Advanced Molecular Gastronomy (Module Code: TFCS9025)

REPORT

Dish name: …over the edges

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1. Introduction

The scientific discipline of molecular gastronomy was conceived in 1988 opening space for the molecular cooking, differing from traditional cooking due to the use of non-traditional ingredients and techniques, besides the deeper science behind it that looks for the mechanisms of the culinary transformation (Hervé This, 2005, 2009).

Molecular gastronomy and science-based cooking are different concepts, where the first one is related to the comprehension of the cooking and eating processes and the last one is related to the application of the basis and tools from science for the development of new dishes, specifically in the context of *haute cuisine.* The science-based cooking is more linked to significant technological developments, and also the development of innovative dishes that constantly makes use of non-conventional ingredients or methods, which are usually derived from those applied in industrial food production (César Vega & Job Ubbink, 2008).

In 1994, Note by Note Cooking was first proposed by Hervé This, differentiating from molecular cooking since the objective goal is no longer to bring new techniques to revolutionize traditional food ingredients, but to prepare food with new ingredients, mostly pure ingredients or mix of pure compounds. In other words, Note by Note Cooking is creating food and molecular gastronomy, as described before, is the scientific study of the phenomena that occur during the production and consumption of the food (Hervé This, 2014).

Note by Note Cooking deconstructs food ingredients, for example, eggs and vegetables, into single chemical compounds, making possible to restructure the essence of traditional dishes in a more creative way, incorporating new tastes, textures, and edible items, it is not just about recreating already existing dishes (CNBC, 2018; IQEMUSU, 2017).

This new form of seeing food goes beyond of developing creative and fancy dishes. According to Hervé This (CNBC, 2018), by applying chemical elements will not only limit the food spoilage that happens during the transportation of crops and animals' products, it can deliver food to more people, be more environmental-friendlier by reducing energy consumption due to use of fridges for storage. Through Note by Note Cooking it is also possible to incorporate nutritional value to dishes of all types by adding purified fibers, for example (Columbia University Press, 2014).

In order to beneficiate from the advantages of Note by Note Cooking and provide to people safe food, it is essential the use of only allowed ingredients that follow the specific food law guidelines. Since the dishes are created based on single compounds, the addition percentage of each component applied needs to respect the limits described on Regulation (EC) No 1333/2008.

Due to the relevance of Note by Note Cooking worldwide, early is launched a new theme for the International Contest for Note by Note, where three categories of competitors (students, professional chefs, and others) work on developing recipes targeting the proposed theme.

1.1 Dish description

A Note by Note savory dish composed by four concepts prepared with only pure compounds. Together they deliver an eye-catching appeal, a boost of flavor perfectly harmonized and a texture experience, besides being fortified with fibers.

The four concepts that constitute this dish and will following be described are:

- A caramel syrup dice;
- A goat cheese foam;
- An Iberian ham crisp;
- And a balsamic vinegar gel.

2. Aim

To create a Note by Note savory dish including fibers in it, making use the most as possible of only perfectly pure compounds, in order to be totally aligned with the topic of the 10th International Contest for Note by Note Cooking which is: savory dice and fibers (no Rubik's Dice).

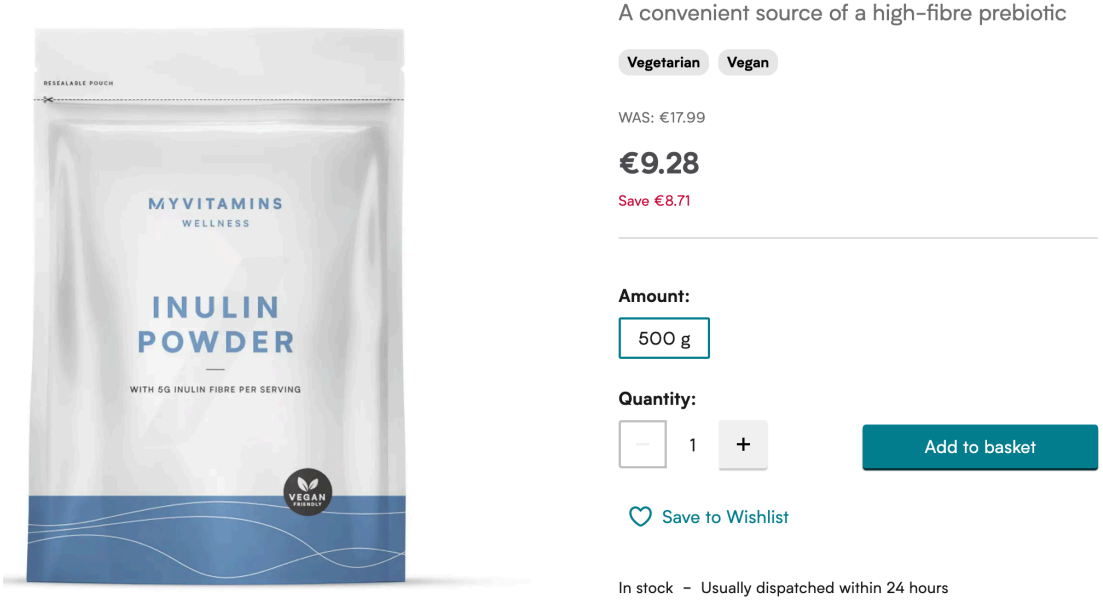
3. Materials and Methods

3.1 Final materials

3.2.1 Caramel syrup dice

Ingredients:

- Water;
- Inulin powder;



Source: MYPROTEIN, 2022

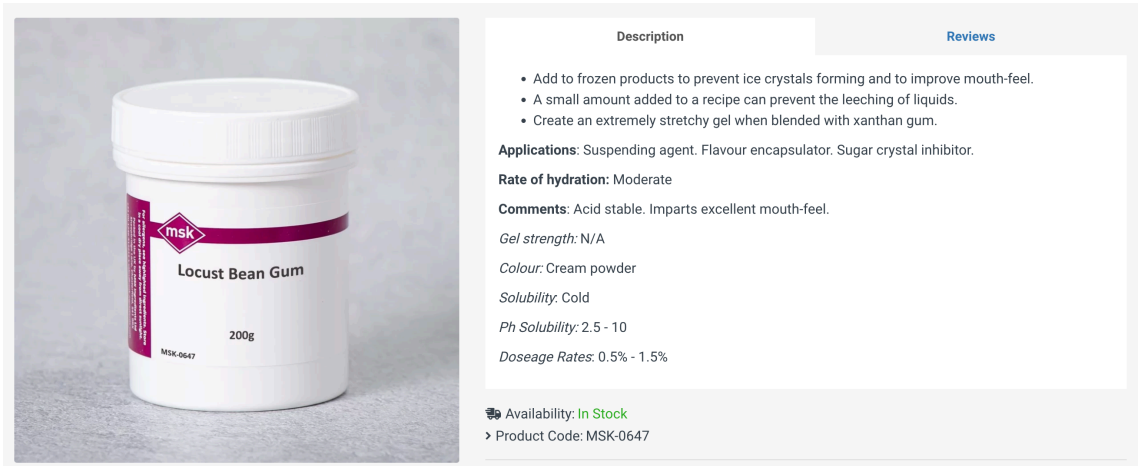
Figure 1. Inulin powder reference

- Castor sugar;
- Agar-Agar gum;

Source: SOSA[a], 2022

Figure 2. Agar-Agar gum reference

- Locust bean gum (LBG);



Source: MSK, 2022

Figure 3. Locust Bean Gum (LBG) reference

- Salt.

Equipment:

- Silicon ice dice mold;

Hendi 679036 Moule à glaçon cube XL

Visiter la boutique Hendi

4,4 ★★★★☆ 67 évaluations

Amazon Choice pour "bac a gros glacons"

8 17 €

Tous les prix incluent la TVA.

5 % offerts pour 4 article(s) acheté(s). Acheter des articles

Livraison GRATUITE (0,01€ pour les livres) **en point retrait (selon éligibilité des articles).** Détails

Matériau	Silicone
Marque	Hendi
Poids	0.13 Kilogrammes
Dimensions de l'article L x l x H	23.2 x 12.8 x 6.2 centimètres

À propos de cet article

- 170x110x(H)52 mm
- Silicone
- Pour la réalisation de 6 grand glaçons en cube(5x5x5 cm), qui fondent lentement

Passez la souris sur l'image pour zoomer

Source: AMAZON FRANCE, 2022

Figure 4. Silicon ice Dice mold reference

- Cookie cutter square shaped (3cm x 3cm);

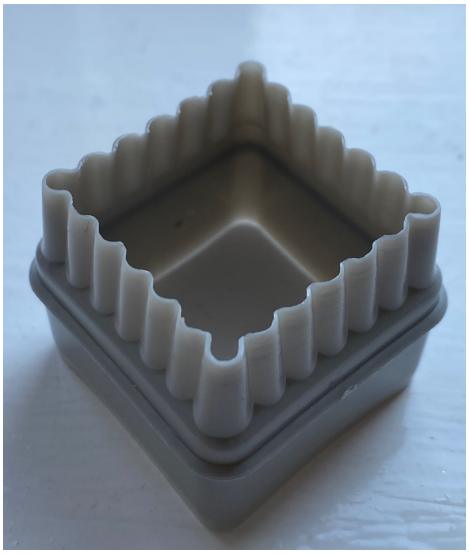


Figure 5. Cookie cutter reference

- Pan;
- Silicon spatula;
- Silver Crest Precision scale (SDL 300 C2 / IAN: 298644);
- Scale (Dunnes home digital kitchen scale / 05686 STYLE 7837422).

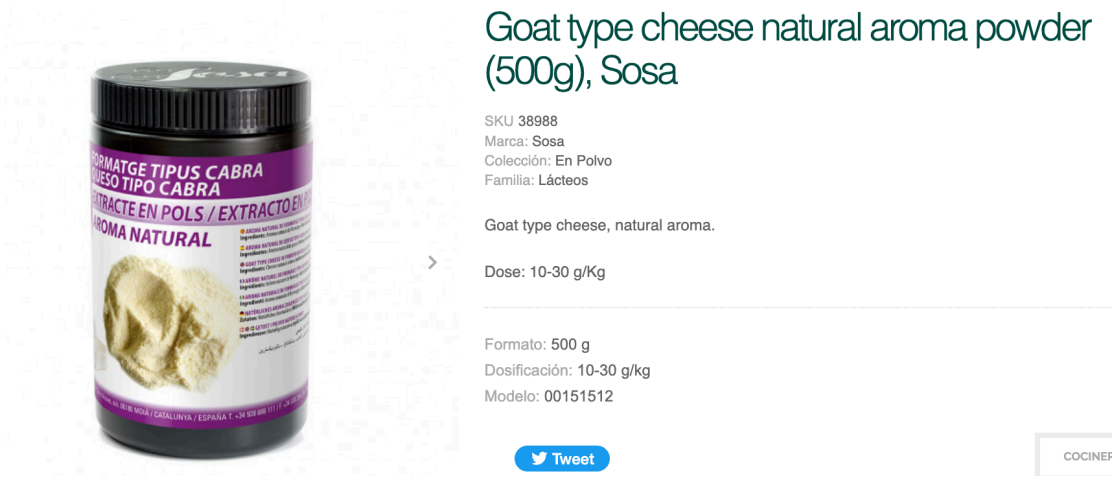
3.2.2 Goat cheese foam

Ingredients:

- Water;
- Egg albumin;

Figure 6. Egg albumin reference

- Goat cheese flavor;



Source: SOSA[b], 2022

Figure 7. Goat cheese flavor reference

- Xanthan gum;

Figure 8. Xanthan gum reference (Supplier: En Place)

- Salt.

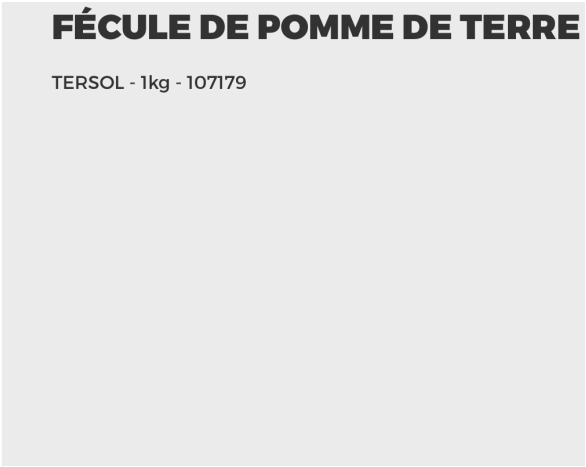
Equipment:

- Stainless steel bowl;
- Whisk;
- Silver Crest Precision scale (SDL 300 C2 / IAN: 298644);
- Scale (Dunnes home digital kitchen scale / 05686 STYLE 7837422).

3.2.3 Iberian ham crisp

Ingredients:

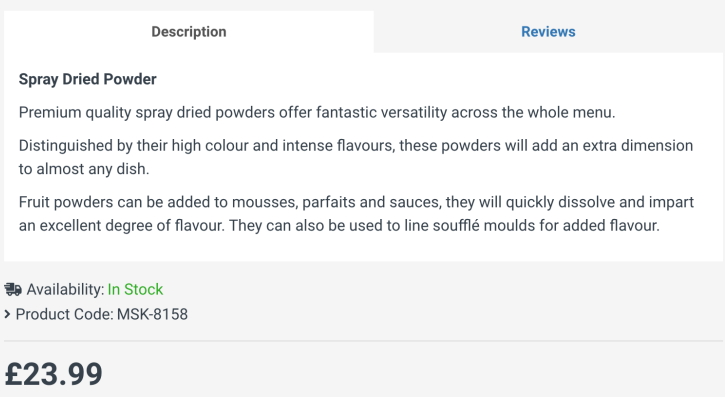
- Water;
- Potato starch;



Source: TANG FRERES, 2022

Figure 9. Potato starch reference

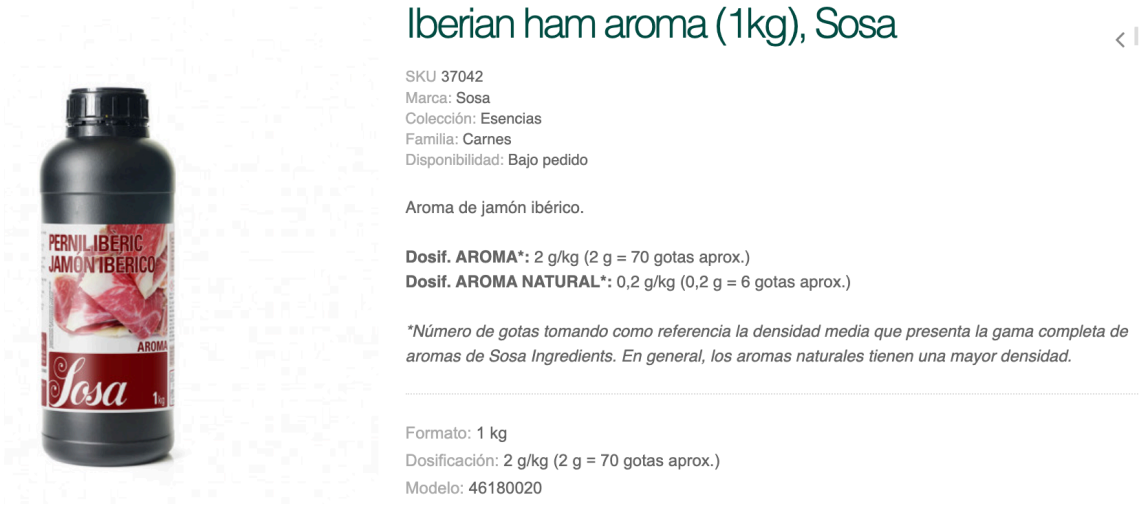
- Beetroot powder;



Source: MSK, 2022

Figure 10. Beetroot powder reference

- Cocoa powder;
- Iberian ham flavor;



Source: SOSA[c], 2022

Figure 11. Iberian ham flavor reference

- Salt.

<u>Equipment:</u>

- Pan;
- Whisk;
- Parchment paper;
- Electrolux SkyLine Premium Oven (Equipment Asset tag: 44218 / SDXCQ1 14354);

Figure 12. Electrolux SkyLine Premium Oven

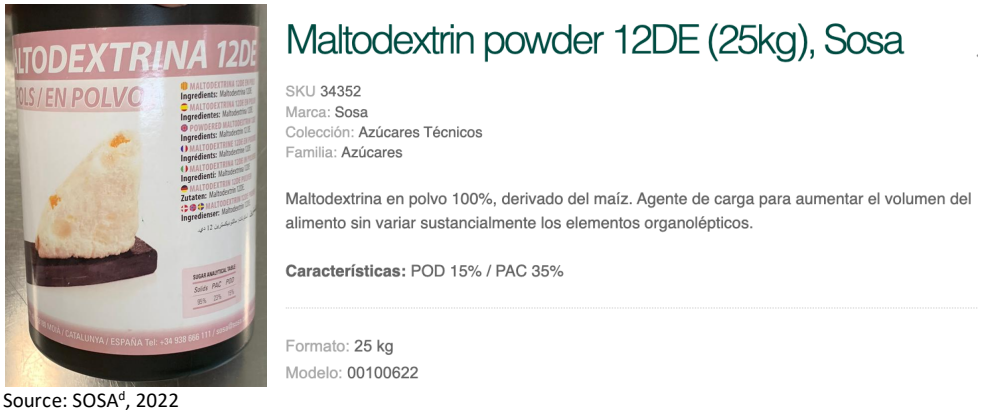
- Silver Crest Precision scale (SDL 300 C2 / IAN: 298644);

- Scale (Dunnes home digital kitchen scale / 05686 STYLE 7837422).

3.2.4 Balsamic vinegar gel

Ingredients:

- Water;
- Balsamic vinegar;
- Inulin fiber (as Figure 1);
- Maltodextrin;



Source: SOSA[d], 2022

Figure 13. Maltodextrin reference

- Olive oil;
- Salt;
- Cocoa powder;
- Xanthan gum (as Figure 8).

Equipment:

- Stainless steel bowl;
- Whisk
- Spoon;
- Silver Crest Precision scale (SDL 300 C2 / IAN: 298644);
- Scale (Dunnes home digital kitchen scale / 05686 STYLE 7837422).

3.2 Methods

3.2.1 Caramel syrup dice

1. Prepare the caramel syrup by melting the sugar in a pan until get golden colored, then add the water (preferable hot), and let it boil until the sugar melts and the syrup thickens;
2. Mix together all the powder ingredients (inulin powder, sugar, agar, and LBG);
3. In a pan add the water, the previously blended powder and the caramel syrup;
4. While mixing with a silicon spatula, boil the mixture for 1 minutes;
5. Pour the solution into the Dice silicon mold and let it set in the fridge for approximately 30 minutes;
6. After settled, cut the sides and center of the Dice using the cookie cutter.

3.2.2 Goat cheese foam

1. Mix together all the powder ingredients (egg albumin, goat cheese flavor, salt, and xanthan gum);
2. In a bowl mix together the water and the previously blended powder;
3. Keep whisking until obtain the foam

3.2.3 Iberian ham crisp

1. In a pan disperse the potato starch and the salt in the water;
2. Boil until the mixture gets thick and translucid;
3. Flavor it and add colorants;
4. Place portions of 3mm thickness over a parchment paper;
5. Bake for 2h at 100ºC (no fan);
6. Deep fry it with vegetable oil at 150ºC for a transparent appearance. When it starts to pop, take it out of the oil.

3.2.4 Balsamic vinegar gel

1. Mix together the powder ingredients (xanthan gum, inulin powder, maltodextrin, salt, and cocoa powder);
2. Add it to a bowl and slowly add the water, oil and, balsamic vinegar while mixing with a whisk.
3. Mix until it thickens (let it set for some minutes for fully xanthan gum hydration before applying it in the dish).

3.2.5 Platting

After preparing all the parts that compose the dish (caramel syrup dice, goat cheese foam, Iberian ham crisp, and balsamic vinegar gel) the platting step can be executed.

1. Place the dice on the center of the plate and add two Iberian ham crisps inside it;
2. Add to the plate one full table spoon of the goat cheese foam and with the back of the spoon spread the foam making a curved shape around the centered dice;
3. To finish the platting, with the tip of a tea spoon, add four dots of the balsamic vinegar gel different sized in a decreasing way around the dice that follows the shape of the spread foam.

4. Results

4.1. Formulation

4.1.1. Caramel syrup dice

Table 1. Final caramel syrup formulation

CARAMEL SYRUP	T.01	
INGREDIENTS	**%**	**(g)**
Water	33,00	99,00
Castor sugar	67,00	201,00
TOTAL	**100,00**	**300,00**

Table 2. Final caramel syrup flavored dice formulation

CUBE	T.04	
INGREDIENTS	**%**	**(g)**
Water	78,45	196,13
Inulin Powder	10,00	25,00
Caramel syrup	10,00	25,00
Agar	1,30	3,25
LBG	0,15	0,38
Salt	0,10	0,25
TOTAL	**100,00**	**250,00**

4.1.2. Goat cheese foam

Table 3. Final goat cheese flavored foam formulation

FOAM	T.05	
INGREDIENTS	**%**	**(g)**
Water	81,45	162,90
Egg Albumin	15,00	30,00
Goat cheese flavor	2,50	5,00
Salt	0,30	0,60
Xanthan gum	0,75	1,50
TOTAL	**100,00**	**200,00**

4.1.3. Iberian ham crisp

Table 4. Final Iberian ham flavored crisp formulation

CRISP	T.02	
INGREDIENTS	**%**	**(g)**
Water	91,30	182,60
Potato starch	6,50	13,00
Beetroot powder	1,00	2,00
Cocoa Powder	0,50	1,00
Salt	0,50	1,00
Parma Flavour	0,20	0,40
TOTAL	**100,00**	**200,00**

4.1.4. Balsamic vinegar gel

Table 5. Final balsamic vinegar gel formulation

GEL	T.02	
INGREDIENTS	**%**	**(g)**
Water	61,75	92,63
Xanthan gum	0,75	1,13
Inulin Fibre	10,00	15,00
Maltodextrin	10,00	15,00
Olive oil	2,00	3,00
Balsamic vinegar	13,50	20,25
Salt	1,00	1,50
Cocoa powder	1,00	1,50
TOTAL	**100,00**	**150,00**

4.2. Platting

Following the steps described on topic “3.2.5. Platting” the dish result is presented on Figures 14, 15 and 16.

Figure 14. Final dish after platting

Figure 15. Final dish after platting

Figure 16. Final dish after platting

4.3. Sensorial

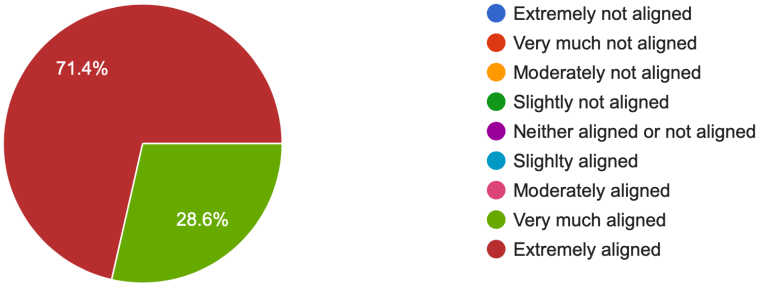
Table 6 shows the results of the informal sensorial done in class. The obtained marks are regarding just visual and odor perception (no tasting was performed).

Table 6. Sensorial results

7 responses

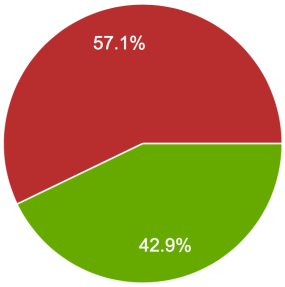
How much do you think it is aligned with the competition guidelines?

7 responses



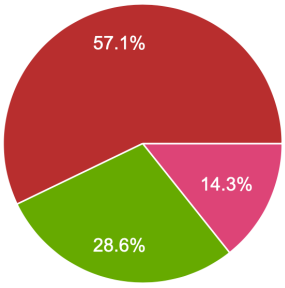
Creativity

7 responses



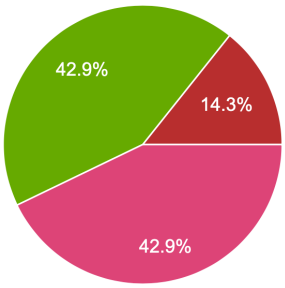
Overall platting appearance

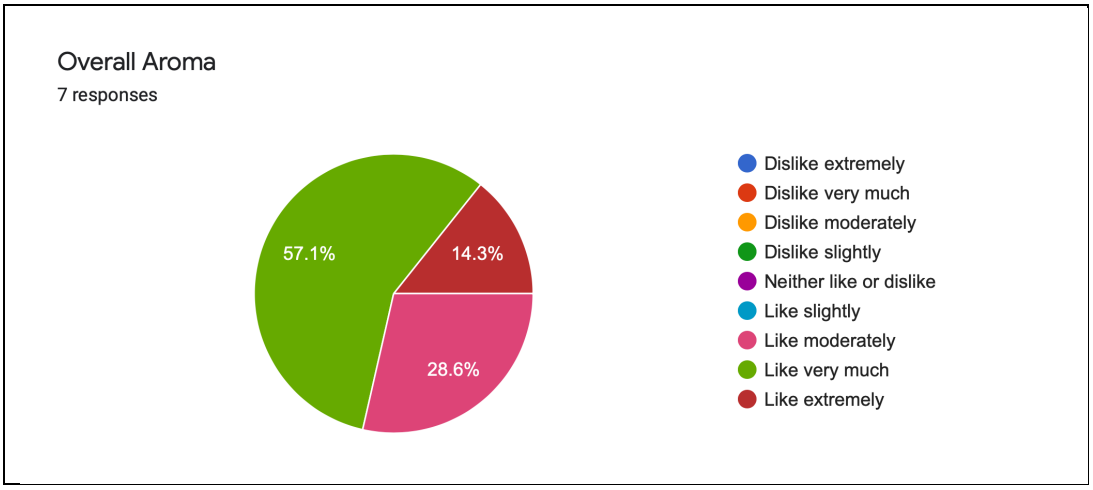
7 responses



Colour palette

7 responses





5. Discussion

5.1. Creation overview

When going through the section "Log book" it will be noticed that the initial idea suffered some changes during its development turning into the final concept here presented.

In the beginning, the main dish design differs from the one given in terms of the following aspects:

- The dice would be flavored as champagne instead of caramel syrup;
- A green colored wheat flour-free tuille flavored as pistachio would be placed instead of the balsamic vinegar gel.

The decision of changing the dice's flavor was done due to the available champagne, and even some other types of wine flavor, did not perform well in this application, it was missing intensity and flavor personality.

In terms of the tuille, since wheat flour is not a pure compound it could not be used to develop it. After several trials trying different ratio combinations of vital gluten, corn starch and inulin as options to mimic the wheat flour functionality in this application, the idea was cancelled due to the high demand of new trials in order to achieve the goal and the lack of time.

5.2. Caramel syrup dice

In order to be able to carve the gum dice and obtain a dice structured only by the edges, agar-agar gum at a concentration of 1.3% in combination with 0.15% of locust bean gum (LBG) was added in a synergic way to create it. LBG does not gel on its own, however when in hot combination with agar it gels when cooled, increasing its strength and giving a more elastic property to the typical brittle gel (PEGG, 2012).

To make gelling possible, the mixture needs to reach more than 90ºC to hydrate and activate the agar and LBG, explaining the necessity of boiling described in the section "3.2.1. Caramel syrup dice". The dice will keep itself in this shape under 80ºC. The indication of placing the solution in the fridge after boiling is just to accelerate the process of gelling, that occurs around 35-45ºC (LERSCH, 2014).

The amount of agar gum and LBG applied to obtain the desired performance are in accordance with the Regulation (EU) No 1333/2008, since there is no specific maximum level of application for these additives (*quantum satis*).

Inulin is a water-soluble polysaccharide and is part of the group of the non-digestible carbohydrates called fructans, that also has prebiotic properties. It was added to compute fiber content to the dish, as requested in the contest's briefing, besides contributing slightly with sweetness since it has 10% of the sucrose sweetness level (SHOAIB ET AL., 2016). The inulin powder applied has 90% of purity, meaning that the developed dice has 9% (9g of fiber per 100g of product) of fiber in it, what allow the dice to be classified as high fiber since, according to the Annex of the Regulation (EC) No 1924/2006, it can be applied where the product contains at least 6g of fiber per 100g.

Through caramelization, a caramel syrup made with just two simple ingredients, sugar and water, in a ratio of 2:1 was prepared and was the main responsible for the flavoring and coloring of the dice. The light sweet notes provided by it was desired in order to harmonize and decrease the intensity of flavoring from the other components of the dish. The small amount of salt added has flavor enhancing functionality.

5.3. Goat cheese foam

In order to obtain a stable foam structure two ingredients were added: egg albumin, responsible for the product aeration (foam formation) and xanthan gum, responsible for the foam stabilization.

Egg albumin is a foaming agent that thanks to the high protein content, allows the dispersion of a gas in a liquid phase. However, the foam by itself tend to ruin with time, requiring the addition of a stabilizer, in this case, xanthan gum. The addition of this polysaccharide helps stabilizing it and keeping the foam structure for a longer period.

As for agar gum and LBG, the maximum level of usage of xanthan gum is *quantum satis*, meaning that the applied quantity follows the law (Regulation (EU) 1333/2008).

In terms of flavoring, a natural powdered goat cheese flavor was added at an application rate of 2.5% (25g of flavor / kg of foam), an appropriate dosage able to provide the desired intensity of goat cheese notes and that follows the supplier's recommendation range of 10-30 g/kg (SOSA[b], 2022). This application rate is also in accordance with the Regulation (EC) No 872/2012.

Salt besides having the functionality of conferring saltness perception, it also boosts the flavor notes.

5.4. Iberian ham crisp

Native potato starch was chosen for this application since it provides a good clarity paste after cooking, due to the small amount of lipids and protein, and also has a neutral flavor (GROMMERS and KROGT, 2009).

Potato starch granules are large, swelling and solubilizing more rapidly than those of cereal starches. Since the potato starch has a low gelatinization temperature and is more sensitive to shear (MASON, 2009) it is important to control the temperature in order to not rupture the swollen potato starch granules and lose

paste viscosity, even more since it is a native starch (non-modified). As soon as the mixture starts to thick and gets translucid, turn off heating and it is right for application.

The combination of beetroot and cocoa powder was added in order to add color to the paste and mimic the color of Iberian ham.

The two hours baking process at low temperature (100ºC) is essential to dry the paste and result in a thin, crispy and translucid sheet. The frying step is fundamental to make these thin sheets more transparent, shiny and even crispier. However, oil temperature control is crucial, it needs to be around 150ºC so when the sheets immerged in the oil start to pop, there is enough time to take it out without the sheet puffs completely. Otherwise, if the oil is too hot, the sheets will puff completely losing the transparent appearance and becoming white.

Still regarding the drying step, the thickness of the gel placed over the parchment paper is also an attention point, since it cannot be too thin, otherwise after drying it will be even thinner and to breakable, turning the application harder, and also, cannot be too thick, otherwise it will take too much time to dry.

The Iberian ham flavor was secured by the addition of 0.2% of Iberian ham flavor from Sosa. This amount added is aligned with the dosage indication provided by the supplier, 2g of flavor / kg of batch (SOSA[c], 2022), indicating that is in accordance with the Regulation (EC) No 872/2012.

5.5. Balsamic vinegar gel

Xanthan gum is a thickener agent soluble in cold water (SWORN, 2021), being the main responsible for the gel texture created. Since it thickens in cold water, it is crucial to disperse it with the other powder ingredients, so when the water is added no lumps are created. And as mentioned in topic “5.3 Goat cheese foam” the allowed percentage of xanthan gum is *quantum satis*.

Maltodextrin helps conferring a mouth filling, besides contributing a little bit with sweetness since it has 12DE.

As described for the dice development, inulin powder was added in order to enrich the fiber content of the whole dish as requested in the guidelines of the competition. An application of 10% of inulin powder represents 9% of fiber in the final gel, since the inulin applied has 90% of pureness, what allows the gel to be classified as high fiber since, according to the Annex of the Regulation (EC) No 1924/2006, it can be applied where the product contains at least 6g of fiber per 100g.

Balsamic vinegar at a considerable high application rate of 13.5% provides the characteristic taste of the concept in combination with the olive oil and the salt.

Cocoa powder was added in order to boost the dark brown tone and reduce the translucency of the gel, making it more similar to the color of a balsamic vinegar reduction.

5.6. Sensorial

As showed on Table 6, mostly of the people (71.4%) who evaluated the dish said that it is extremely aligned with the 10th International Competition for Note by Note Cooking guidelines. And also said that they consider it as a creative dish.

The overall platting appearance was likewise well evaluated, computing 57.1% of like extremely, 28.6% live very much, and 14.3% like moderately.

Regarding the color palette, 42.9% of the answers liked it moderately, and also 42.9% liked it very much. Just 14.3% liked it extremely.

In terms of overall aroma, 57.1% liked it very much and 14.3% liked it extremely, while 28.6% liked it moderately.

6. Conclusion

The created dish is very aligned with what was requested in the guidelines of the 10th International Contest for Note by Note Cooking, delivering a savory dish including a dice, nutritionally boosted with fibers and developed with only pure compounds. In addition to that, the dish was well evaluated by the tasters regarding: creativeness, overall platting appearance, color palette, and overall aroma.

As a dish improvement the fibers could also be included in the Iberian ham crisps and the goat cheese foam in order to turn the dish even more fiber enriched. And also, evaluate serving it slightly warmer in order to release volatiles and have a more attracting aroma perception.

7. References

AMAZON FRANCE. Hendi 679036 Moule à glaçon cube XL. Available at: https://www.amazon.fr/dp/B07H5MWQTM/ref=cm_sw_r_wa_api_glt_i_PZY9Q8FTJ74W5KQB6DEM?_encoding=UTF8&psc=1. Accessed on: 28 April, 2022.

PEGG A. M., 2012. "The application of natural hydrocolloids to foods and beverages, locust bean gum", in Natural food additives, ingredients and flavourings. pp.175-196.

CNBC, 2018. The future of food may be cooking with chemical compounds. Available at: https://www.cnbc.com/2018/06/29/note-by-note-cuisine-can-boost-food-security-herve-this.html. Accessed on: 27 April, 2022.

Columbia University Press, 2014. Note-by-Note Cooking. Available at: https://cup.columbia.edu/book/note-by-note-cooking/9780231164870. Accessed on: 27 April, 2022.

GROMMERS H. E., KROGT D. A. V. D., 2009. "The preference for potato starch in applications", in Starch. Available at: https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/potato-starch. Accessed on: 29 April, 2022.

IQEMUSU, 2017. La cuisine note à note. Available at: https://iqemusu.com/en/introduction-note-by-note-cooking/. Accessed on: 27 April, 2022.

LERSCH M., 2014. Texture – A hydrocolloid recipe collection. Available at: https://khymos.org/recipe-collection/. Accessed on 28 April, 2022.

MASON W. R., 2009. "Potato", in Starch. Available at: https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/potato-starch. Accessed on: 29 April, 2022.

MSK, 2022. Beetroot spray dried powder (500g). Available at: https://msk-ingredients.com/msk-8158-beetroot-spray-dried-powder-500g?search=beetroot&description=true. Accessed on: 28 April, 2022.

MSK, 2022. Locust Bean Gum. Available at: https://msk-ingredients.com/modern-ingredients/thickeners-and-gums/msk-0647-locust-bean-gum-200g. Accessed on: 28 April, 2022.

Regulation (EC) No 872/2012 of 1 October 2012 adopting the list of flavouring substances provided for by Regulation (EC) No 2232/96 of the European Parliament and of the Council, introducing it in Annex I to Regulation (EC) No 1334/2008 of the European Parliament and of the Council and repealing Commission Regulation (EC) No 1565/2000 and Commission Decision 1999/217/EC .

Regulation (EC) No 1333/2008 of the European Parliament and of the Council of 16 December 2008 on food additives, OJ L 354, 31.12.2008.

Regulation (EC) No 1924/2006 of the European Parliament and the Council of 20 December 2006 on nutrition and health claims made on foods.

SHOAIB M. et al, 2016. Inulin properties, health benefits and food applications. Available at: https://www.sciencedirect.com/science/article/pii/S0144861716303812?casa_token=nn8a3QAsxR8AAAAA:mG81PkuRjHFVHpGi9clU8egtst5SaYNj4Bs9nhWssyHT_Ux_Dh0nLrz3mOji0WILx3zSZVZzaXlE. Accessed on: 29 April, 2022.

SOSA[a], 2022. Agar-Agar. Available at: https://www.sosa.cat/en-ww/agar-agar-20k-sosa. Accessed on: 28 April, 2022.

SOSA[b], 2022. Goat type cheese natural aroma powder (500g). Available at: https://www.sosa.cat/en-ww/aroma-natural-de-queso-de-cabra-en-polvo. Accessed on: 28 April, 2022.

SOSA[c], 2022. Iberian ham aroma (1kg) Sosa. Available at: https://www.sosa.cat/en-ww/aroma-de-jamon-iberico-1kg-sosa. Accessed on: 28 April, 2022.

SOSA[d], 2022. Maltodextrin powder 12DE (25kg) Sosa. Available at: https://www.sosa.cat/en-ww/maltodextrina-25kg-sosa. Accessed on: 28 April, 2022.

SWORN G., 2021. "Xanthan gum", in Handbook of hydrocolloids. Available at: https://www.sciencedirect.com/science/article/pii/B9780128201046000048. Accessed on: 29 April, 2022.

TANG FRERES, 2022. Fécule de pomme de terre. Available at: https://www.tang-freres.fr/produits-asiatiques/epicerie/farines-aides-culinaires/fecule-de-pomme-de-terre-tersol-107179/. Accessed on: 28 April, 2022.

THIS H., 2005. Molecular gastronomy. Available at: https://www.nature.com/articles/nmat1303. Accessed on: 27 April, 2022.

THIS H., 2009. Molecular gastronomy, a scientific look at cooking. Available at: https://pubs.acs.org/doi/abs/10.1021/ar8002078. Accessed on: 27 April, 2022.

THIS H., 2014. Note by note cooking. Available at: https://www.researchgate.net/publication/280679407. Accessed on: 27 April, 2022.

VEGA C., UBBINIK J., 2008. Molecular gastronomy: a food fad or science supporting innovative cuisine?. Available at: https://www.sciencedirect.com/science/article/abs/pii/S0924224408000046. Accessed on: 27 April, 2022.

8. Log book

MODULE CODE: TFCS9025
MODULE TITLE: Advanced molecular gastronomy
STUDENT NAME: Douglas Yokomi Fornari
FOOD PRODUCT: Dice
CLASS NO.: 1 **DATE: 28.03.22**

Weekly Aims and Objectives

- Structure the Dice incorporating fiber and flavor to it;
- Make the goat cheese foam;
- Make the coral tuille.

Materials and Method (Ingredients, Equipment and Method)

Table 1. Dice formulation

	28.03.22		
CUBE	T.01		
INGREDIENTS	**%**	**(g)**	**Step**
Water	91,25	456,25	2
Inulin Powder	3,00	15,00	1
Sugar	4,00	20,00	1
Agar	1,50	7,50	1
LBG	0,15	0,75	1
ChampagneType Flavor	0,10	0,50	3
TOTAL	**100,00**	**500,00**	

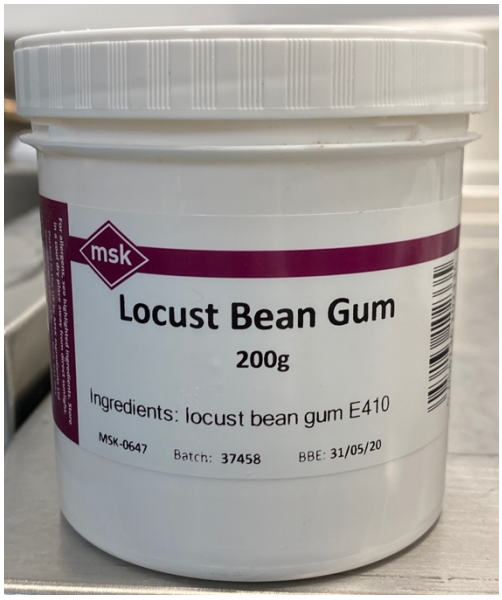
Table 2. Foam formulation

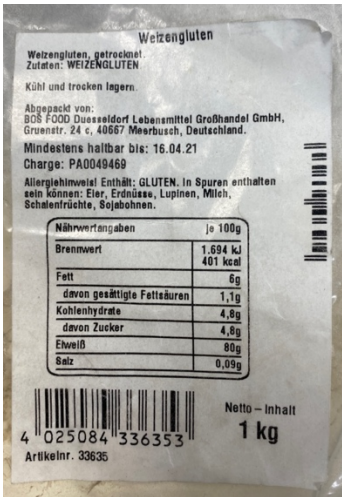
	28.03.22		
FOAM	T.01		
INGREDIENTS	**%**	**(g)**	**Step**
Water	81,50	244,50	2
Egg Albumin	15,00	45,00	1
Soy Lecithin	0,50	1,50	1
Goat cheese flavor	2,50	7,50	1
Salt	0,50	1,50	1
TOTAL	**100,00**	**300,00**	

Table 3. Tuille formulation

	28.03.22		
TUILLE	T.01		
INGREDIENTS	**%**	**(g)**	**Step**
Water	65,50	131,00	1
Olive oil	24,00	48,00	1
Gluten	10,00	20,00	1
Pistachio flavor	0,50	1,00	1
TOTAL	**100,00**	**200,00**	

Ingredients reference:





Equipment for Dice:

- Dice silicon mold;
- Pan;
- Silicon spatula;
- Cookie cutter square shaped (3cm);
- Silver Crest Precision scale (SDL 300 C2 / IAN: 298644);
- Scale (Dunnes home digital kitchen scale / 05686 STYLE 7837422);

Equipment for foam:

- Stainless steel bowl;
- Whisk;
- Spoon;
- Silver Crest Precision scale (SDL 300 C2 / IAN: 298644);
- Scale (Dunnes home digital kitchen scale / 05686 STYLE 7837422).

Equipment for tuille:

- Stainless steel bowl;
- Whisk;
- Ladle;
- Stainless steel spatula;
- Non-sticky frying pan;
- Kitchen paper;
- Silver Crest Precision scale (SDL 300 C2 / IAN: 298644);
- Scale (Dunnes home digital kitchen scale / 05686 STYLE 7837422).

Dice method:

1. Mix together all the powder ingredients (inulin, sugar, agar, and LBG);
2. In a pan add the water and mix the previously blended powder;
3. While mixing with a silicon spatula, boil the mixture for 2 minutes;
4. Add the champagne flavor;
5. Pour the solution into the Dice silicon mold and let it set in the fridge for approximately 30 minutes;
6. After settled, cut the sides and center of the Dice using the cookie cutter.

Foam method:

1. Mix together all the powder ingredients (egg albumin, goat cheese flavor, salt, and soy lecithin);
2. In a bowl mix together, the water and the previously blended powder;
3. Keep whisking until obtain the foam;
4. Wait 5 minutes before collecting the foam with a spoon.

Tuille method:

1. In a bowl mix together all the ingredients;
2. Warm a frying pan on the cook top;
3. On the very hot frying pan, pour 1 ladle of the batter (be careful, it will pop);
4. When it stops popping and the boarder start to unstick, take out the tuille from the pan using a spatula and place over a kitchen paper.

Results and discussion

- The gum Dice had a good structure, making possible to cut and shape it as desired, however the flavoring was not right, maybe because of lower flavor dosage or the flavor profile. The texture was very characteristic of agar structure, a little bit hard and that does not melt in mouth (it breaks in smaller pieces);
- Regarding the foam, it was possible to create a foam by whisking, however this foam was not stable, turning back into liquid very fast. The goat cheese flavoring was appropriate. It presented a yellow tone, probably from the powdered soy lecithin;
- The tuille did not work out, it started to burn the edges while the center was still soft and also it was very hard to unstick from the frying pan even though the formulation had a high percentage of oil. The taste was very oily and he pistachio flavor was not noticed at all.

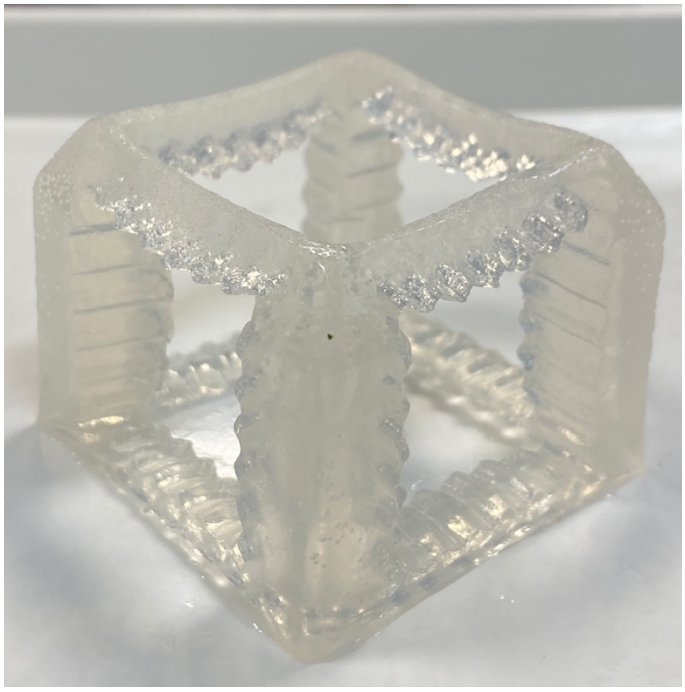


Figure 1. Agar + LBG Dice after shaping

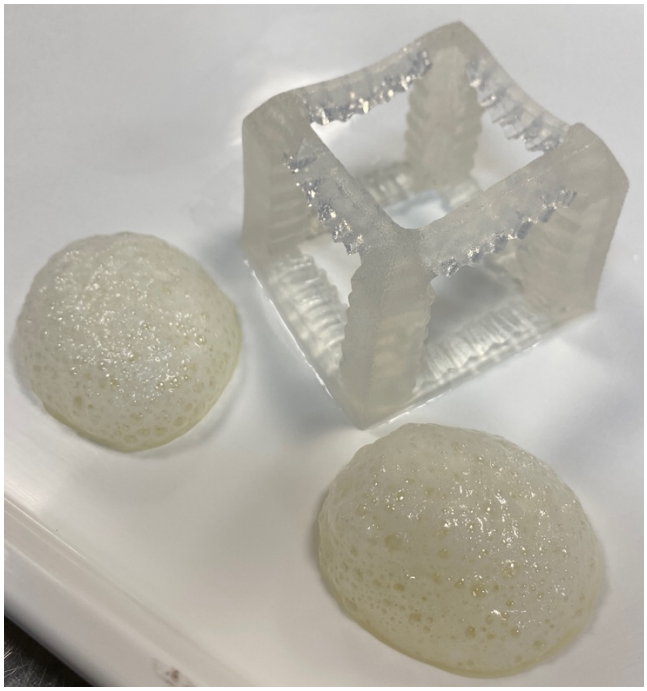


Figure 2. Agar + LBG Dice after shaping and the goat cheese foam

Conclusions

- It is necessary to focus on the Dice flavoring, and then analyze the possibility of turning the texture softer, but at the same time without losing the good structuring performance;
- The goat cheese foam requires more stability, making it stay more time as a foam and not turning back into liquid too fast;
- The tuille formulation and preparation method need to be reviewed.

Recommendations for following week.

Dice:

- For an easier and better shaping of the Dice, fully fill the silicon mold;
- Try also other types of wine and champagne flavor;
- Replace the castor sugar by caramel syrup, in order to bring more flavor to it;
- Consider an option of a Dice flavoring with more amount of caramel syrup, 10% instead of just 4% (without alcoholic drink flavor), in order to play with savory and sweet, like goat cheese and honey;
- Try increasing the amount of fiber (Inulin) to 10%.

Foam:

- Add different rates of xanthan gum in order to try to improve the foam stability (0.25 – 0.75%).
- Try without the powdered soy lecithin to take out the yellow tone.

Tuille (on class NO. 3):

- Try a formulation with less oil in it and replace olive oil for a less flavor oil, like rapeseed, for example;

- Reduce the amount of gluten and make a combination of corn flour, inulin and gluten to replace it;
- Spray oil in the pan and let it heat before adding the tuille batter, in order to stick less;
- Spray the flavor on the top of the tuille instead of applying it before cooking, it will preserve more the flavor since it was not exposed to heat.

Crisp:

- Work on the development of the Iberian ham crisp.

Ingredients required for the following 2 weeks.

- Wine and champagne flavors;
- Xanthan gum;
- Potato starch;
- Iberian ham flavor;
- Beetroot powder;
- Cocoa powder.

MODULE CODE: TFCS9025
MODULE TITLE: Advanced molecular gastronomy
STUDENT NAME: Douglas Yokomi Fornari
FOOD PRODUCT: Dice
CLASS NO.: 2 **DATE: 01.04.22**

Weekly Aims and Objectives

- Find a nice flavoring for the Dice;
- Better stabilize the goat cheese foam;
- Make the Iberian ham crisp.

Materials and Method (Ingredients, Equipment and Method)

Table 4. Caramel syrup formulation

CARAMEL SYRUP	01.04.22 T.01		
INGREDIENTS	**%**	**(g)**	**Step**
Water	33,00	99,00	1
Castor sugar	67,00	201,00	1
TOTAL	**100,00**	**300,00**	

Table 5. Dice formulation

CUBE	01.04.22 T.02			01.04.22 T.03			01.04.22 T.04		
INGREDIENTS	**%**	**(g)**	**Step**	**%**	**(g)**	**Step**	**%**	**(g)**	**Step**
Water	83,77	167,54	2	83,77	167,54	2	78,45	156,90	2
Inulin Powder	10,00	20,00	1	10,00	20,00	1	10,00	20,00	1
Caramel syrup	4,00	8,00	2	4,00	8,00	2	10,00	20,00	2
Agar	1,40	2,80	1	1,40	2,80	1	1,30	2,60	1
LBG	0,15	0,30	1	0,15	0,30	1	0,15	0,30	1
Flavor 167 (White wine)	0,58	1,16	3						
Flavor 161 (Cava)				0,58	1,16	3			
Salt	0,10	0,20	3	0,10	0,20	3	0,10	0,20	3
TOTAL	**100,00**	**200,00**		**100,00**	**200,00**		**100,00**	**200,00**	

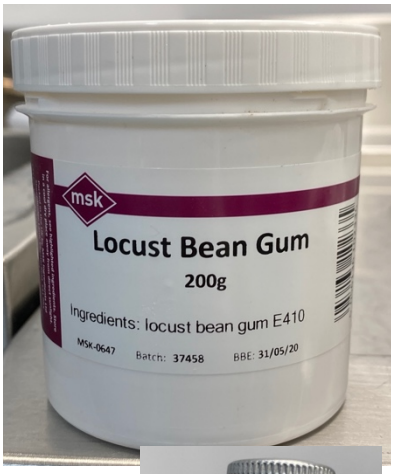
Table 6. Foam formulation

FOAM	01.04.22 T.02			01.04.22 T.03			01.04.22 T.04			01.04.22 T.05		
INGREDIENTS	**%**	**(g)**	**Step**	**%**	**(g)**	**Step**	**%**	**(g)**	**Step**	**%**	**(g)**	**Step**
Water	81,25	203,13	2	81,95	163,90	2	81,75	163,50	2	81,45	162,90	2
Egg Albumin	15,00	37,50	1	15,00	30,00	1	15,00	30,00	1	15,00	30,00	1
Soy Lecithin	0,50	1,25	1									
Goat cheese flavor	2,50	6,25	1	2,50	5,00	1	2,50	5,00	1	2,50	5,00	1
Salt	0,50	1,25	1	0,30	0,60	1	0,30	0,60	1	0,30	0,60	1
Xanthan gum	0,25	0,63	1	0,25	0,50	1	0,50	1,00	1	0,75	1,50	1
TOTAL	**100,00**	**250,00**		**100,00**	**200,00**		**100,05**	**200,00**		**100,00**	**200,00**	

Table 7. Iberian crisp formulation

CRISP	01.04.22 T.01		
INGREDIENTS	**%**	**(g)**	**Step**
Water	91,90	183,80	1
Potato starch	5,90	11,80	1
Beetroot powder	1,00	2,00	1
Cocoa Powder	0,50	1,00	1
Salt	0,50	1,00	1
Parma Flavour	0,20	0,40	2
TOTAL	**100,00**	**200,00**	

Ingredients reference:



Equipment for Dice:

- Dice silicon mold;
- Pan;

- Silicon spatula;
- Cookie cutter square shaped (3cm);
- Silver Crest Precision scale (SDL 300 C2 / IAN: 298644);
- Scale (Dunnes home digital kitchen scale / 05686 STYLE 7837422).

Equipment for foam:

- Stainless steel bowl;
- Whisk;
- Spoon;
- Silver Crest Precision scale (SDL 300 C2 / IAN: 298644);
- Scale (Dunnes home digital kitchen scale / 05686 STYLE 7837422).

Equipment for crisp:

- Electrolux SkyLine Premium Oven (Equipment Asset tag: 44218 / SDXCQ1 14354);
- Pan;
- Whisk;
- Parchment paper;
- Silver Crest Precision scale (SDL 300 C2 / IAN: 298644);
- Scale (Dunnes home digital kitchen scale / 05686 STYLE 7837422).

Dice method:

1. Prepare the caramel syrup by melting the sugar in a pan until get golden colored, then add the water (preferable hot), and let it boil until the sugar melts and the syrup thickens;
2. Mix together all the powder ingredients (inulin, sugar, agar, and LBG);
3. In a pan add the water and mix the previously blended powder;
4. While mixing with a silicon spatula, boil the mixture for 2 minutes;
5. Add the flavor, salt, and caramel syrup;
6. Pour the solution into the Dice silicon mold and let it set in the fridge for approximately 30 minutes;
7. After settled, cut the sides and center of the Dice using the cookie cutter.

Foam method:

1. Mix together all the powder ingredients (egg albumin, goat cheese flavor, salt, xanthan gum, and soy lecithin);
2. In a bowl mix together, the water and the previously blended powder;
3. Keep whisking until obtain the foam;
4. Wait 5 minutes before collecting the foam with a spoon.

Crisp method:

1. In a pan disperse the potato starch and the salt in the water;
2. Boil until the mixture gets thick and translucid;

3. Flavor it and add colorants;
4. Place portions of 3mm thickness over a parchment paper;
5. Bake for 2h at 100ºC.

Results and discussion

- Dice: no texture difference was noticed among the three trials (T.02, T.03, and T.04), just flavoring and coloring. The version made only with a higher application rate of caramel syrup (T.04) was the preferred one regarding flavoring, the more intensity of sweetness will match with the goat cheese flavoring of the foam. The version T.04 presented a more intense yellow tone, since has higher application rate of caramel syrup;
- Dice: the increase in inulin percentage did not cause impact in the structure;
- Dice: filling the silicon mold until the top made the shaping with the cookie cutter easier;
- Dice: T.04 defined as the final formulation for the Dice.

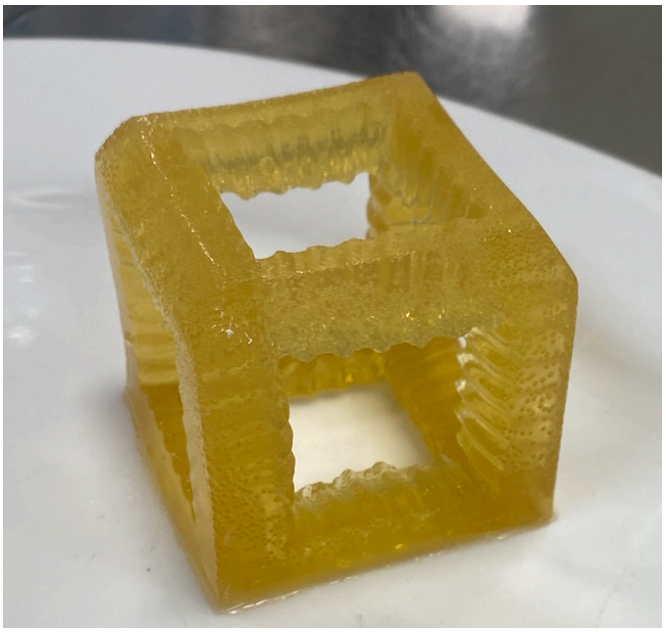


Figure 3. Dice made with formulation T.04

- Foam: formulation T.02 presented an intense yellow tone and did not aerate well. The T.03 performed much better and did not present the yellow tone saw before, showing that the powdered soy lecithin impacted I the colouring and foaming. However, foam structure was still missing;
- Foam: the more the application rate of xanthan gum was done, the more structured the foam got. T.05 (0.75% of xanthan gum) gave the most interesting texture and was defined as the final formulation for the foam.

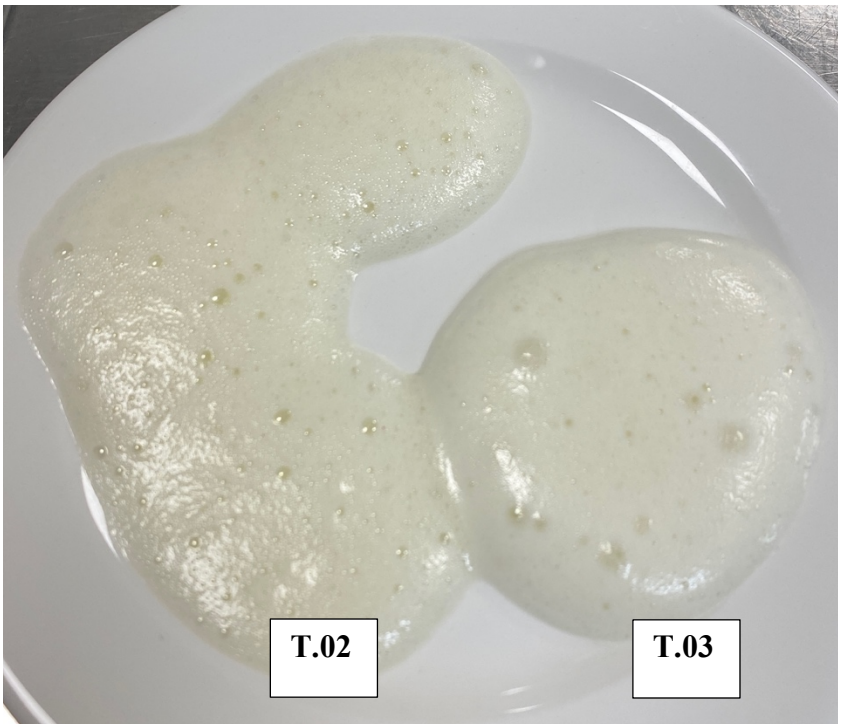


Figure 4. Comparation foam texture with formulation T.02 x T.03

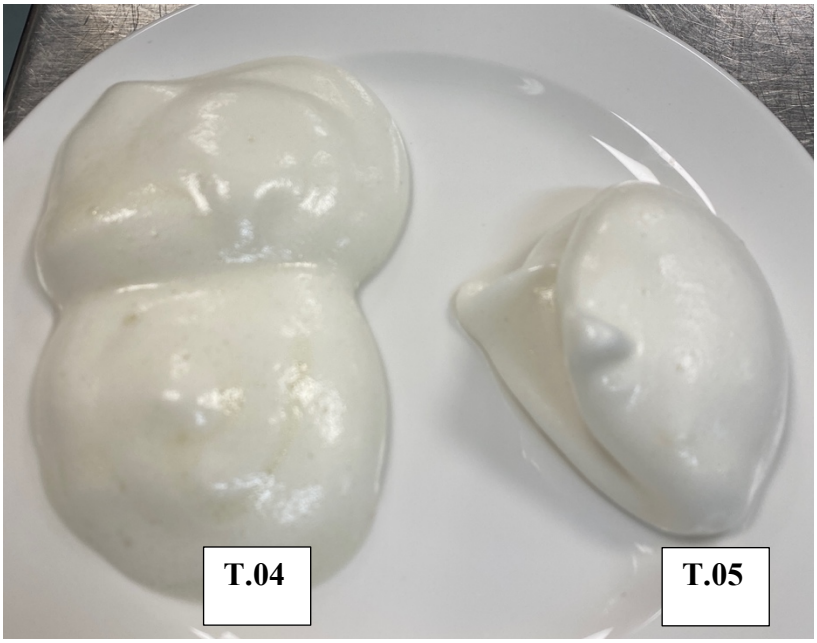


Figure 5. Comparation foam texture with formulation T.04 x T.05

- Crisp: the colouring made with beetroot and cocoa have a very nice and similar colour to Iberian ham;
- Crisp: the flavouring application rate was appropriate;
- Crisp: after cooking the mixture was not to thick and a filamentous formation was observed, probably due to starch granule rupture. So, reduce cooking time after boiling and add 10% more potato starch;

- Crisp: after baking, it was thin and crispy as expected, however could be a little bit crispier. Maybe more starch addition helps and frying too.

Figure 6. Dish with the caramel syrup Dice (formulation T.04), the goat cheese foam (formulation T.05) and the Iberian ham crisp (formulation T.01)

Recommendations for following week.

- Work on the tuille formulation;
- Try frying the Iberian ham crisp that were storage;
- Bake new Iberian ham crisp with more 10% of potato starch, and cook it less time to preserve more the starch granules and avoid filament formation.

Ingredients required for the following 2 weeks.

- Corn flour.

MODULE CODE: TFCS9025
MODULE TITLE: Advanced molecular gastronomy
STUDENT NAME: Douglas Yokomi Fornari
FOOD PRODUCT: Dice
CLASS NO.: 3 **DATE: 04.04.22**

Weekly Aims and Objectives

- Make the pistachio tuille;
- Deep fry the reserved Iberian ham crisps from last class;
- Make Iberian ham crisp with more potato starch (10% of increasement).

Materials and Method (Ingredients, Equipment and Method)

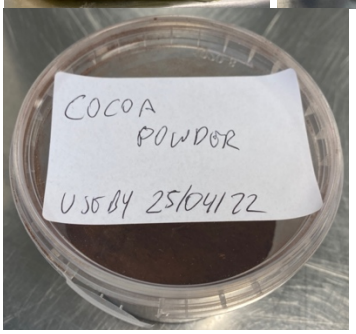
Table 8. Tuille formulation

TUILLE	04.04.22 T.02			04.04.22 T.03		
INGREDIENTS	**%**	**(g)**	**Step**	**%**	**(g)**	**Step**
Water	71,85	143,70	1	71,85	143,70	1
Olive oil	15,00	30,00	1	15,00	30,00	1
Gluten	1,20	2,40	1	1,55	3,10	1
Pistachio flavor	1,00	2,00	1	1,00	2,00	1
Green colorant	0,10	0,20	1	0,10	0,20	1
Inulin Fiber	1,00	2,00	1	3,00	6,00	1
Corn flour	9,35	18,70	1	7,00	14,00	1
Salt	0,50	1,00	1	0,50	1,00	1
TOTAL	**100,00**	**200,00**		**100,00**	**200,00**	

Table 9. Iberian crisp formulation

CRISP	04.04.22 T.02		
INGREDIENTS	**%**	**(g)**	**Step**
Water	91,30	182,60	1
Potato starch	6,50	13,00	1
Beetroot powder	1,00	2,00	1
Cocoa Powder	0,50	1,00	1
Salt	0,50	1,00	1
Parma Flavour	0,20	0,40	2
TOTAL	**100,00**	**200,00**	

Ingredients reference:



Equipment for tuille:

- Stainless steel bowl;
- Whisk;
- Ladle;
- Stainless steel spatula;
- Non-sticky frying pan;
- Kitchen paper;
- Silver Crest Precision scale (SDL 300 C2 / IAN: 298644);
- Scale (Dunnes home digital kitchen scale / 05686 STYLE 7837422).

Equipment for crisp:

- Electrolux SkyLine Premium Oven (Equipment Asset tag: 44218 / SDXCQ1 14354)
- Pan;
- Whisk;
- Parchment paper;
- Silver Crest Precision scale (SDL 300 C2 / IAN: 298644);
- Scale (Dunnes home digital kitchen scale / 05686 STYLE 7837422).

Tuille method:

1. In a bowl mix together all the ingredients;
2. Warm a frying pan on the cook top with some oil covering the bottom of the frying pan;
3. On the very hot frying pan, pour 1 ladle of the batter (be careful, it will pop);
4. When it stops popping and the boarder start to unstick, take out the tuille from the pan using a spatula and place over a kitchen paper;
5. Spray the pistachio flavor on the top of it.

Crisp method:

1. In a pan disperse the potato starch and the salt in the water;
2. Boil until the mixture gets thick and translucid;
3. Flavor it and add colorants;
4. Place portions of 3mm thickness over a parchment paper;
5. Bake for 2h at 100ºC;
6. Deep fry it with vegetable oil at 150ºC for a transparent appearance (when it starts to pop, take it out of the oil / at 190ºC for a puffed shape (when it puffs can be taken out of the oil).

Results and discussion

- Regarding the tuille, the addition of starch seemed to help, however it created a gelatinized texture that was taking too long to dry, resulting in burnt edges and raw center. So, both tuille formulations did not work well. For reasons of time and not being possible to use wheat flour, it was decided to not follow anymore with this development, some type of gel will replace it;
- Regarding the Iberian ham crisps, the increase of potato starch addition created a better texture of the cream, making easier to spread over the parchment paper, and also resulted in a nicer texture after baking. The frying needs to be at a lower temperature (150ºC) so the crisp just gets crispier and does not puffs changing too much the appearance and texture.

Recommendations for following week.

- Develop a gel that will replace the tuille (pistachio or balsamic vinegar flavored);

- Design the dish plating (place the Dice in the center of the plate, make a curved shape with the goat cheese foam using the back of a spoon, add some balsamic gel spots, and insert the Iberian ham crisps inside the Dice).

Ingredients required for the following 2 weeks.

- Spirulina;
- Balsamic vinegar.

MODULE CODE: TFCS9025
MODULE TITLE: Advanced molecular gastronomy
STUDENT NAME: Douglas Yokomi Fornari
FOOD PRODUCT: Dice
CLASS NO.: 4 **DATE: 25.04.22**

Weekly Aims and Objectives

- Develop a gel flavored as pistachio and balsamic vinegar, and decide which one to follow with;
- Make the final formulations for the Dice, foam and crisp;
- Define dish platting.

Materials and Method (Ingredients, Equipment and Method)

Table 10. Final caramel syrup formulation

CARAMEL SYRUP	T.01		
INGREDIENTS	**%**	**(g)**	**Step**
Water	33,00	99,00	1
Castor sugar	67,00	201,00	1
TOTAL	**100,00**	**300,00**	

Table 11. Final caramel syrup flavored Dice formulation

CUBE	T.04		
INGREDIENTS	**%**	**(g)**	**Step**
Water	78,45	156,90	2
Inulin Powder	10,00	20,00	1
Caramel syrup	10,00	20,00	2
Agar	1,30	2,60	1
LBG	0,15	0,30	1
Salt	0,10	0,20	3
TOTAL	**100,00**	**200,00**	

Table 12. Final goat cheese flavoured foam formulation

FOAM	T.05		
INGREDIENTS	**%**	**(g)**	**Step**
Water	81,45	162,90	2
Egg Albumin	15,00	30,00	1
Goat cheese flavor	2,50	5,00	1
Salt	0,30	0,60	1
Xanthan gum	0,75	1,50	1
TOTAL	**100,00**	**200,00**	

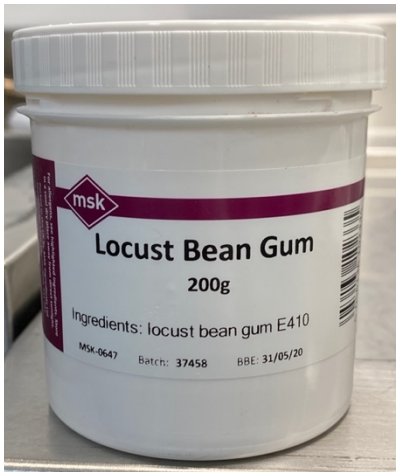
Table 13. Final Iberian ham flavored crisp formulation

CRISP	T.02		
INGREDIENTS	**%**	**(g)**	**Step**
Water	91,30	182,60	1
Potato starch	6,50	13,00	1
Beetroot powder	1,00	2,00	1
Cocoa Powder	0,50	1,00	1
Salt	0,50	1,00	1
Parma Flavour	0,20	0,40	2
TOTAL	**100,00**	**200,00**	

Table 13. Gel formulation

	25.04.22			25.04.22		
	Pistachio			Balsamic		
GEL	T.01			T.02		
INGREDIENTS	**%**	**(g)**	**Step**	**%**	**(g)**	**Step**
Water	75,50	113,25	2	61,75	92,63	2
Xanthan gum	0,75	1,13	1	0,75	1,13	1
Inulin Fibre	10,00	15,00	1	10,00	15,00	1
Maltodextrin	10,00	15,00	1	10,00	15,00	1
Olive oil	2,00	3,00	2	2,00	3,00	2
Balsamic vinegar			2	13,50	20,25	2
Salt	1,00	1,50	1	1,00	1,50	1
Spirulina	0,25	0,38	3			
Cocoa powder				1,00	1,50	3
Pistachio flavour	0,50	0,75	3			
TOTAL	**100,00**	**150,00**		**100,00**	**150,00**	

Ingredients reference:



Equipment for Dice:

- Dice silicon mold;
- Pan;
- Silicon spatula;
- Cookie cutter square shaped (3cm);
- Silver Crest Precision scale (SDL 300 C2 / IAN: 298644);

- Scale (Dunnes home digital kitchen scale / 05686 STYLE 7837422);

Equipment for foam:

- Stainless steel bowl;
- Whisk;
- Spoon;
- Silver Crest Precision scale (SDL 300 C2 / IAN: 298644);
- Scale (Dunnes home digital kitchen scale / 05686 STYLE 7837422).

Equipment for crisp:

- Electrolux SkyLine Premium Oven (Equipment Asset tag: 44218 / SDXCQ1 14354)
- Pan;
- Whisk;
- Parchment paper;
- Silver Crest Precision scale (SDL 300 C2 / IAN: 298644);
- Scale (Dunnes home digital kitchen scale / 05686 STYLE 7837422).

Equipment for gel:

- Stainless steel bowl;
- Whisk;
- Silver Crest Precision scale (SDL 300 C2 / IAN: 298644);
- Scale (Dunnes home digital kitchen scale / 05686 STYLE 7837422).

Dice method:

1. Prepare the caramel syrup by melting the sugar in a pan until get golden colored, then add the water (preferable hot), and let it boil until the sugar melts and the syrup thickens;
2. Mix together all the powder ingredients (inulin, sugar, agar, and LBG);
3. In a pan add the water and mix the previously blended powder;
4. While mixing with a silicon spatula, boil the mixture for 2 minutes;
5. Add the flavor, salt, and caramel syrup;
6. Pour the solution into the Dice silicon mold and let it set in the fridge for approximately 30 minutes;
7. After settled, cut the sides and center of the Dice using the cookie cutter.

Foam method:

1. Mix together all the powder ingredients (egg albumin, goat cheese flavor, salt, and xanthan gum);
2. In a bowl mix together, the water and the previously blended powder;
3. Keep whisking until obtain the foam.

Crisp method:

1. In a pan disperse the potato starch and the salt in the water;
2. Boil until the mixture gets thick and translucid;
3. Flavor it and add colorants;
4. Place portions of 3mm thickness over a parchment paper;
5. Bake for 2h at 100ºC;
6. Deep fry it with vegetable oil at 150ºC for a transparent appearance (when it starts to pop, take it out of the oil.

Gel method:

1. Mix together the powder ingredients (xanthan gum, inulin fiber, maltodextrin, and salt);
2. Add it to a bowl and slowly add the water, oil and, balsamic vinegar;
3. Flavor and color as specified for each formulation.

Results and discussion

- The Dice, the foam and the crisp went just as planned, in the same way as it performed on the previous trials, showing good repeatability of the formulations;
- Both, pistachio and balsamic, gel formulations gave interesting results, however the balsamic one combined better with the other dish flavors, being the one selected to compose the final dish;
- The dish platting followed the last week recommendation: the Dice was placed on the center of the plate, a curved shape with the goat cheese foam using the back of a spoon was made, some balsamic gel spots were added, and the Iberian ham crisps were inserted inside the Dice, as showed on Figure 7, 8 and 9.

Figure 7. Final dish platting

Figure 8. Final dish platting

Figure 9. Final dish platting