek yogurt was substituted with milk proteins (casein and whey) while lactic acid was used as a coagulant and to provide the characteristic tangy flavor (Modler and Kalab, 1983). In addition, sugar replaced condensed milk and honey as the sweetener. To compensate for the loss of thickness normally provided by honey and condensed milk, iota carrageenan was added as a gelling agent, and lecithin was included to emulsify the mixture (Koo et al., 2019), using the doses proposed in the recipes of Lersch (2014).

1. In a medium bowl, whisk together the micellar casein, whey protein, sugar, milk powder, iota carrageenan, lecithin, and water until smooth and fully combined (Figure 3.A).
2. Transfer the mixture to a saucepan and heat over medium heat, stirring constantly, until it begins to simmer.
3. Reduce the heat to low and continue stirring for 5 minutes, allowing the mixture to thicken.
4. Remove from the heat and stir in the lactic acid and vanilla flavouring
5. Divide the mixture into two equal parts.
    a. For one half, add the rose water concentrate and go directly to step 6.
    b. For the second half, add the matcha, green colour, and greena flavour and mix until getting a homogeneous mixture.
6. Prepare the silicone mold and madeleine mold by applying a light layer of non-stick spray.

7. Pour the white mixture into the silicone mold and the matcha mixture into the madeleine mold.
8. Refrigerate for 40 minutes
9. Once fully set, carefully remove from the mold (Figure 3.B) .
10. Shape veins and petals with a knife.

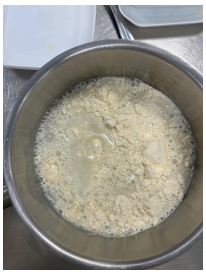
A.  B. 

Figure 3. *A. Cream-cake mixture before heating B. Cream-cake before shaping the petals*

Procedure coral tuile leaves

The procedure was based on the recipe proposed by Cioccia (2020), substituting all-purpose flour with corn flour.

1. In a bowl, whisk together the water, oil, flour, and salt until the mixture is smooth and very liquid in consistency.
2. Add green coloring and carvone flavoring to the base mixture.
3. Preheat a non-stick pan over medium-high heat.
4. To cook the tuile, pour approximately one tablespoon of the mixture into the pan. Allow it to cook until the bubbling (Figure 4). Then the tuile will become crisp, it takes about 2–3 minutes.
5. Carefully remove the tuile using a spatula and place it on paper towels to absorb any excess oil. Let it cool before handling.

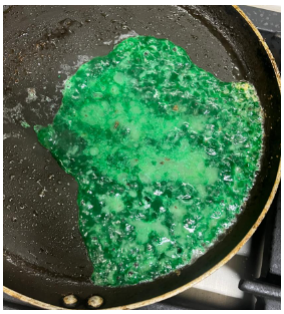


Figure 4. *Coral Tuiles bubbling*

Results

A sensory analysis with 7 participants was conducted for each element, focusing on the key sensory drivers in each case. For the final dish, a radar chart was created to compare multiple qualitative aspects. The most relevant results are presented below.

Soil and lavender crumble

A crunchy yet delicate crumble was achieved using a mixture of corn flour, gluten, sugar, water, and coconut oil, without the addition of margarine or butter as is typical in traditional recipes. The texture was crisp but not overly hard, for the sensory analysis this variable was considered as “Just right” offering a light and pleasant bite. Both flavor variations were successfully obtained: the lavender version evoked the gentle floral notes and color of lavender blossoms (Figure 5), while the combination of dark chocolate and baked bread was reminiscent of a chocolate cake (Figure 6). However, in terms of intensity, the sensory analysis indicated that the lavender flavor could be enhanced, as it was mainly rated as “slightly too little,” whereas the soil flavor was considered “Just right” (Figures 7 and 8).

When paired with the creamy texture of the cream-cake, the crumble provided a balanced contrast, enhancing the overall sensory experience of the dish.

A.  ***B.*** 

Figure 5. *A. Final lavender crumble B. Reference of lavender color (Evergreen Garden Care, 2025)*

Figure 6. *Final crumble texture resembling soil with flavor of dark chocolate and baked bread*

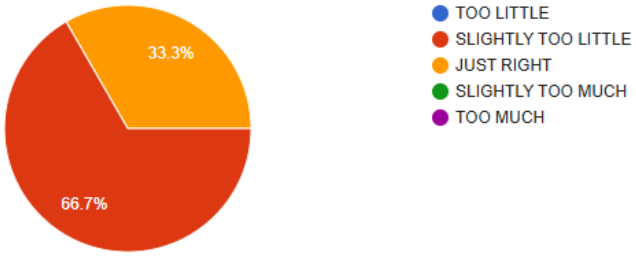


Figure 7. *Flavor intensity evaluation for lavender crumble*

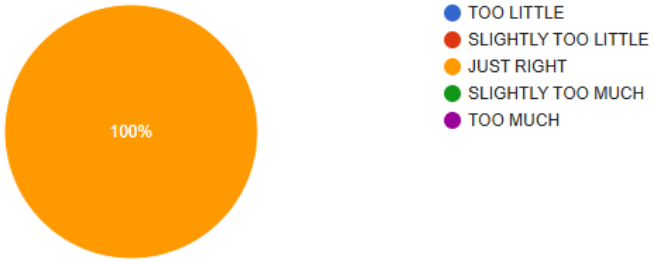


Figure 8. *Flavor intensity evaluation for soil crumble*

Flower and leaves cream-cake

To create the cream-cake element, a blend of whey protein, micellar casein, sugar, and milk powder was used, in combination with iota carrageenan and lecithin as texturizing agents. Vanilla and lactic acid were added to emulate the characteristic taste of classic cream or cheesecake. For the specific variations, rose water concentrate was used in the rose version (Figure 9.A) to evoke a subtle floral note, while matcha and carvone flavor were incorporated in the leaf version (Figure 9.B) to enhance its earthy profile. The final product had a smooth, creamy taste and a moldable texture, which allowed for easy shaping into delicate petals and leaf veins.

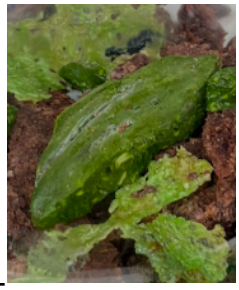
A.  B. 

Figure 9. *A. Final rose water cream-cake flower after shaping the petals. B. Final matcha-cream-cake leave after shaping the veins.*

According to the sensory analysis, the cream-cake for both cases was perceived as “Just right” in terms of viscosity (Figure 10). It was noted that the rose element made the creaminess more noticeable, as the petal shape made it easier to eat in small bites. In contrast, the rose water flavor was perceived as “Too little” (Figure 11), while the leaves were rated as “Too much” (Figure 12), with the matcha flavor overpowering the greena notes.

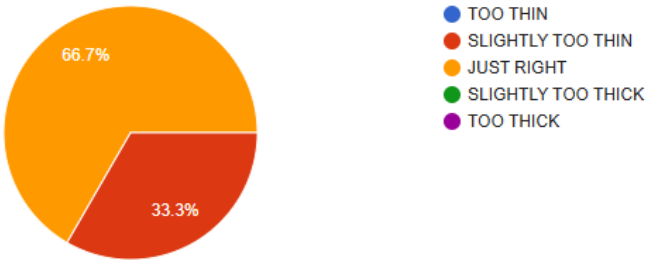


Figure 10. *Viscosity sensory evaluation for cream-cake (flower and leaves)*

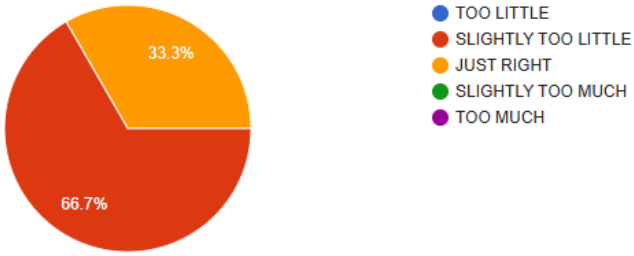


Figure 11. *Flavor intensity evaluation for cream-cake flower*

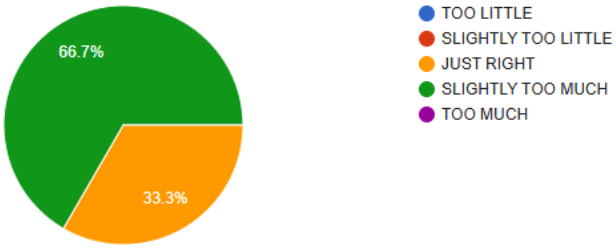


Figure 12. *Flavour intensity evaluation for cream-cake leaves*

Leaves coral tuiles

The coral tuile was a successful element in terms of appearance, flavor, and texture. Its vibrant green color provided contrast to the white rose and the dark soil crumble, while the crisp texture and subtle touch of salt added to the overall tasting experience. However, the carvone flavor was not strongly perceived. It is worth noting that achieving a firm structure requires allowing the bubbling to stop while heating in the pan, and removing the tuile promptly to prevent burning in certain areas (Figure 13).

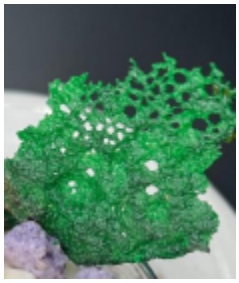


Figure 13. *Final coral tuiles texture*

Regarding the sensory analysis of this element, the overall flavor was perceived as “Just right,” but when asked specifically about the carvone notes, it was mentioned that they could be enhanced (Figure 14).

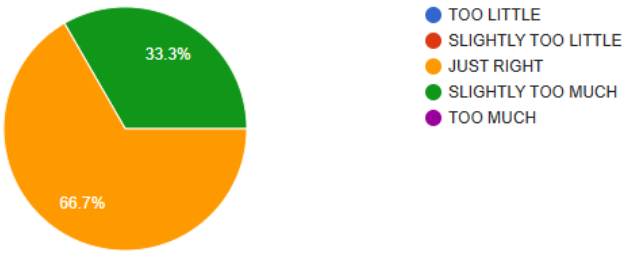


Figure 14. *Flavour intensity evaluation for coral tuile leaves*

Final Dish

Figure 15 shows the final dish being assembled in an hourglass-shaped glass. At the bottom, the garden and its biodiversity are represented through the varied textures and colors of the leaves. At the top, the rose and lavender form a delicate element that will gradually melt and fall, symbolically nourishing the soil below.

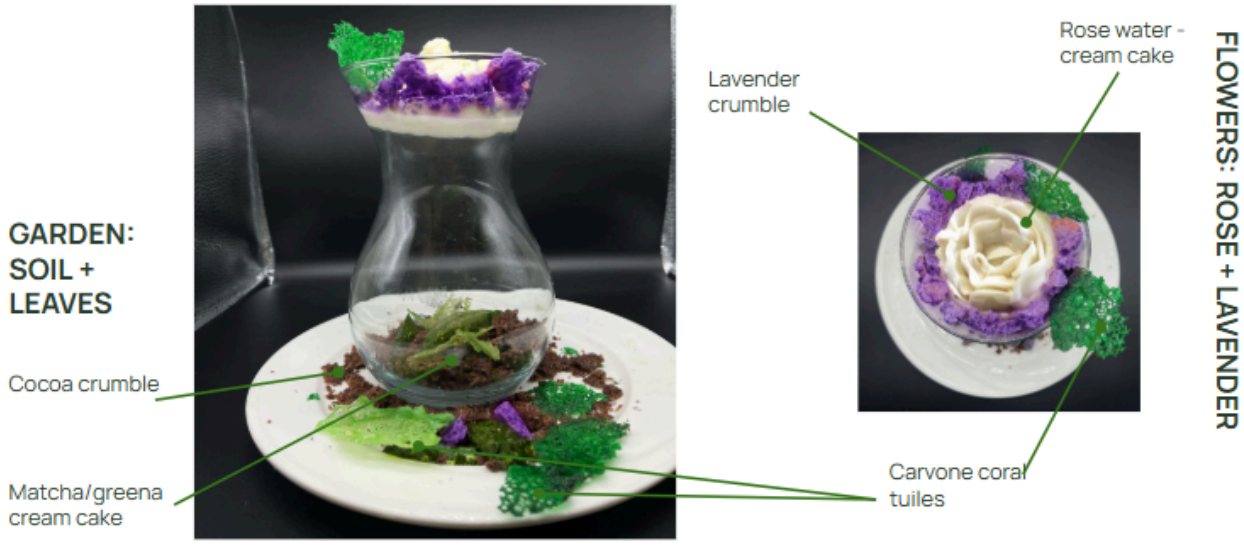


Figure 15. *Final dish*

From the sensory analysis of the combined elements (Figure 16), it can be observed that the soil crumble received the highest ratings. However, it may still be important to improve flavor intensity, particularly for the lavender crumble and the coral tuile leaves. Overall, all the elements showed a strong resemblance to the natural elements they were intended to represent.

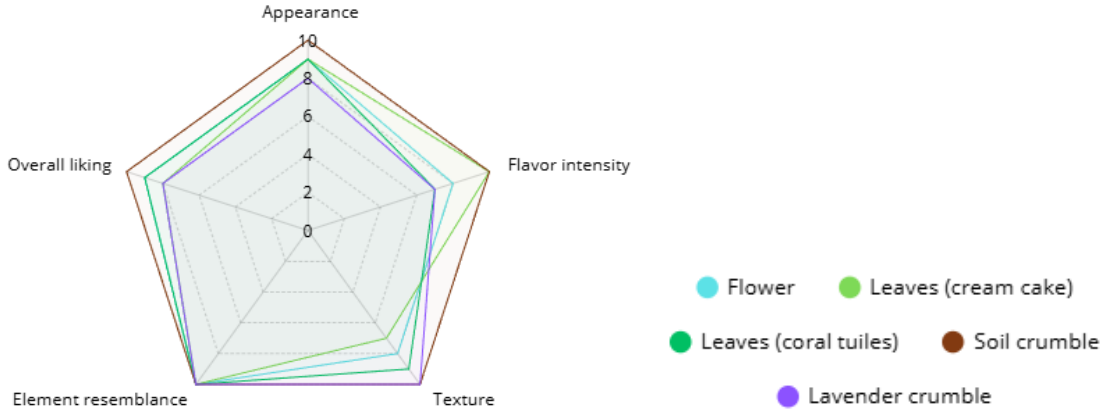


Figure 16. *Radar plot final dish*

Discussion

Soil and lavender crumble

A final crumble was developed, inspired by a traditional recipe that typically includes flour, butter, and sugar. Despite the substitutions, a crumble was successfully created and highly rated during sensory analysis.

This success is largely attributed to the corn flour, which provided structure through its starch content, and the water, which allowed the starch to gelatinize during baking, helping the crumble hold together while still forming clusters when breaking after baking. The addition of gluten compensated for the natural lack of gluten in corn flour, contributing network strength and cohesiveness (Kose and Yeiyinli, 2008).

On the other hand, coconut oil played a key role in creating a crisp surface, holding the matrix together, and controlling spread during baking (Zhong, 2013). Sugar contributed not only sweetness but also enhanced flavor and appearance through the Maillard reaction and caramelization.

The inclusion of baked bread and dark chocolate flavors created a flavor reminiscent of a freshly baked chocolate cake. However, the lavender flavor was not as appealing; therefore, it is recommended to consider adding another essential oil or aromatic compound to enhance its presence. Additionally, redesigning the shape of the lavender crumble component could better represent the form of a long lavender plant.

Flower and leaves cream-cake

The proposed recipe was based on replacing the ingredients of a cream cheese-free recipe with their pure compounds, following the principles of Molecular Gastronomy to create a matrix similar to that of a traditional cheesecake. At the beginning, some elements like lyophilized blueberries and colorant were incorporated, which resulted in an undesirable grainy texture. For this reason, they were removed to avoid interfering with the matrix, and the desired texture was obtained.

Iota carrageenan was used as the gelling agent, as it is a polysaccharide derived from red seaweeds that forms a gel when heated to around 70 °C. It first creates ionic interactions that lead to the formation of helix structures, which then aggregate into soft and flexible gels upon cooling. Additionally, it contributes to a rich mouthfeel and a characteristic 'melt-in-the-mouth' sensation (Koo *et al*., 2019; Lersch, 2014).

To replicate the protein and fat matrix typically provided by cream cheese, micellar casein, whey protein, milk powder, and water were used. As milk proteins are sensitive to heat, boiling the

mixture to activate the iota carrageenan caused the proteins to denature. This process involves the unfolding of their structures and the disruption of disulfide bonds, allowing new bonds to form between protein molecules. As a result, a network is created that can effectively entrap water and any fat present in the skimmed milk, helping to stabilize the matrix and mimic a creamy texture (Modler and Kalab, 1983). On the other hand, lecithin, a phospholipid, served as the key emulsifier, helping to incorporate all ingredients into a stable mixture (Lersch, 2014). Lactic acid was added to provide the sour flavor typical of dairy products and to lower the pH, which supports protein denaturation. Further modifications include increasing the amount of micellar casein to enhance creaminess, as it can have a fat mimetic effect with carrageenan (Flett, Duizer and Goff, 2010).

Leaves coral tuiles

For the coral tuiles, corn flour played a key role, as its starch can gelatinize when combined with water, forming a cohesive matrix. In the mixture, oil and water undergo phase separation; however, when poured into a hot pan, the water rapidly evaporates while the oil coats the starch matrix, creating a crispy surface. The steam generated from the boiling water pushes through the batter, forming holes and resulting in the characteristic porous structure. For this reason, it is essential to remove the tuile from the heat only once the bubbling completely stops, as removing it too early would prevent the desired structure from forming (McGee, 2004). Further improvements may include enhancing the flavor by adding it during the final stages of cooking, as some volatile compounds may have evaporated during heating. Besides, it could be improved by working with different purple-like colors to enhance the appearance of the lavender element.

Maximum permitted levels

Table 5 shows the compliance of the ingredients with the maximum permitted levels according to **Regulation (EC) No 1333/2008**. While some additives are subject to specific regulations, many fall under the category of *quantum satis*, meaning they may be used in amounts necessary to achieve the desired effect in food. The only ingredient potentially subject to a specific limit is the purple colorant, as it contains Brilliant Blue FCF.

Table 5. Maximum permitted levels

Ingredients	**¿Recognized as Safe?**	**Notes**
Corn Flour	Yes	No maximum permitted levels
Water	Yes	No maximum permitted levels
Powdered Gluten	Yes	No maximum permitted levels
Sugar	Yes	No maximum permitted levels
100% Pure Coconut Oil	Yes	No maximum permitted levels
Cocoa powder	Yes	No maximum permitted levels

Purple gel concentrate	Under certain conditions	It contains E102 Tartrazine and E133 Brilliant Blue FCF. According to Regulation (EC) No 1333/2008, regarding Tartrazine, when used as a decorative colouring, there is no specific maximum permitted level; however, products containing it must include the warning: “may have an adverse effect on activity and attention in children.” In the case of Brilliant Blue (E133), for dairy-based desserts, the permitted level should not exceed 150 mg/kg. In this formulation, 0.5 g of purple colorant was used in a final dish weighing 224.8 g. Assuming the colorant is composed of a 1:1 mixture of Tartrazine and Brilliant Blue, this means this corresponds to approximately 1.11 g/kg, exceeding the limit. For this reason, it is important to consult the colorant supplier for the exact concentration of E133 in the product to calculate its precise amount and ensure compliance with the regulation.
Dark Chocolate flavoring	Yes	According to Regulation (EC) No 1333/2008, it falls under Annex III as a carrier approved for food flavourings and is used under the principle of *quantum satis*.
Baked bread flavor	Yes	According to Regulation (EC) No 1333/2008, it falls under Annex III as a carrier approved for food flavourings and is used under the principle of *quantum satis*.
Lavender flavor	Yes	According to Regulation (EC) No 1333/2008, it falls under Annex III as a carrier approved for food flavourings and is used under the principle of *quantum satis*.
Micellar casein	Yes	No maximum permitted levels
Whey protein	Yes	No maximum permitted levels
Skimmed milk powder	Yes	No maximum permitted levels
Iota carrageenan	Yes	According to Regulation (EC) No 1333/2008, E407 (iota carrageenan) falls under category 01.6 (cream) and is permitted under the principle of *quantum satis* for this type of application.
Soy lechitin	Yes	According to Regulation (EC) No 1333/2008, E322 (lechitin) falls under category of Group 1 (additives) and in the 01.5 (dehytrated milk) and is permitted under the principle of *quantum satis* for this type of application.

“Vanilla” flavor	Yes	According to Regulation (EC) No 1333/2008, it falls under Annex III as a carrier approved for food flavourings and is used under the principle of *quantum satis*.
Rose water concentrate	Yes	According to Regulation (EC) No 1333/2008, it falls under Annex III as a carrier approved for food flavourings and is used under the principle of *quantum satis*.
Lactic acid	Yes	According to Regulation (EC) No 1333/2008, E270 (lactic acid) falls under category of Group 1 (additives) and is permitted under the principle of *quantum satis* for this type of application.
Green colour	Under certain conditions	It contains aluminium lake and E102 tartrazine. According to Regulation (EC) No 1333/2008 as decorative colouring, there is no specification for maximum permitted level, but it should include “it may have an adverse effect on activity and attention in children”.
Matcha	Yes	No maximum permitted levels
Greena flavor	Yes	According to Regulation (EC) No 1333/2008, it falls under Annex III as a carrier approved for food flavourings and is used under the principle of *quantum satis*.
Sunflower Oil	Yes	No maximum permitted levels
Green apple colorant	Under certain conditions	It contains E102 tartrazine. According to Regulation (EC) No 1333/2008, as decorative colouring, there is no specification for maximum permitted leve,l but it should include “it may have an adverse effect on activity and attention in children”
Carvone flavor	Yes	According to Regulation (EC) No 1333/2008, it falls under Annex III as a carrier approved for food flavourings and is used under the principle of *quantum satis*.
Salt	Yes	No maximum permitted levels

Conclusion

Through the concept “Back to Nourish: A Future Rooted in Nature”, this project exemplifies how culinary innovation can reflect ecological awareness and contribute to sustainability through the lens of Note-by-Note cooking. Drawing from Molecular Gastronomy principles, pure compounds were used to craft this dish. The hourglass presentation served as a metaphor for time, regeneration, and circularity. The top elements, rose water cream-cake and lavender crumble, symbolized natural potential and blossoming, while the bottom layer, edible garden soil and leaves, represented biodiversity and the return to roots. Their eventual integration within the glass mirrors how agricultural by-products, like lavender residues and dairy derivatives, can be repurposed to restore and regenerate ecosystems.

From a technical standpoint, the project succeeded in recreating creaminess using micellar casein and whey proteins without cream cheese, generating a desirable texture. The crumble effectively simulated soil and floral textures, while coral tuiles and matcha components added structural and visual diversity. Scientific understanding of emulsification, gelatinization, and gelling mechanisms guided these formulations.

Regulatory considerations were also addressed. Most ingredients fell under the *quantum satis* category in Regulation (EC) No 1333/2008. However, the use of a purple colorant containing E133 (Brilliant Blue FCF) and E102 (Tartrazine) in the lavender crumble raised concerns. While the overall use appeared safe, a hypothetical 1:1 pigment-to-colorant ratio could exceed permitted limits for desserts (150 mg/kg for E133), emphasizing the importance of verifying additive concentrations with suppliers to ensure regulatory compliance.

The dish not only fulfilled the main objectives but also embodied the message of sustainable transformation. By uniting food science with environmental storytelling, it invites us to reconsider the future of food, not just as nourishment, but as a change in our relationship with nature.

As documented in the logbooks, the project’s concept remained consistent in its core message, but several elements evolved over time to improve the overall outcome. Initially, the design included features such as a case to hold the flower or only one type of edible leaf. However, through experimentation, these components were adapted or replaced to better serve the visual and conceptual goals. This evolution highlights how initial ideas can shift and improve over time, reinforcing that flexibility and openness to change are essential in creative and scientific processes. Exploring Molecular Gastronomy and creating Note-by-Note dishes is both challenging and rewarding, demanding patience, perseverance, and curiosity. Throughout the process, mistakes become meaningful learning opportunities. Overall, these experiences deepen the understanding of the scientific principles behind science and gastronomy.

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MODULE CODE: TFCS9025
MODULE TITLE: Molecular gastronomy
STUDENT NAME: Mariana Yunuen Moreno Becerril D24127329
WEEK NO: 1 **DATE:** March 18th 2025

FOOD PRODUCT

Note by note: Back to Nourish — A Future Rooted in Nature

Concept

This dish invites reflection on time, nature, and our responsibility to nourish the Earth as it nourishes us. Presented in an hourglass-shaped glass, it symbolizes the delicate balance between what we take and give back, a metaphor for the circular economy and the need to restore harmony between humans and nature.

Inside, a vibrant edible garden grows at the base, representing soil, biodiversity, and the roots of life. At the top, flowers bloom, evoking the beauty that emerges when we choose regeneration over-extraction. An inspiration for the concept is illustrated in Figure 1.

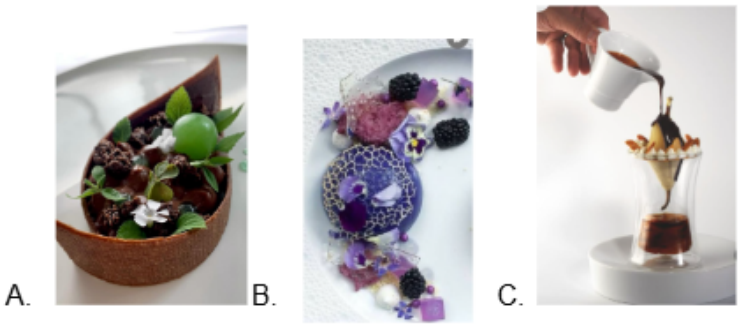


Figure 1. *A. Inspiration for the garden at the base. B. Inspiration for the flowers and berries at the top. C. Inspiration for the hourglass with two stages and liquid for nourishing*

This is a reminder that the future of food begins with returning to our roots, embracing natural cycles, and crafting a future where food heals, nourishes, and respects the planet.

Timeline

Date	Objective
Tuesday March 18th	Work on: - Flower and garden case - Earth crumble
Monday March 24th	Work: - Flower cheesecake
Monday March 31st	Improvements
Monday April 7th	Assemble the final dish

Weekly Aims and Objectives (March 18th)

- Get to know available ingredients and equipment
- Assemble the cases and earth crumble
- Evaluate texture, flavor and color of cases
- Evaluate texture, flavor and color of earth crumble

Materials and Method (Burke *et al.*, 2021)

<u>Earth-garden and flower gelatine case</u>

Table 1. Ingredients earth-garden and flower gelatine case

Ingredient	Quantity	Units	Brand	Picture
Water	30	g	-	-
Gelatin	10	g	Louis Francois	

Case earth-garden				
Brown colorant powder/ cocoa powder	0.3 5 (pinch)	g	CITAVO	
Dark chocolate flavoring	1	drop	SOSA	
Baked bread flavor (kitchen lab)	1	drop	MSK	
Case flowers				
Purple colorant powder	0.5	g	Cake decoration	
Agua de rosas Flower flavor (kitchen lab)	1	drop	SOSA	

Raspberry flavor	1	drop	MSK	

Procedure:

1. Put 30 g of water in 10 g of gelatin powder
2. Mix with a whisk until smooth
3. Split the mixture
    a. Earth case
        i. Add brown colorant powder and flower flavor
        ii. Mix with a whisk until color is smooth
        iii. Set in the microwave 30 seconds
    b. Flower case
        i. Add purple colorant powder, chocolate flavour, and baked bread flavor
        ii. Mix with a whisk untilthe color is smooth
        iii. Set in the microwave 30 seconds
4. Place in moulds

<u>Soil crumble</u>

Table 2. Ingredients earth crumble

Ingredient	Quantity	Units	Brand	Picture
Corn Flour	30	g	Gem	
Water	15	g	NA	NA

Powdered Gluten	6	g	Weizengluten	
Sucralose	20 (25 this time)	g	MYPROTEIN	
100% Pure Coconut Oil	25	g	KTC	
Brown colorant powder	3	g	CITAVO	

Dark Chocolate flavoring	1	g	SOSA	
Baked bread flavor (kitchen lab)	1	g	MSK	

Procedure:

1. Melt coconut oil.
2. Combine all of the ingredients in a medium mixing bowl.

Figure 2. *Mixture of crumble ingredients*

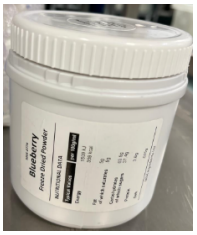
3. Transfer the dough onto a baking tray.
4. Bake in the oven for 12 minutes at 180°C.
5. After 12 minutes, take the tray out and let it cool down.

6. When the crust is cool and break it.

Flower cream cake

Table 3. Ingredients: flowers cream-cake

Ingredient	Quantity	Units	Brand	Picture
Micellar casein	25	g	MY PROTEIN	
Whey protein	5	g	Sports Supplements Limited t/a Bulk™	
Skimmed milk powder	10	g	Millac value	
Sucrose (sugar)	40	g	Gem	-
Iota carrageenan	2	g	MSK	

Lechitin	0.5	g	SOSA	
Water	250	g	-	-
Rose water flavor	1	drop	Sosa	
Lactic acid 1g	1	g	MSK	
Blueberry flavor	1	drop	MSK	
Lila colorant	0.5 (pinch)	g	SOSA	
Freeze dried blueberry	3	g	MSK	

Procedure

1. In a medium bowl, mix the micellar casein, whey protein, sugar, milk powder, iota carrageenan, lecithin, and water.
2. Heat until it comes to a simmer.
3. Reduce heat to low and stir for 5 minutes.
4. Remove from heat and add the lactic acid, flavors and colorant.
5. Add in silicon mold blueberry in powder and non-stick spray and pour the mixture.
6. Let it set in the fridge for 40 minutes.
7. Once it has set, remove it from the mold.

Results and discussion

For the gelatin case

In the case of the flower element (Figure 3), the case did not fit properly in the hourglass structure, indicating that this element won't be useful. For the earth element (Figure 4), the color appeared too light compared to the desired visual effect, suggesting the need for pigment adjustment (such as adding cocoa powder) to achieve a darker, more soil-like appearance.

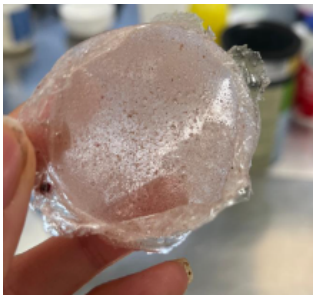


Figure 3. *Flower gelatin case*

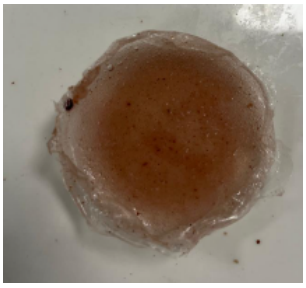


Figure 4. *Soil gelatin case*

For the crumble

The flavor of the crumble was **excessively strong** and will need to be reduced by approximately threefold. While the cooking time and color were adequate, it is necessary to reduce the intensity of the aftertaste to improve overall sensory acceptance.

Due to the unavailability of potato flour, it was substituted with cornflour, which proved to be an effective alternative. The baking time and resulting texture were optimal as seen in Figures 5 and 6.

Figure 5. *"Soil" crumble after baking*

Figure 6. *"Soil" crumbles upon breaking, giving a crumb-like texture*

As illustrated in Figure 7, the crumble effectively mimicked the appearance of soil. However, the gelatin cases lacked sufficient firmness and were visually concealed by the crumble, indicating that their inclusion in the final dish may be unnecessary.

Figure 7. *"Soil" crumbles within the hourglass structure*

Conclusion

The development of the first part of the dish (earth) demonstrated successful visual and textural mimicry of natural elements, particularly with the crumble, which effectively replicated the appearance of the soil. However, the flavor intensity of the crumble was found to be excessive and must be significantly reduced to improve sensory acceptance. The substitution of potato flour with cornflour was successful, having no negative impact on texture or baking performance. While the baking time and texture were optimal, some elements, such as the gelatin cases, did not perform as intended due to insufficient firmness and being obscured by the crumble. Their removal from the final dish should be considered to enhance overall visual clarity and composition. Further adjustments in formulation for next weeks and presentation are recommended to refine both sensory and structural aspects of the final dish.

Recommendations for following week.

Crumble:

- Reduce flavour intensity (use only 1 drop of chocolate and 1 drop of bread flavouring).
- Break more of the crumble to achieve the desired crumb texture.

Gelatin Cases:

- Do not use them and create a cream-cake that it's big enough to hold itself.

New possible ideas:

- Create the flower stem using spaghetti gel.
- Design a decorative net to place on top of the flower element.

References

Burke, R., Kelly, A., Lavelle, C. & This Vo. Kientza, H. (Eds) (2021). Handbook of Molecular Gastronomy: Scientific Foundations, Educational Practices, and Culinary Applications. Handbook of Molecular Gastronomy: Scientific Foundations, Educational (routledge.com) CRC Press. (Published on June 9th 2021).

MODULE CODE: TFCS9025
MODULE TITLE: Molecular gastronomy
STUDENT NAME: Mariana Yunuen Moreno Becerril D24127329
WEEK NO: 2 **DATE:** March 24th, 2025

FOOD PRODUCT

Note by note: Back to Nourish — A Future Rooted in Nature

Concept

This dish invites reflection on time, nature, and our responsibility to nourish the Earth as it nourishes us. Presented in an hourglass-shaped glass, it symbolizes the delicate balance between what we take and give back, a metaphor for the circular economy and the need to restore harmony between humans and nature.

Inside, a vibrant edible garden grows at the base, representing soil, biodiversity, and the roots of life. At the top, flowers bloom, evoking the beauty that emerges when we choose regeneration over-extraction. An inspiration for the concept is illustrated in Figure 1.

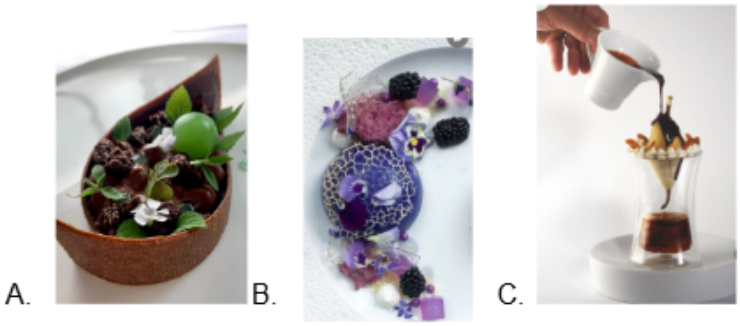


Figure 1. *A. Inspiration for the garden at the base. B. Inspiration for the flowers and berries at the top. C. Inspiration for the hourglass with two stages and liquid for nourishing*

This is a reminder that the future of food begins with returning to our roots, embracing natural cycles, and crafting a future where food heals, nourishes, and respects the planet.

Timeline

Date	Objective
Tuesday March 18th	Work on: - Flower and garden case - Earth crumble
Monday March 24th	Work: - Flower cheesecake
Monday March 31st	Improvements
Monday April 7th	Assemble the final dish

Weekly Aims and Objectives (March 24th)

- Create the flower cheesecake
- Improve the earth crumble
    - Reduce flavour intensity (use only 1 drop of chocolate and 1 drop of bread flavouring).
    - Break more the crumble to achieve the desired crumb texture.

Materials and Method (Ingredients, Equipment and Method)

<u>Soil crumble</u>

Table 1. Ingredients earth crumble

Ingredient	Quantity	Units	Brand	Picture
Corn Flour	30	g	Gem	

Water	15	g	NA	NA
Powdered Gluten	6	g	Weizengluten	
Sucralose	25	g	MYPROTEIN	
100% Pure Coconut Oil	25	g	KTC	
Brown colorant powder	5	g	CITAVO	

Dark Chocolate flavoring	1	drop	SOSA	
Baked bread flavor (kitchen lab)	1	drop	MSK	

Procedure:

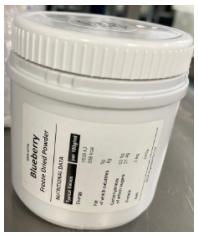
1. Melt coconut oil.
2. Combine all of the ingredients in a medium mixing bowl.
3. Transfer the dough onto a baking tray.
4. Bake in the oven for 12 minutes at 180°C.
5. After 12 minutes, take the tray out and let it cool down.
6. When the crust is cool and break it.

Flower cream cake

Table 2. Ingredients: flowers cream-cake

Ingredient	Quantity	Units	Brand	Picture

Micellar casein	25	g	MY PROTEIN	
Whey protein	5	g	Sports Supplements Limited t/a Bulk™	
Skimmed milk powder	10	g	Millac value	
Sucrose (sugar)	40	g	Gem	-
Iota carrageenan	2	g	MSK	
Lechitin	0.5	g	SOSA	
Water	250	g	-	-

Rose water flavor	1	drop	Sosa	
Lactic acid 1g	1	g	MSK	
Blueberry flavor	1	drop	MSK	
Lila colorant	0.5 (pinch)	g	SOSA	
Freeze dried blueberry	3	g	MSK	

Procedure

1. Mix micellar casein, whey protein, sugar, milk powder, iota carrageenan, lecithin, and water.
2. Heat until it comes to a simmer.
3. Reduce heat to low and stir for 5 minutes.
4. Remove from heat and add the lactic acid, flavors and colorant.
5. Add in silicon mold blueberry in powder and non-stick spray and pour the mixture.

6. Let it set in the fridge for 40 minutes.
7. Once it has set, remove it from the mold.

Results and discussion

For the crumble

This time, the flavoring of the crumble was reduced to one drop for dark chocolate and baked bread, leading to a better final taste. The cocoa powder was also increased from 3 g to 5 g, resulting in a darker color. Additionally, the crumble was crushed to achieve an appearance more similar to soil. Figure 3 shows the differences between the first and second trials. For this reason, the recipe will retain these final adjustments.

A.  B. 

Figure 3. *"Soil" crumbles upon breaking, giving a crumb-like texture . A. Result week 1. B. Result week 2*

For the cream-cake

The texture of the cream-cake was not as expected (Figure 4). For this reason, it is recommended to try again without adding the lyophilized berries, as they may affect the food matrix. However, the flavor was well-balanced, which provided a floral note. Moreover, the cream-cakes will be kept in the freezer longer, as they were not yet fully set.

Figure 4. *Result of cream-cake*

Conclusion

The recipe modifications led to a better crumble flavor and a darker color, achieving a more soil-like appearance. However, the cream-cake's texture was compromised, possibly due to the lyophilized berries. While the flavour provided a pleasant floral note, adjustments are needed, including removing the berries and extending freezing time to improve consistency.

Recommendations for following week.

Soil

- Instead of using sucralose, try using caster sugar as the Maillard reaction could end in a better final texture and flavour.

Cream - cake

- Do not add freeze-dried ingredients to avoid affecting the texture.
- Work with two versions: one with purple colorant and one without to determine if there are significant differences in brightness.
- Put in a bigger mold so it can cover the diameter of the hourglass top
- As enough cream-cake is obtained, split the mixture and create leaves by adding them matcha, green colorant, and carvona flavour.

Create Tuiles

- Create leaves for the garden with coral tuiles and add green colorant and greena flavor.

New Ideas:

- Shape the cream-cake with a knife to create the petals

References

Burke, R., Kelly, A., Lavelle, C. & This Vo. Kientza, H. (Eds) (2021). Handbook of Molecular Gastronomy: Scientific Foundations, Educational Practices, and Culinary Applications. Handbook of Molecular Gastronomy: Scientific Foundations, Educational (routledge.com) CRC Press. (Published on June 9th 2021).

MODULE CODE: TFCS9025
MODULE TITLE: Molecular gastronomy
STUDENT NAME: Mariana Yunuen Moreno Becerril D24127329
WEEK NO: 3 **DATE:** March 31st, 2025

FOOD PRODUCT

Note by note: Back to Nourish — A Future Rooted in Nature

Concept

This dish invites reflection on time, nature, and our responsibility to nourish the Earth as it nourishes us. Presented in an hourglass-shaped glass, it symbolizes the delicate balance between what we take and give back, a metaphor for the circular economy and the need to restore harmony between humans and nature.

Inside, a vibrant edible garden grows at the base, representing soil, biodiversity, and the roots of life. At the top, flowers bloom, evoking the beauty that emerges when we choose regeneration. An inspiration for the concept is illustrated in Figure 1.

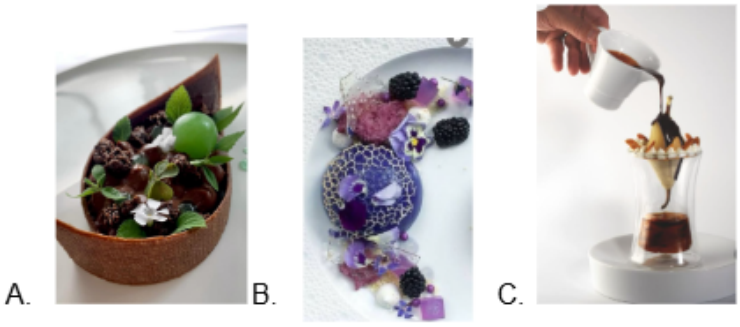


Figure 1. *A. Inspiration for the garden at the base. B. Inspiration for the flowers and berries at the top. C. Inspiration for the hourglass with two stages and liquid for nourishing.*

This is a reminder that the future of food begins with returning to our roots, embracing natural cycles, and crafting a future where food heals, nourishes, and respects the planet.

From earth we rise, in cycles we return

Timeline

Date	Objective
Tuesday March 18th	Work on: - Flower and garden case - Earth crumble
Monday March 24th	Work: - Flower cheesecake - Improve crumble
Monday March 31st	Work: - Improve cheesecake and create leaves with it - Create Coral Tuiles
Monday April 7th	Work - Assemble the dish

Weekly Aims and Objectives (March 31st)

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1. Improve Cheesecake

- Do not add freeze-dried ingredients to avoid affecting the texture.
    - Work with two versions: one with purple colorant and one without to determine if there are significant differences in brightness.
    - Put in a bigger mold so it can cover the diameter of the hourglass top, and find leave molds for the hourglass base.
    - Create matcha leaves with it

2. Create coral tuiles as leaves

Materials and Method (Burke *et al.*, 2021)

Table 1. Ingredients soil and lavender crumble

Ingredient	Quantity	Units	Brand	Picture
Corn Flour	30	g	Gem	
Water	15	g	-	-
Powdered Gluten	6	g	Weizengluten	
Sugar	20	g	Gem	
100% Pure Coconut Oil	25	g	KTC	
Cocoa powder	5	g	CITAVO	

Dark Chocolate flavoring	0.5	g	SOSA	
Baked bread flavor	0.5	g	MSK	

Table 2. Ingredients flower and leaves cream-cake

Ingredient	Quantity	Units	Brand	Picture
Micellar casein	25	g	MY PROTEIN	
Whey protein	5	g	Sports Supplements Limited t/a Bulk™	
Skimmed milk powder	10	g	Millac value	

Sugar	40	g	Gem	
Iota carrageenan	2	g	MSK	
Soy lechitin	0.5	g	SOSA	
Water	250	g	-	-
“Vanilla” flavor	2	g	Eurovanille	
Rose water concentrate	1	Drop	Sosa	

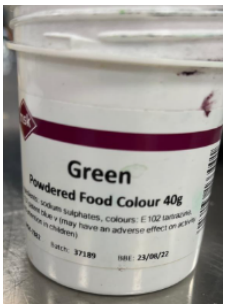
Lactic acid	2	g	MSK	
Green colour	0.3	g	MSK	
Matcha	3	g	SOSA	
Greena flavor	1	drop	MSK	

Table 3. Ingredients Coral Tuiles

Ingredient	Quantity	Units	Brand	Picture

Corn Flour	15	g	Gem	
Water	100	g	-	-
Sunflower Oil	30	g	Mediterani	
Green apple colorant	7	Drops	Mallard ferriere	
Carvone flavor	1	drop	MSK	

Salt	1	g	-	-

Results and discussion

The texture of the cheesecake was as expected, as well as the flavor. For the moment, the formula will remain the same. The coral tuiles also turned out as expected. The only change is that it is now necessary to shape a flower on top. The matcha leaves also had a good flavor and color, however, they don't look like leaves. for this reason, it is important to work with the final presentation of the dish.

The change of sucralose for sugar in the soil worked better and, as expected ,gave better taste and texture, which will be kept for the final dish.

The coral tuiles had the expected shape, which proved a contrast to the dish.

Figure 2. *Result of cheesecake*

Conclusion

The changes made this week led to better results in terms of flavor and texture. However, for next week, it will be necessary to work on the final appearance and the creation of the flowers and veins of the leaves to give the resemblance to the initial concept and garden elements. However, in terms of formulation it will remain as it was proposed.

Recommendations for following week.

- Create a better design by shaping the veins and petals of the flower and leaves.
- With the current formulation for soil crumble, split the mixture and create lavender crumble (with purple colorant and lavender flavor) to create the lavender element, and give more elements to the flower on top.

References

Burke, R., Kelly, A., Lavelle, C. & This Vo. Kientza, H. (Eds) (2021). Handbook of Molecular Gastronomy: Scientific Foundations, Educational Practices, and Culinary Applications. Handbook of Molecular Gastronomy: Scientific Foundations, Educational (routledge.com) CRC Press. (Published on June 9th 2021).

MODULE CODE: TFCS9025
MODULE TITLE: Molecular gastronomy
STUDENT NAME: Mariana Yunuen Moreno Becerril D24127329
WEEK NO: 4 **DATE:** April 7th, 2025

FOOD PRODUCT

Note by note: Back to Nourish — A Future Rooted in Nature

Concept

This dish invites reflection on time, nature, and our responsibility to nourish the Earth as it nourishes us. Presented in an hourglass-shaped glass, it symbolizes the delicate balance between what we take and give back — a metaphor for the circular economy and the need to restore harmony between humans and nature.

Inside, a vibrant edible garden grows at the base, representing soil, biodiversity, and the roots of life. At the top, flowers bloom, evoking the beauty that emerges when we choose regeneration. An inspiration for the concept is illustrated in Figure 1.

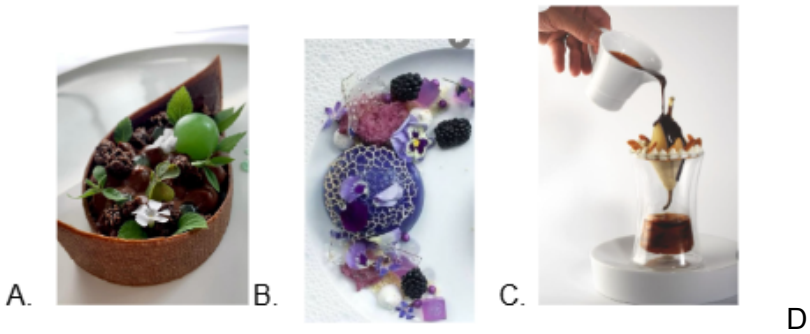


Figure 1. *A. Inspiration for the garden at the base. B. Inspiration for the flowers and berries at the top. C. Inspiration for the hourglass with two stages and liquid for nourishing.*

This is a reminder that the future of food begins with returning to our roots, embracing natural cycles, and crafting a future where food heals, nourishes, and respects the planet.

From earth we rise, in cycles we return

Timeline

Date	Objective
Tuesday March 18th	Work on: - Flower and garden case - Earth crumble
Monday March 24th	Work: - Flower cheesecake - Improve crumble
Monday March 31st	Work: - Improve cheesecake and create leaves with it - Create Coral Tuiles
Monday April 7th	Work - Create lavender crumbles - Shape the flower - Assemble the dish

Weekly Aims and Objectives (April 7th)

- Create the final dish
- Create an aesthetic design by shaping the veins and petals of the flower and leaves.
- With the current formulation for soil crumble, split the mixture and create lavender crumble to create the lavender element, and give more elements to the flower on top.

Materials and Method (Burke *et al.*, 2021)

Table 1. Ingredients soil and lavender crumble

Ingredient	Quantity	Units	Brand	Picture

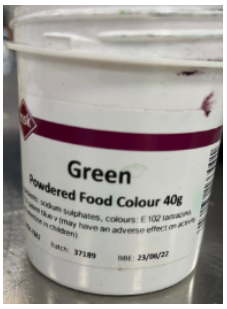
Corn Flour	30	g	Gem	
Water	15	g	-	-
Powdered Gluten	6	g	Weizengluten	
Sugar	20	g	Gem	
100% Pure Coconut Oil	25	g	KTC	
Cocoa powder	5	g	CITAVO	

Purple gel concentrate	0.5	g	Cake decoration	
Dark Chocolate flavoring	0.5	g	SOSA	
Baked bread flavor	0.5	g	MSK	
Lavender flavor	1	Drop	Sosa	

Table 2. Ingredients flower and leaves cream-cake

Ingredient	Quantity	Units	Brand	Picture
Micellar casein	25	g	MY PROTEIN	

Whey protein	5	g	Sports Supplements Limited t/a Bulk™	
Skimmed milk powder	10	g	Millac value	
Sugar	40	g	Gem	
Iota carrageenan	2	g	MSK	
Soy lechitin	0.5	g	SOSA	
Water	250	g	-	-

“Vanilla” flavor	2	g	Eurovanille	
Rose water concentrate	1	Drop	Sosa	
Lactic acid	2	g	MSK	
Green colour	0.3	g	MSK	
Matcha	3	g	SOSA	

Greena flavor	1	drop	MSK	

Table 3. Ingredients Coral Tuiles

Ingredient	Quantity	Units	Brand	Picture
Corn Flour	15	g	Gem	
Water	100	g	-	-
Sunflower Oil	30	g	Mediterani	

Green apple colorant	7	Drops	Mallard ferriere	
Carvone flavor	1	drop	MSK	
Salt	1	g	-	-

Results and discussion

The texture of the cheesecake met expectations, and all procedures were carried out consistently, yielding reproducible results. The final dish was not only visually appealing but also demonstrated a well-balanced flavor profile compared to the initial formulations. There was a challenge in shaping the flower; although it held its form, it required additional refrigeration time. After setting for approximately 40 minutes, the petals could be shaped successfully. Additionally, it is important to ensure that the lavender crumble is properly homogenized, as some portions showed uneven coloring. For plating, the pieces with more intense color were selected.

Figure 2. *Result of final dish*

Conclusion

In conclusion, the final dish successfully achieved both visual appeal and a balanced flavor profile, aligning with the initial goals. Minor technical adjustments—such as extended setting time for shaping and improved homogenization of the lavender crumble—highlight the importance of precision in execution. These refinements contribute to a more consistent and aesthetically cohesive final product, demonstrating the value of iteration and attention to detail in culinary development.

References

Burke, R., Kelly, A., Lavelle, C. & This Vo. Kientza, H. (Eds) (2021). Handbook of Molecular Gastronomy: Scientific Foundations, Educational Practices, and Culinary Applications. Handbook of Molecular Gastronomy: Scientific Foundations, Educational (routledge.com) CRC Press. (Published on June 9th 2021).