MOLECULAR GASTRONOMY

NOTE-BY-NOTE REPORT
DISH: THE ASTRAL DISH

Course: Advanced Molecular Gastronomy (TFCS9025)
Student: Mary Kei Rojas Mezarina (D24127342)
Professor: Pauline Danaher

May 07th, 2025

TABLE OF CONTENT

I. INTRODUCTION

Note-by-note cuisine represents a transformative approach to cooking, in which dishes are constructed from pure molecular compounds rather than traditional whole ingredients. This concept was pioneered by Hervé This in 1994. According to This (2014), it is a method for creating food using individual compounds, which can be either naturally extracted or synthetically produced. The author highlights that compounds remain chemically identical regardless of their source; for example, tap water is considered a compound under chemical analysis. In a later publication, This (2016) emphasised that the primary concern is ensuring the compounds are food-grade, and that the cost and sustainability of their production must be considered in the future.

In many applications of molecular gastronomy, ingredients such as hydrocolloids and gelling agents (e.g., agar-agar and gelatine) are employed. These allow for freedom in the design of a product's composition, structure, texture, and flavour. Additionally, emerging technologies such as 3D food printing contribute to the advancement of personalised and structurally complex foods (Burke et al., 2020).

Although note-by-note cuisine may appear theoretical, chefs have already produced visually striking and technically sophisticated dishes using pure molecular compounds, such as the blue *bouchée ultra*, amylopectin tarts, and bubble cocktails. These examples demonstrate the culinary and artistic potential of this method, even though it remains in an experimental phase, primarily explored by elite chefs with the necessary time and resources. Hervé This emphasises that the primary goal of note-by-note cooking is to provide pleasure, not merely to showcase technical innovation, thereby challenging conventional perceptions of food and expanding the boundaries of culinary creativity (Wurgaft, 2015).

The note-by-note concept supports innovation and fosters creativity in the development of new food products. It has been integrated into academic programmes in both food science and culinary arts and has led to the establishment of international competitions (Burke et al., 2016).

The International Contest for Note-by-Note Cuisine selected the theme "Food for the Future" to address the global need for sustainable and nutritious food solutions. This theme is aligned with the Sustainable Development Goals (SDGs) of the 2030 Agenda for Sustainable Development, which include producing more food using less and cleaner energy (SDG 7), reducing food waste (SDG 12), improving health through safe and nutritious food (SDG 3), and promoting sustainable agrifood systems that can help mitigate water scarcity (SDG 6) (FAO, n.d.).

II. AIM

Aim: Develop a savoury note-by-note dish using pure compound ingredients, in order to be aligned with the topic of the 13th International Contest for Note-by-Note Cuisine, Food for the Future.

Objectives:

- Obtain the final formulation for the savoury dish of a chicken-flavoured filling and a cheese-flavoured ball with mushroom sauce and sugar stars, based on an astral theme.
- Create a note-by-note dish which addresses the challenges of the future of food.
- Evaluate consumer acceptance and perceptions with a sensory analysis of the final dish.

III. MATERIAL AND METHODS

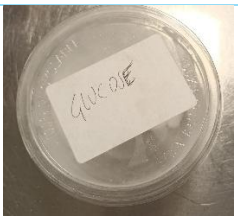
3.1 Ingredients

The dish has three main components, the cheese-flavoured ball with chicken-flavoured-filling, a mushroom sauce and the sugar stars. In Table 1, it is shown the ingredients used in the preparation of each part of the dish.

Table 1. Ingredients used in the preparation of the dish

Element of the dish	Ingredients	Brand/ Model	Picture
Plant based-chicken	169 mL Tap water	N.A.	
	40 g Pea protein	Bulk	
	4 g Corn starch (Corn flour)	Gem	
	5 g Nutritional yeast	Special Ingredients	

	2 g Monosodium glutamate	Ajinomoto	
	0.6 g Xanthan gum	Sosa	
	1.3 g Salt	N.A.	
	0.3 g Chicken flavouring	Special Ingredients	
Cheese balls	75mL Water	N.A.	
	40 g Potato starch	Family Elephant	
	2 g Xanthan gum	Sosa	
	2 g Egg white proteins	Louis Francois	

	3.8 g Sunflower oil	Floil	
	1 g Salt	N.A.	
	0.02 g blue colouring	MSK	
	0.04 g purple colouring	Sosa	
	0.3 g Cheddar cheese flavour	MSK	
Mushroom sauce	50 g glucose powder	N.A.	
	2g tartaric acid	MSK	
	500 ml water	N.A.	
	7 g corn flour	Gem	

	20 g potato starch	Family Elephant	
	0.5 g mushroom flavouring	Kitchen Lab Food	
	0.04 g purple food colorant	Sosa	
	0.05 g Yellow food colorant	Mallard Ferriere	
	0.05 g Brown food colorant	Colour Splash Classic	
Sugar starts	80 g caster sugar	N.A.	
	10 ml water	N.A.	

3.2 Materials

- 2 Steel bowl (medium)
- 2 Steel bowl (small)

- 2 Dessert spoon
- 1 Balloon whisk (medium)
- 3 Plastic pipette
- 1 Weighing scales
- 2 small pot
- 2 Small laddle
- 1 Baking tray
- 1 Half sphere silicone mould 6 cm
- 1 Parchment paper

3.3 Equipment

- Scale
- Kitchen Stove

Figure 1. Kitchen stove

- Fridge
- Electrolux SkyLine Premium Oven

Figure 2. Electrolux oven

3.4 Methods

1) The steps to prepare the chicken-flavoured filling were:

1. The whey protein was dissolved with nutritional yeast, monosodium glutamate, and salt.
2. A total of 119 ml of water was mixed in to dissolve the ingredients.
3. In another bowl, the maize starch was dissolved in 50 ml of water.

4. The solution of water with the other ingredients was brought to a boil.
5. The maize starch mixture was added, and the combined mixture was cooked at 45°C for 10 minutes.
6. Whey protein and the other ingredients were added to the mixture.
7. Vegan chicken flavouring was stirred in.
8. While the dough was still warm, small portions were taken and placed in silicone moulds.
9. The moulds were then refrigerated for at least 10–15 minutes to firm up.

2) To make the cheese-flavoured balls:

1. Weighed out all ingredients.
2. 75 mL water was heated at 60-70°C.
3. Xanthan gum was slowly whisked in while stirring continuously, allowing it to hydrate for 5–10 minutes until a smooth, slightly thick liquid formed.
4. In a separate bowl, mixed potato starch and salt.
5. Egg white proteins were mixed in well with the dry ingredients.
6. The hydrated hydrocolloid mixture was gradually poured in while stirring.
7. Sunflower oil was added and mixed thoroughly.
8. Potato flavouring was stirred into the mixture.
9. Split the dough in 3 different bowls and add colorants blue and purple
10. The dough was divided into three bowls, and blue and purple colorants were added. It was kneaded until smooth, slightly sticky, and able to hold its shape.
11. The dough was allowed to rest for 10–15 minutes at room temperature to ensure full hydration and binding.

Assembly & Cooking Process

1. The oven was preheated to 180°C.
2. A small amount of the cheese gel mixture was flattened in silicone moulds.
3. A small scoop of the plant-based chicken core was placed inside. More cheese gel was carefully placed over the filling.
4. The moulds were baked at 180°C for 10 minutes.

3) To make the mushroom sauce:

1. Glucose was melted, and tartaric acid was added in 500 ml of water.
2. The mixture was brought to a boil and thickened with corn starch and potato starch.
3. Off heat, a drop of mushroom flavouring was added.
4. The sauce was divided into three bowls, each with different colorants (brown, purple, and yellow).

4) To make the sugar stars:

1. The sugar was weighed.
2. Water was added, and the mixture was stirred in a pot.
3. The mixture was heated until the sugar dissolved.
4. It was brought to a boil without stirring until it reached a medium caramel colour.

5. The caramel was poured onto parchment paper and left to cool.

IV. RESULTS

4.1 Final formulations

To validate the EU regulations about the additive's concentration in the product and to contrast with other recipes in the discussion section, the final formulations were determined.

a) Vegan chicken filling

Table 2. Final formulation for vegan chicken filling

Ingredients	**g**	**%**
Water	169	76.1
Pea protein	40	18
Corn flour	4	1.8
Nutritional yeast	5	2.25
Monosodium glutamate	2	0.9
Xanthan gum	0.6	0.27
Salt	1.3	0.59
Chicken flavouring	0.3	0.14
Total	222.2	100

b) Cheese-flavoured balls

Table 3. Final formulation for cheese-flavoured balls

Ingredients	**g**	**%**
Water	75	60.4
Potato starch	40	32.2
Xanthan gum	2	1.61
Egg white proteins	2	1.61
Sunflower oil	3.8	3.06
Salt	1	0.81
Blue colouring	0.02	0.02
Purple colouring	0.04	0.03
Cheedar cheese flavouring	0.3	0.24
Total	124.16	100

c) Mushroom sauce

Table 4. Final formulation for mushroom sauce

Ingredients	**g**	**%**

Glucose powder	50	8.63
Tartaric acid	2	0.35
Water	500	86.3
Corn flour	7	1.21
Potato starch	20	3.45
Mushroom flavouring	0.5	0.09
Purple food colorant	0.04	0.01
Yellow food colorant	0.05	0.01
Brown food colorant	0.05	0.01
Total	579.64	100

d) Sugar stars

Table 5. Final formulation for sugar stars

Ingredients	**g**	**%**
Caster sugar	80	88.9
Water	10	11.1
Total	90	100

4.2 Final dish

The result of the dish is shown in Figure 3, where it can be seen the three main compounds of it. The galaxy that is mimic with a mushroom sauce, the planets which represent cheese ball with chicken flavouring filling, and the sugar decorations.

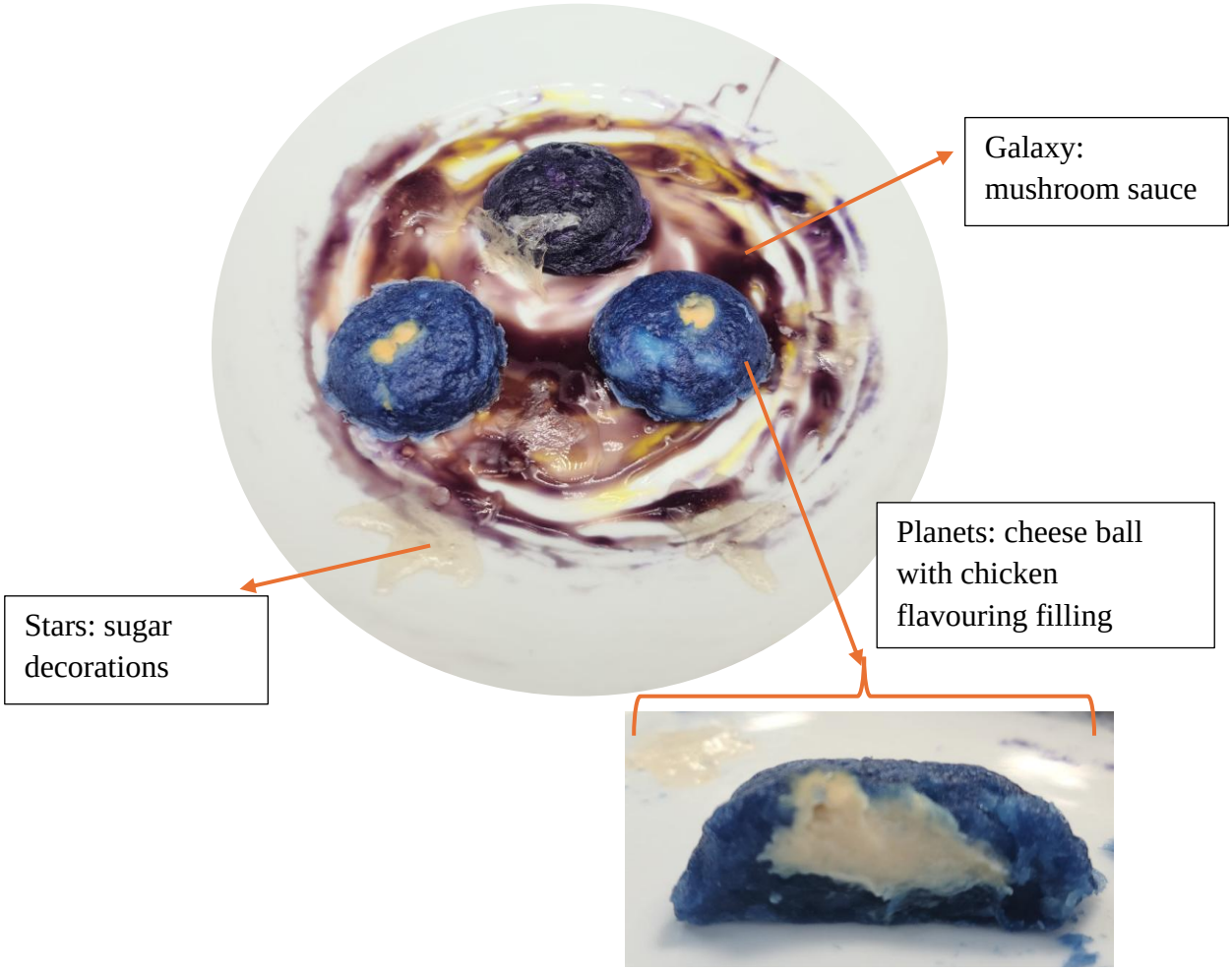


Figure 3. Final "Astral dish" after platting

4.3 Sensory analysis

A hedonic sensory analysis using a 9-point scale was conducted in the final dish, with eight participants. The results are presented in the Figures 4 to 11.

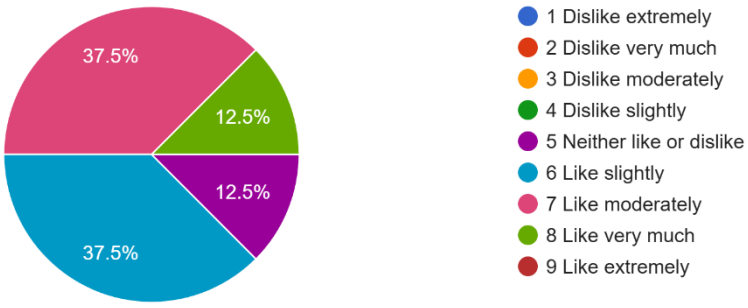


Figure 4. Visual appearance

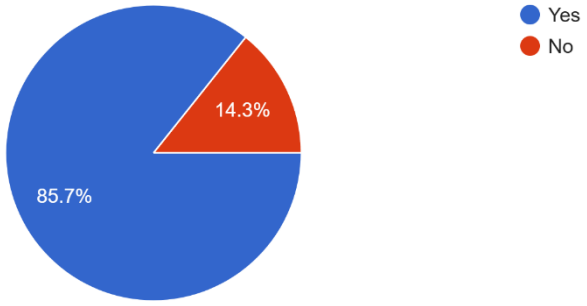


Figure 5. Appealing as an appetizer

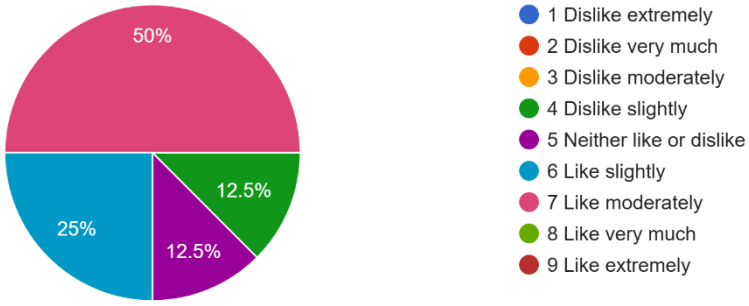


Figure 6. Colours of the dish

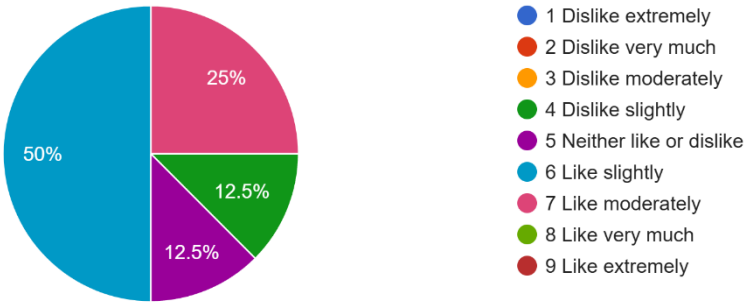


Figure 7. Taste of the cheese ball with the chicken filling

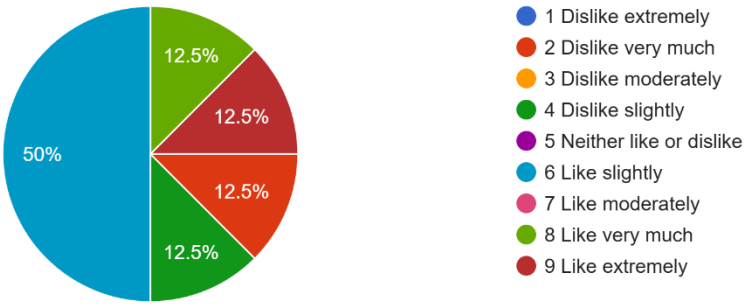


Figure 8. Texture of the dish

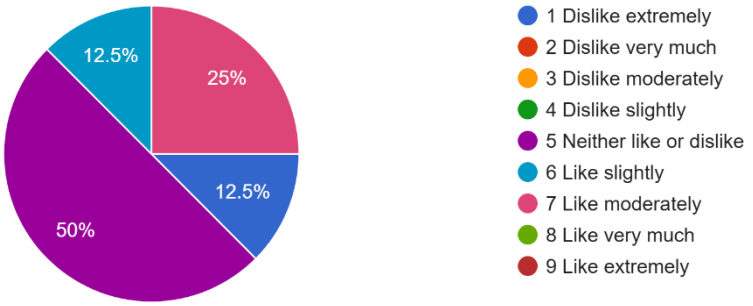


Figure 9. Aftertaste of the dish

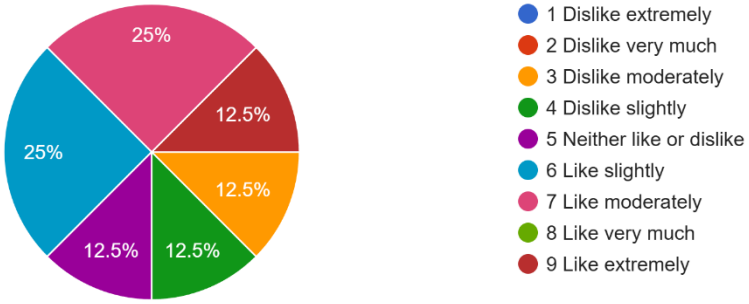


Figure 10. Overall acceptability of the dish

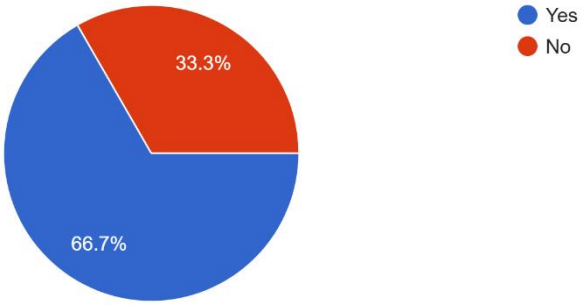


Figure 11. Balance of the flavours

V. DISCUSSION

5.1 Creation overview

The “Astral Dish” mimic an appetiser of the future. The space thematic try to show a panoramic view of a constellation, and it is related to future space exploration and human life beyond Earth.

It is related with food for the future concept primary because it tries to make a cheaper high protein plant-based dish. For this, uses the chickpea protein to mimic the texture of chicken protein.

Additionally, there is a sustainability factor contemplated in the dish because it uses plant-based ingredients and pure compounds. This concept aligns with FAO (n.d.) mention about the vision for a world free of hunger, with social justice and a healthy natural environment. Instead of using meat, it is more sustainable to use plant-based products due to having less carbon footprint; and the concept of a savoury appetiser is related to the access to a universal food for everyone, trying to make a healthy product that gives carbohydrates and protein in a good balance.

5.2 Flavoured-cheese balls with vegan-chicken flavouring

Firstly, the plant-based chicken was successfully developed in terms of texture and flavour. It was a gel structure form due to corn starch and xanthan gum. The pea protein gives protein content in replacement to protein meat. Dahal *et al.* (2025) explains that adding starch to meat alternative products modulates functionality and sustainability. Endogenous starch, primarily from peas, is prominent in plant-based products because pea protein is mainly used to formulate meat alternatives; as well as exogenous sources of starch such as corn, it acts as fillers to increase the volume and water binding, thus improving the texture of meat alternatives.

This is why the texture was easy to make using corn flour, and having a base of pea protein that also helps to achieve the final structure, as it can be appreciated in Figure 12.

Figure 12. Vegan-chicken after integration of ingredients

On the other hand, xanthan gum plays an important role in the vegan chicken filling because it thicks the solution, the concentration used was 0.27%. Majzoobi *et al.* (2017) explain that this is an anionic polysaccharide and is produced by the bacterium *Xanthomonas campestris.* This hydrocolloid has been used in different food products due to their gelling, thickening, emulsifying and stabilising properties. Regarding the concentration used it seems accurate and

enough, Majzoobi *et al.* (2017) indicated that values below 0.6% were recommended in vegan sausages.

The used of xanthan gum by the Regulation (EC) No 1333/2008 is permitted under the principle of *quantum satis*. This means that it is listed as an authorized food additive, meaning it can be used as needed to achieve the desired effect, provided it does not mislead the consumer and is used in accordance with good manufacturing practice.

Regarding the vegan meat chicken flavouring, it is composed from natural flavouring substances. The use of this additive complies with Regulation (EC) No 1334/2008, who indicated it must be used in *quantum satis*. The dosage used in the dish is below the maximum recommended of 1% (Special Ingredients, n.d.).

The cheese ball formed a solid gel after the baking process. The main ingredient was the potato starch with 32% of the final ball. Potato starch undergoes a process called gelatinization; it gelatinizes at relatively low temperatures. Tiefenbacher (2018) explains: "when potato starch is heated in the presence of water during baking, the granules absorb water and swell. At around 60–70 °C, the starch begins to gelatinize, disrupting its crystalline structure. This process continues as the temperature rises, causing the granules to burst and release amylose, which forms a gel-like network. Upon cooling, this contributes to the firm texture and crumb structure in baked products." This is the reason after the baking process, the texture was similar to a cheese, and it was possible to see structured gel.

In relation to the colourants used in the cheese ball structure, the concentrations also comply with REGULATION (EC) No 1333/2008. The blue colorant from MSK has as a major compound Patent Blue V (E131) (Caterite, 2025). Considering its application as vegetable preparations the maximum amount is 200 ppm, which is the amount used in the formulation. Also, the purple colorant from Sosa has as an active compound anthocyanin, and its dosage is *quantum satis*.

5.3 Mushroom sauce

The mushroom sauce is a liquid gel which was able to thick due to the corn flour and potato starch, a difference between the sauce and the flavoured cheese ball was the amount of starch incorporated to the formulation. For the sauce, 1% of corn flour and 3.45% of potato starch were added. Shiotsub (1982) found a gelatinization temperature of potato starch at 61.1°C. At the beginning of the heating, the starch absorbs some water, and when the gelatinization begins, the granules swell and disintegrate as the temperature rises, making the solution thicker and translucent.

Jimenez et al. (2024) used 2.38% of potato modified starch in Alfredo sauce obtaining good results as a thickening agent. This is why, the concentration of potato starch can be reduced for future trials, while controlling the gelatinization temperature.

The glucose powder was added to give sweetness to the sauce and the tartaric acid (E334) had the role of acidity regulator and perform in the gelatinisation, improving texture and viscosity. According to Regulation (EC) No 1333/2008, the maximum limit of tartaric acid in sauces is 4 000 ppm or 0.4%. The amount of this additive used in the mushroom sauce is 0.35% being lower than the maximum.

The mushroom flavouring complies with Regulation (EC) No 1334/2008 as used in *quantum satis*. Therefore, it should not pose a safety risk for consumers regarding this flavouring.

In terms of food colourants in the sauce, the purple one was already analysed, and it only need to be administrative with good manufacturing practices. The yellow one contains E102; and the brown is a mix of allura red E129, tartrazine E102, brilliant blue E133, vegetable carbon E153.

5.4 Sugar starts

The sugar starts are sugar that crystallized after been heated and cool down. Sugars such as glucose or sucrose can crystallise after being dissolved, heated, and then allowed to cool. During heating, sugar dissolves completely in water, forming a solution. Upon cooling, if the solution is supersaturated, sugar molecules begin to re-align and form crystals. This process is influenced by factors such as concentration, cooling rate, and the presence of interfering agents like acids or other sugars.

5.5 Sensory analysis

Regarding the sensory analysis, the hedonic sensory analysis provided valuable insights into the acceptability of the dish. The evaluation was conducted with eight untrained panellists using a 9-point hedonic scale, assessing visual appearance, appetizing appeal, colour, texture, taste, aftertaste, balance of flavours, and overall acceptance.

According to the results (Figures 4–11), the visual presentation received positive feedback, likely due to the vivid colours and space-themed arrangement, with results of 37.5% liked it moderately and the other 37.5% liked slightly. The appealing nature of the dish as an appetizer also scored well, with most participants (85.7%) finding the dish visually and conceptually engaging.

The taste and texture of the cheese ball with chicken-flavoured filling received moderate ratings, suggesting the structure and flavour delivery were satisfactory but could be further improved. 50% of the responders said they liked the taste and texture slightly. Regarding the aftertaste was reported to be slightly intense by some participants, possibly due to the concentration of flavouring agents or the presence of hydrocolloids.

The overall acceptability showed 25% of participants liked it slightly, 25% liked it moderately and 12,5% liked extremely. These results indicate a general approval but confirm there are some opportunities of refinement, especially in flavour and texture.

On the other hand, the balance of flavours was appreciated by 66% of responders who said they liked the flavour balance. However, there are comments from participants suggested that it could be improved.

In summary, the sensory evaluation highlighted that the concept and formulation were well received, especially the visual and thematic execution. However, future iterations could benefit from adjusting flavour intensity and texture refinement.

VI. CONCLUSIONS

- The development of The Astral Dish successfully demonstrated the application of note-by-note cuisine principles in creating a savoury dish aligned with the concept of "Food for the Future."
- The dish effectively fulfilled the "Food for the Future" theme by utilizing pure compounds and plant-based proteins, addressing key concerns of sustainability, health, and innovation, all while maintaining an appealing presentation.
- The formulation of the chicken-flavoured filling, cheese-flavoured balls, mushroom sauce, and sugar crystals was successful, resulting in a stable food system that incorporated liquid, solid gels, and crystals. This also allowed the dish to effectively mimic the original food.
- The mushroom sauce and sugar decorations enhanced both the visual appeal and thematic coherence of the dish, strengthening its connection to the concept of future food.
- The sensory evaluation indicated that the concept and formulation were well received, particularly the visual appeal and thematic execution. However, future iterations could benefit from refining the flavour intensity and texture to improve the overall sensory experience.

VII. RECOMMENDATIONS

- Control of temperature during the gelatinization process to obtained better texture and avoid grainy results.
- Enhance the concentration of mushroom and cheese flavourings to achieve a more balanced taste.
- Replace the artificial colourants for natural colourants.
- Consider fortifying the dish with essential micronutrients or functional compounds.
- Explore the adaptation of the dish for space missions by testing freeze-drying or vacuum-sealing techniques while maintaining flavour and structure

VIII. REFERENCES

- Caterite, (2025). *MSK Blue Colour Powder*. [online] Available at: https://www.caterite.co.uk/msk-blue-colour-powder/ [Accessed 7 May 2025].
- Dahal, P., Hall, C. and Janaswamy, S. (2025). Impact of polysaccharides on advancing plant-based meat alternatives. Food Biomacromolecules. 2025; pp 1–11. https://onlinelibrary.wiley.com/journal/29962757- 1. Doi: https://doi.org/10.1002/fob2.70005
- FAO (n.d.). Agrifood systems and the 2030 Agenda. Available at: https://www.fao.org/sustainable-development-goals-helpdesk/overview/agrifood-systems-and-the-2030-agenda/en [Accessed 7 May 2025].
- Jimenez, P.S; Punia, S.; Scott, W. (2024). Effects of different types of starches on heat penetration and physicochemical characteristics in alfredo sauce. Journal of Food Measurement and Characterization 18 (10): pp 8888-88897. Doi: https://doi.org/10.1007/s11694-024-02853-8
- This, H. (2014). Note-by-Note cooking: The Future of Food. Columbia University Press.
- This, H. (2016). What can "Artificial Meat" be? Note by note cooking offers a variety of answers. Notes Académiques de l'Académie d'agriculture de France (N3AF) 2016, pp 6. Available at: https://www.researchgate.net/publication/280679407_Note_by_note_cooking [Accessed: 9 May 2025].
- Majzoobi, M., Talebanfar, S., Eskandari, M.H. & Farahnaky, A., 2017. Improving the quality of meat-free sausages using j-carrageenan, konjac mannan and xanthan gum. *International Journal of Food Science and Technology*, **52**(6), pp.1269–1275. Doi: https://doi.org/10.1111/ijfs.13394
- Burke, R. and Danaher, P. (2016). Note by Note: A New Revolution in Cooking. Dublin Gastronomy Symposium. May 31st. 2016. https://arrow.tudublin.ie/cgi/viewcontent.cgi?article=1060&context=dgs
- Burke, R.M., Danaher, P. and Hurley, D. (2020). Creating bespoke note by note dishes and drinks inspired by traditional foods. International Journal of Gastronomy and Food Science, 7, Article 33. Doi: https://doi.org/10.1016/j.ijgfs.2020.100033 (Accessed: 9 May 2025).
- Regulation No 1333/2008 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 December 2008 on food additives. OJ L 354 31.12.2008, p. 16. Consolidated version accessed online [21/03/2025]: https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:02008R1333-20200702#tocId44
- Regulation (EC) No 1334/2008 of the European Parliament and of the Council of 16 December 2008 on flavourings and certain food ingredients with flavouring properties for use in and on foods and amending Council Regulation (EEC) No 1601/91, Regulations (EC) No 2232/96 and (EC) No 110/2008 and Directive 2000/13/EC. Official Journal of the European Union, L 354, pp.34–50. Consolidated version accessed online [07/05/2025]: http://data.europa.eu/eli/reg/2008/1334/oj
- Special Ingredients. (n.d.). Vegan Meat Chicken Food Flavouring Drops 30ml. Available at: https://specialingredients.co.uk/products/vegan-meat-chicken-food-

flavouring-drops-30ml?srsltid=AfmBOoqSQ9oicsP5TXp3SVSgOcOPnZ0rhOaY-iWBjJwA-N9qEL0BFpBv [Accessed 6 May 2025].

- Shiotsubo, T. (1982). Gelatinization temperature of potato starch at the equilibrium state. Agric. Bio. Chem. 48(1), pp.1–7. Available at: https://www.jstage.jst.go.jp/article/bbb1961/48/1/48_1_1/_pdf [Accessed 8 May 2025].
- Tiefenbacher, K.F. (2018). Chapter Ten - Glossary of Terms in Wafers, Waffles and Adjuncts. In: Wafers, Waffles, and Thin Bakery Products. 1st ed. [ebook] Elsevier, pp.361–388. Available at: https://doi.org/10.1016/B978-0-12-809437-2.00010-1 [Accessed 7 May 2025].
- Wurgaft, B.A. (2015) 'Notes on "Note-by-Note": A new molecular cuisine?', Los Angeles Review of Books. Available at: https://lareviewofbooks.org/article/notes-note-note-new-molecular-cuisine/ [Accessed 7 May 2025].

IX. APPENDIX

Appendix 1: Logbooks

MODULE CODE: TFCS9025
MODULE TITLE: Advanced Molecular Gastronomy
STUDENT NAME: Mary Kei Rojas Mezarina
FOOD PRODUCT: Astral Meal – Savoury dish potato and cheese-flavoured shell with a chicken-flavoured filling that symbolize Mars and the constellation.
WEEK NO.: 1 **DATE: 18-03-25**

Weekly Aims and Objectives
Aim: Develop the savoury note-by-note dish using pure compound ingredients, consisting in make a chicken-flavoured filling and the potato and cheese flavoured shell.
Objectives:

- Validate the quantity and the ingredients to obtain a good consistency and flavour of the filling and the shell.
- Validate the baking process parameters (T° and time) to obtain the final croquette.

Materials and Method (Ingredients, Equipment and Method)

Materials:

- 2 Steel bowl (medium)
- 2 Steel bowl (small)
- 2 Dessert spoon
- 1 Balloon whisk (medium)
- 3 Plastic pipette
- 1 Weighing scales
- 2 small pot
- Baking tray
- Half sphere silicone mould

Equipments:

- Oven

a) Plant based-chicken:

Ingredients:

1. 80 g Water
2. 40 g Pea protein
3. 4 g Maize starch or corn starch
4. 5 g Nutritional yeast
5. 2 g Monosodium glutamate
6. 2 g Salt
7. 0.3 g Chicken flavouring

Process:

- Weigh out all ingredients.
- Dissolve the whey protein with nutritional yeast, monosodium glutamate, salt and flavouring.
- Dissolve the maize starch in 50 ml of water.
- Boil the remaining water with sugar.
- Add the maize starch with the water and let it cook (45°C) over low fire for 10 minutes.
- After that add the whey protein and the other ingredients.
- When the meat is still warm, take small portions and make balls with your hands.

b) Potato crust:

Ingredients:

1. 75g Water
2. 40 g Potato starch
3. 0.6 g xanthan
4. 2 g Egg white proteins
5. 3.8 g Sunflower oil
6. 1 g Salt
7. 1 g red food colouring
8. 0.3 g cheese
9. 0.3 g potato flavour

Process:

- Weigh out all ingredients.
- Mix dry ingredients and hydrate with warm water (40°C).
- Allow the sodium alginate to set before shaping into small hollow balls.

c) Galaxy Sauce

Ingredients:

1. 3.5 g Methylcellulose
2. 0.5 g Purple Food coloring

Process:

5. Weigh out all ingredients
6. Mix dry ingredients and hydrate with water.
7. Heat the ingredients until obtain a thick solution.

Assembly & Cooking Process

8. Flatten a small amount of the potato gel mixture into circles.

9. Place a small scoop of the plant-based chicken core inside.
10. Carefully close the shell around the filling.
11. Bake at 180°C for 5 minutes.

Results and discussion

Analysing the final dish, it can be seen in Figure 1 that a better texture is needed for the vegan chicken balls. The flavour of the vegan chicken filling was good. Adding xanthan gum can help to thicken the texture, because it was necessary to chill the dough before baking and after this step, that the texture was not defined. Add olive oil to the silicon mould can help in avoiding stickiness of the chicken dough.

Figure 1. Astral note by note dish

The texture of ball has a feeling of undercooked and there are lumps that affect the final texture. An increase in flavour and colour is necessary to enhance the appeal and achieve the appearance of a red planet. The crust looks grainy; therefore a smoother dough is needed.

Figure 2. Baked cheese ball with vegan chicken filling

For the galaxy solution, it is better to make a sauce with a flavouring such as tomato and add pectin at 1.9 % instead of methylcellulose.

Conclusions

- It was possible to obtain a savoury dish with some opportunities to improve flavour and texture, as well as the final presentation.

- It is necessary to enhance the texture of the vegan chicken filling and the galaxy sauce.
- Change the flavouring of the balls from potato and cheese to only cheese due to availability of ingredients.

Recommendations for following week.

1. Add xanthan gum in the vegan chicken filling to increase the thickness.
2. Make the ball of the planets in two different mould sizes, one big one and the two remaining in a smaller mould.
3. Increase the baking time from 5 minutes to 10 minutes.

Ingredients required for the following 2 weeks.

1. Glucose and pectin for the galaxy sauce
2. Cheese flavouring

MODULE CODE: TFCS9025

MODULE TITLE: Advanced Molecular Gastronomy
STUDENT NAME: Mary Kei Rojas Mezarina
FOOD PRODUCT: Astral Meal – Savoury dish potato and cheese-flavoured shell with a chicken-flavoured filling that symbolize Mars and the constellation.
WEEK NO.: 2 **DATE: 24-03-25**

Weekly Aims and Objectives
Aim: Develop the savoury note-by-note dish using pure compound ingredients, consisting in make a chicken-flavoured filling and a cheese flavoured shell.
Objectives:

- Increase the thickness by adding xanthan gum to the vegan chicken filling.
- Make two different sizes of balls, one large in the centre and two smaller ones.
- Increase the baking time at 10 minute to achieve a better texture of the ball.
- Improve the flavour and texture of the galaxy sauce.

Materials and Method (Ingredients, Equipment and Method)

Materials:

- 2 Steel bowl (medium)
- 2 Steel bowl (small)
- 2 Dessert spoon
- 1 Balloon whisk (medium)
- 3 Plastic pipette
- 1 Weighing scales
- 2 small pot
- Baking tray
- 1 Half sphere silicone mould 3 cm
- 1 Half sphere silicone mould 6 cm

Equipments:

- Oven

d) Plant based-meat:

Ingredients:

- 80 g Water
- 40 g (pea protein)
- 4 g Maize starch or corn starch
- 5 g Nutritional yeast
- 2 g Monosodium glutamate
- 0.6 g xanthan gum

- 1.3 g Salt
- 0.3 g Chicken flavouring

Process:

- Weigh out all ingredients.
- Dissolve the whey protein with nutritional yeast, monosodium glutamate, salt and flavouring in 85 mL of water.
- Dissolve the maize starch in 50 ml of water
- Boil the remaining water with sugar.
- Add the maize starch with the water and let it cook (45°C) over low fire for 10 minutes.
- After that add the whey protein and the other ingredients.
- When the meat is still warm, take small portions and make balls with your hands or use the silicone moulds.
- Chill in the fridge for at least 10–15 minutes to firm up.

e) Cheese crust:

Ingredients:

- 75g Water
- 40 g Potato starch
- 2 g xanthan gum
- 1 g locust bean gum/guar gum
- 2 g Egg white proteins
- 3.8 g Sunflower oil
- 1 g Salt
- 1 g red food colouring
- 0.3 g cheese flavour

Process:

- Weigh out all ingredients.
- Heat 75g water to 60-70°C (not boiling).
- Slowly whisk in locust bean gum and xanthan gum while stirring continuously.
- Let it hydrate for 5–10 minutes to form a smooth, slightly thick liquid.
- In a separate bowl, mix potato starch and salt.
- Add egg white proteins and mix well.
- Slowly pour in the hydrated hydrocolloid mixture while stirring.
- Add sunflower oil and mix thoroughly.
- Fold in cheese flavouring.
- Add red food colouring for appearance.
- Knead until the dough is smooth, slightly sticky but holds its shape.

- Let the dough rest for 10-15 minutes at room temperature to allow full hydration and binding.
- Preheat oven to 180°C.

Assembly & Cooking Process

- Flatten a small amount of the potato gel mixture in silicone moulds.
- Place a small scoop of the plant-based chicken core inside.
- Carefully put the potato gel to cover the filling.
- Bake at 180°C for 10 minutes.

f) Galaxy sauce

Ingredients:

- 50 g water
- 0.07 g Sea salt
- 2.5 g glucose
- 0.8 g Pectin low methoxyl
- 0.05 g Purple Food colouring

Process:

- Weigh out all ingredients
- Heat 50g of water to 80-85°C (hot but not boiling).
- Slowly sprinkle pectin (0.8g) into the hot water while whisking continuously.
- Keep stirring and let it hydrate for 2-3 minutes.
- Reduce heat to 60°C.
- Add glucose (2.5g) and sea salt (0.07g), stirring until fully dissolved.
- Stir in purple food colouring (0.05g) to achieve the desired hue.
- Simmer for 3-5 minutes, allowing the sauce to thicken slightly.
- Remove from heat and let the sauce cool for 5–10 minutes to stabilize the texture.
- If too thick, adjust with a small amount of warm wate

Results and discussion

During this session, it was possible to have a better order of steps to make the cheese ball. It can be seen in Figure 1, the solution of ingredients before adding colourants looks less grainy and smoother.

Figure 1. Solution of cheese balls before adding colorants

It was possible to enhance the visual appealing of the dish (see Figure 2), an informal sensory analysis was performed regarding the colours and the presentation of the dish. All the participants concluded they liked the dish and more elements can be included in it to make it look more futuristic, to be align with the astral topic.

Figure 2. Final dish after platting

Figure 3 shown a better texture of the final ball after baking, increasing the temperature from 7 to 10 minutes make the ball grow a little more. Also, controlling the viscosity of the chicken filling cooling down the preparation help with a better texture; and the addition of xanthan gum make a more homogeneous crust.

Figure 3. Cheese flavoured ball with vegan chicken flavouring

Conclusions

- It was possible to achieve a better texture of the chicken filling using xanthan gum.

- Making two differences sizes of the planets, give more visual appealing to the dish.
- The baking time was validated and help in the final texture.
- The galaxy sauce does not have the viscosity of a typical sauce.

Recommendations for following week.

- Change the formulation of the sauce to have better results.

Ingredients required for the following 2 weeks.

- Tartaric acid
- Mushroom flavouring
- Bronw food colouring

MODULE CODE: TFCS9025

MODULE TITLE: Advanced Molecular Gastronomy
STUDENT NAME: Mary Kei Rojas Mezarina
FOOD PRODUCT: Astral Meal – Savoury dish potato and cheese-flavoured shell with a chicken-flavoured filling that symbolize Mars and the constellation.
WEEK NO.: 3 **DATE: 31-03-25**

Weekly Aims and Objectives

Aim: Develop the savoury note-by-note dish using pure compound ingredients, consisting in make a chicken-flavoured filling and cheese flavoured shell.

Objectives:

- Improve the flavour and texture of the galaxy sauce.

Materials and Method (Ingredients, Equipment and Method)

Materials:

- 2 Steel bowl (medium)
- 2 Steel bowl (small)
- 2 Dessert spoon
- 1 Balloon whisk (medium)
- 3 Plastic pipette
- 1 Weighing scales
- 2 small pot
- Baking tray
- 1 Half sphere silicone mould 3 cm
- 1 Half sphere silicone mould 6 cm

Equipments:

- Oven

a) Plant based-meat:

Ingredients:

- 80 g Water
- 40 g (pea protein)
- 4 g Maize starch or corn starch
- 5 g Nutritional yeast
- 2 g Monosodium glutamate
- 0.6 g xanthan gum
- 1.3 g Salt
- 0.3 g Chicken flavouring

Process:

- Weigh out all ingredients.

- Dissolve the whey protein with nutritional yeast, monosodium glutamate, salt and flavouring; with 119 mL of water.
- Dissolve the maize starch in 50 ml of water
- Boil the remaining water with sugar.
- Add the maize starch with the water and let it cook (45°C) over low fire for 10 minutes.
- After that add the whey protein and the other ingredients.
- When the meat is still warm, take small portions and make balls with your hands or use the silicone moulds.
- Chill in the fridge for at least 10–15 minutes to firm up.

b) Cheese/potato crust:

Ingredients:

- 75g Water
- 40 g Potato starch
- 2 g xanthan gum
- 1 g locust bean gum/guar gum
- 2 g Egg white proteins
- 3.8 g Sunflower oil
- 1 g Salt
- 1 g red food colouring
- 0.3 g cheese
- 0.3 g potato flavour

Process:

- Weigh out all ingredients.
- Heat 75g water to 60-70°C (not boiling).
- Slowly whisk in locust bean gum and xanthan gum while stirring continuously.
- Let it hydrate for 5–10 minutes to form a smooth, slightly thick liquid.
- In a separate bowl, mix potato starch and salt.
- Add egg white proteins and mix well.
- Slowly pour in the hydrated hydrocolloid mixture while stirring.
- Add sunflower oil and mix thoroughly.
- Fold in cheese and potato flavour.
- Add red food colouring for appearance.
- Knead until the dough is smooth, slightly sticky but holds its shape.
- Let the dough rest for 10-15 minutes at room temperature to allow full hydration and binding.
- Preheat oven to 180°C

Assembly & Cooking Process

- Flatten a small amount of the cheese gel mixture in silicone moulds.

- Place a small scoop of the plant-based chicken core inside.
- Carefully put the cheese gel to cover the filling.
- Bake at 180°C for 10 minutes.

c) Galaxy

Ingredients:

- 50 g glucose powder
- 2g tartaric acid
- 500 ml water
- 7 g corn flour
- 20 g potato starch
- 0.5 g mushroom flavouring
- 0.04 g brown food colorant

Process:

- Weigh out all ingredients
- Overheat, melt 100 g glucose and 2 g tartaric acid in 200 g water.
- Bring to a boil and thicken with corn starch and potato starch.
- Off heat, emulsify the recovered fat in the liquid part of the fractionated oil. If
- Then add a drop of mushroom flavouring.

Results and discussion

Figure 1 shows the final dish from week 3. As can be observed, the cheese balls lost their original spherical shape. During this session, a different type of mould was used, which made it difficult to demould the balls properly.

Regarding the mushroom sauce, a better texture was achieved compared to previous attempts due to the corn flour and potato starch; however, the visual appeal could be improved by adding more colours.

Figure 1. Final dish

Conclusions

- Using the other type of mould did not work because the balls lost its shape after demoulding.
- The viscosity of the sauce was better in contrast with the last week.

Recommendations for following week.

- Use more colours in the planet, the main one purple and blue the smalls one.
- Try to have at least two colours in the sauce brown.
- Make starts crystallizing a sugar and water solution.

Ingredients required for the following 2 weeks.

- Purple food colouring

MODULE CODE: TFCS9025

MODULE TITLE: Advanced Molecular Gastronomy
STUDENT NAME: Mary Kei Rojas Mezarina
FOOD PRODUCT: Astral Meal – Savoury dish cheese-flavoured shell with a chicken-flavoured filling that symbolize Mars and the constellation.
WEEK NO.: 4 **DATE: 07-04-25**

Weekly Aims and Objectives
Aim:
1. Obtain the final note-by-note dish using pure compound ingredients, consisting in make a chicken-flavoured filling and cheese flavoured shell.

Objectives:
- Use more colours in the "planets" balls.
- Have at least three colours in the sauce: brown, blue and pink.
- Make starts crystallizing sugar and water solution.
- Improve the flavour and texture of the galaxy sauce.

Materials and Method (Ingredients, Equipment and Method)

Materials:
- 2 Steel bowl (medium)
- 2 Steel bowl (small)
- 2 Dessert spoon
- 1 Balloon whisk (medium)
- 3 Plastic pipette
- 1 Weighing scales
- 2 small pot
- Baking tray
- 1 Half sphere silicone mould 3 cm
- 1 Half sphere silicone mould 6 cm

Equipments:
- Oven
- Fridge
- Stove

a) Plant based chicken:

Ingredients:
- 80 g Water
- 40 g pea protein
- 4 g Corn starch
- 5 g Nutritional yeast
- 2 g Monosodium glutamate
- 0.6 g xanthan gum

- 1.3 g Salt
- 0.3 g Chicken flavouring

Process:

1. Weigh out all ingredients.
2. Dissolve the whey protein with nutritional yeast, monosodium glutamate, and salt.
3. Add 119 mL of water to dissolve the ingredients above.
4. Dissolve the maize starch in 50 ml of water
5. Boil the remaining water with sugar.
6. Add the maize starch with the water and let it cook (45°C) over low fire for 10 minutes.
7. After that add the whey protein and the other ingredients.
8. When the dough t is still warm, take small portions and make balls with your hands or use the silicone moulds.
9. Add the vegan chicken flavouring to the solution
10. Chill in the fridge for at least 10–15 minutes to firm up.

b) Flavoured Cheese balls:

Ingredients:

- 75mL Water
- 40 g Potato starch
- 2 g xanthan gum
- 2 g Egg white proteins
- 3.8 g Sunflower oil
- 1 g Salt
- 1 g blue colouring
- 1 g purple colouring
- 0.3 g cheese
- 0.3 g potato flavour

Process:

1. Weigh out all ingredients.
2. Heat 75g water to 60-70°C (not boiling).
3. Slowly whisk xanthan gum while stirring continuously.
4. Let it hydrate for 5–10 minutes to form a smooth, slightly thick liquid.
5. In a separate bowl, mix potato starch and salt.
6. Add egg white proteins and mix well.
7. Slowly pour in the hydrated hydrocolloid mixture while stirring.
8. Add sunflower oil and mix thoroughly.
9. Fold in cheese and potato flavour.
10. Split the dough in 3 different bowls and add colours: red, blue, purple
11. Knead until the dough is smooth, slightly sticky but holds its shape.

12. Let the dough rest for 10-15 minutes at room temperature to allow full hydration and binding.
13. Preheat oven to 180°C

Assembly & Cooking Process

1. Flatten a small amount of the cheese gel mixture in silicone moulds.
2. Place a small scoop of the plant-based chicken core inside.
3. Carefully put the potato gel to cover the filling.
4. Bake at 180°C for 7 minutes.

c) Galaxy (Sauce)

- 100 g glucose powder
- 2g tartaric acid
- 2000 g water
- 1tsp corn starch 6.7
- 20 g potato starch
- 0.5 g mushroom flavouring
- 0.04 g purple food colorant
- 0.05 g yellow food colorant
- 0.05 g brown food colorant

Process:

1. Glucose is melted, and tartaric acid is added to 500 ml of water.
2. The mixture is brought to a boil and thickened with corn starch and potato starch.
3. Off heat, a drop of mushroom flavouring is added.
4. The sauce is divided into three bowls, each with different colourants (brown, purple, and yellow).

d) Nebula (Coral Tuile Garnish)

- 100 ml water
- 30 ml vegetable oil (neutral, like sunflower or canola)
- 10 g all-purpose flour (or cornstarch for a gluten-free version)
- 1/4 tsp salt
- Yellow and blue colorant

Process:

- Whisk water, oil, flour, and salt until smooth.
- Heat non-stick pan over medium-high heat.
- Pour the batter; let bubble and crisp for 30–45 sec.
- Remove with spatula, drain on paper towel, and cool completely.

Sugar Starts

- 80 g caster sugar
- 10 ml water

Process:
1. Heat caster sugar in a heavy-based pan over a gentle heat until it has dissolved.
2. Bring to the boil without stirring until a medium caramel colour.
3. After placing the caramel on parchment paper, allow it to cool for a few minutes.

Results and discussion

Figure 1 shown the final dish after the last trial. The new colours enhance the visual appearance.

Figure 1. Final astral dish

A hedonic sensory analysis was performed for the final dish. The sensory analysis showed positive feedback on visual appearance and creativity. Texture and flavour received moderate scores, indicating room for improvement. Overall, the dish was well accepted but could benefit from better flavour balance.

The sugar tuile garnish could not form; all the trials failed after frying. Possible causes can be high heat and the need to enhance the proportions of ingredients in the solution.

Conclusions

- The addition of more colours to the “planet” balls helped enhance their visual appeal, though further contrast could improve the effect.
- The use of brown, purple, and yellow in the sauce successfully contributed to the space theme, though greater colour intensity is recommended.
- Sugar crystallisation was achieved, forming decorative "stars," but consistency and shape could still be refined.
- The galaxy sauce showed better texture and structure; however, its flavour requires further development to improve overall dish acceptability.

Recommendations for following week.

In case there will be more sessions, it can be possible to make more designs using sugar like caramel cages and repeat the sugar tuile with a different non-stick frying pan.
Make a less thick sauce, reducing the amount of potato starch.

Ingredients required for the following 2 weeks.

-