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Advanced Molecular Gastronomy Report
International Contest for Note-by-Note Cooking
«Carrot moss with cream, whiskey gel, citrus drops, and walnut crust»



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Introduction

Citing Hervé This, Molecular gastronomy is “to make food directly from the basic constituent chemicals themselves—the individual flavour notes that comprise dishes” (Ashley, 2013). Food science was neglected as a serious topic of scientific study and cooking for a long time but the development of the discipline such as Molecular gastronomy had been started in 90th by Hervé This with Nicholas Kurti gave a boost to the food industry (Burke, This and Kelly, 2016). Beside helpfulness of this discipline, Molecular gastronomy represents a new field combining technical, artistic, and social components in the creation of novel foods opening horizons for scientists and chefs.

Deep researching molecular gastronomy Hervé This and Nicholas Kurti first started in 2012 the Idea of Note-by-note cooking as a contest between scientists, chefs, and students. Note-by-note cooking is an approach of molecular cooking, where dishes are made only using or mostly using pure compounds (Burke and Danaher, 2016).

This year the topic of the competition is “Food waste”. This topic was chosen since the problem of food is increasing rapidly. The frightening statistic by World Health Organization reported in 2022 that over 800 million people are suffering from severe malnutrition while one-third of all the food is wasted or lost. Food waste badly affects the environment, the economy, and food security. Food waste statistics represent terrifying numbers, for example, 25% of the carrot pomace and more than 20 mil tons per year of the peel, seeds, and pulp of oranges are thrown after juice making (Edwards, 2021). Considering the given topic and these facts, I chose Carrot Cake where I will use carrot and citrus powders as implied food waste.

This dish also will contain conceptual idea. By this dish I want to remind people about careful attitude of people towards food. In addition, Molecular gastronomy is a new scientific vision of the culinary where typical ingredients might be replaced with new sustainable compounds with extended shelf-life. These compounds decrease costs for transportation as make it easier.

I would like to play with three key textures: Crispy, Creamy and Chewy to enhance impression of the dish (Sullivan, 2021). Combining these key textures, concept, and specific ingredients in “Carrot moss with cream, whiskey gel, citrus drops and walnut crust”, I hope will deliver emotion and idea to the panellist during the sensory analysis.

In this report my dish will be presented as a response on Note-by-Note challenge. I will cover technical part of the dish as well as creative and inspirational parts.

Aim of the assignment

To deal with a posed world-important issue, the following criteria were the goals of the competition.

- deal with food waste;
- close as much as possible to pure Note-by Note cooking by using most pure compounds or ingredients close to being pure compounds;
- good taste and original appearance.

My aim of the assignment is to combine scientific knowledge with the given topic and artistic approach. The deep understanding of the functions of the used ingredients supported the recipe and contributed with deserved texture and appearance. The combination of aromas, shapes and colorants facilitated the expected appearance of the dish. As a connection with the topic “Food Waste”, the recipe implied the use of the food waste and the idea of the careful and wise attitude to food.

To embellish the usual recipe, several additional elements were used. Carrot moss and cream were basis of the cake. Whiskey gel and citrus drops contributed peculiarity and signature while walnut crust added crunchy texture (Figure 1).

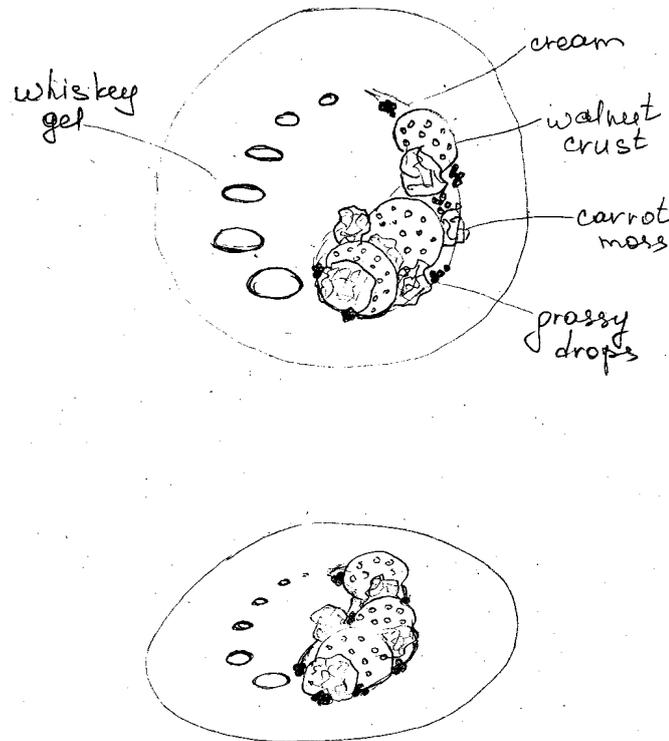


Figure 1 The sketch of the designed recipe

Materials and methods

Equipment

1. Electric whisk Planetary mixer, 5L, electronic with hub. COD 600193 (used only for experimental part). More details here: <https://www.electroluxprofessional.com/pd/food-preparation/planetary-mixers/5-litres/be5-5-liters/planetary-mixers-planetary-mixer-5-lt.-electronic-with-hub-600193/>



Figure 2 Used electric whisk. Source: <https://www.electroluxprofessional.com/pd/food-preparation/planetary-mixers/5-litres/be5-5-liters/planetary-mixers-planetary-mixer-5-lt.-electronic-with-hub-600193/>

2. Thermometer

Hygiplas Easytemp Colour Coded White Thermometer. More details here: <https://www.nisbets.ie/hygiplas-easytemp-colour-coded-white-thermometer/j242>



Figure 3 Used thermometer

3. Refrigerator and freezer

1 Door Digital Refrigerator, 670lt, (-2/+10) - Remote (CO₂), COD 725237. More details here: <https://www.electroluxprofessional.com/pd/refrigeration-equipment/refrigerators-and-freezers-cabinets/ecostore-premium-670-1430-liters/ecostore-premium-670-1430-liters-digital-refrigerators-remote-co2/ecostore-premium-1-door-digital-refrigerator-670lt-2-+10-remote-co2-725237/>

1 Door Digital Freezer, 670lt (-22/-15) - Remote (CO₂), COD 725239. More details here: <https://www.electroluxprofessional.com/pd/refrigeration-equipment/refrigerators-and-freezers-cabinets/ecostore-premium-670-1430-liters/ecostore-premium-670-1430-liters-digital-freezers-remote-co2/ecostore-premium-1-door-digital-freezer-670lt-22-15-remote-co2-725239/>



Figure 4 Used refrigerator. Source: <https://www.electroluxprofessional.com/pd/refrigeration-equipment/refrigerators-and-freezers-cabinets/ecostore-premium-670-1430-liters/ecostore-premium-670-1430-liters-digital-refrigerators-remote-co2/ecostore-premium-1-door-digital-refrige>

4. Digital kitchen scale

George Home, Model EKS-006 weight up to 5kg, weights in grams and ounces.,



Figure 5 Used digital kitchen scale

5. Micro scale

Pocket Scale- Ascher Portable Digital Scale with Back-lit LCD Display, Elite Digital Pocket Scale 200 x 0.01g, Mini scales 200g, Mini Digital Weighing Scale. More details here: https://www.amazon.co.uk/Ascher-Portable-Digital-Back-lit-Weighing/dp/B01FQHE25U/ref=asc_df_B01FQHE25U?tag=bingshoppinga-21&linkCode=df0&hvadid=80882880812406&hvnetw=o&hvqmt=e&hvbmt=be&hvdev=c&hvlocint=&hvlocphy=&hvtargid=pla-4584482456224150&psc=1.

6. Oven

Electrolux SkyLine Premium Electric Combi Oven 10GN1/1. More details here:
<https://www.electroluxprofessional.com/pd/cook-chill/skyline-premium-ovens/skyline-premium-ovens-electric/skyline-premium-ovens-10gn-1-1-electric/skyline-premium-electric-combi-oven-10gn1-1-217822/>



Figure 6 Oven used

7. Hob

Modular Cooking Range Line 900XP. More details here:
<https://www.electroluxprofessional.com/pd/cooking/900xp/gas-solid-tops/freestanding-gas-solid-tops/modular-cooking-range-line-900xp-gas-solid-top-on-gas-oven-with-2-burners-with-3mm-worktop-and-electric-ignition-391257/>



Figure 7 Hob used

8. Microwave

Panasonic Professional Microwave Oven NE-1840 230V 3200 watts. More details here:

<https://www.sirman.com/en-GB/cooking-appliances/ovens/panasonic-ne1840/533NE1840>



Figure 8 Used microwave

9. Thermomix

Thermomix®

TM6.

More

details

here:

<https://www.vorwerk.ie/en/c/home/products/thermomix/thermomix-tm6.html>.



Figure 9 Used Thermomix

10. Two bowls
11. Two pans
12. Spoon
13. Whisk
14. 4 disposable cups
15. Baking paper
16. Oven tray
17. Syphon
18. Pipette
19. Slotted spoon

Ingredients

Table 1 The ingredients used

Ingredient	Quantity, g	Supplier	Link	Picture
Refined vegetable oil	~100 (for spheres)			
Sugar	85			
Icing sugar	30			

Glucose syrup	30	Belgogluc	https://sbi4beer.com/wp-content/uploads/2020/12/Technische-specificaties-Belgogluc-CF-81-Glucosestroop.pdf	
Corn starch	20	Gem	https://www.thetradingpost.fr/goldenfry-cornflour-c2x24478813	
Carrot powder	20	Sosa	https://www.sosa.cat/en-ww/zanahoria-en-polvo	
Citrus powder	20	Sosa	https://www.sosa.cat/en-ww/piel-de-naranja-liofilizada-en-polvo-700g-sosa	
Skimmed milk powder	18	Pritchitts	https://www.bradleysfoods.co.uk/Catalogue/Ambient-Products/Milk-Cream-Non-Dairy-Cream-and-Custard/Milk-Powder/MILLAC-VALUE-MILK-POWDER-2kg-MIL5744	
Albumen	12	Sosa	https://infusions4chefs.co.uk/sosa-albumin-powder-egg-white-500g/	
Casein Protein	5	MyProtein	https://www.myprotein.ie/sports-nutrition/peptopro-casein/10530179.html	
Lecithin	16	Sosa	https://www.sosa.cat/en-ww/lecitina-de-soja-en-polvo-sosa	
Xanthan gum	3	En-Place Foods	https://en-placefoods.com/	

Hyfoamer	2	MSK	https://msk-ingredients.com/msk-1056-hyfoamer-200g	
Agar-agar	3	Sosa	https://www.sosa.cat/en-ww/agar-agar-500g-sosa	
Liquid green colour	1	Il Punto Italiana	https://www.ilpuntoitaliana-shop.it/negoziocoloranti/gel-colorato-alimentare-per-decorare-e-scrivere/gel-concentrato-verde-100gr/	
Liquid yellow colour	1	Il Punto Italiana	https://www.ilpuntoitaliana-shop.it/negoziocoloranti/gel-colorato-alimentare-per-decorare-e-scrivere/gel-concentrato-verde-100gr/	
Liquid vanilla flavour	0.5	Sosa	https://www.sosa.cat/en-ww/extracto-natural-de-vainilla-bourbon-de-madagascar-sosa	
Liquid walnut flavour	0.5	Iqemususu	https://iqemususu.com/en/produit/coch/	
Liquid whiskey flavour	0.5	Sosa	https://infusions4chefs.co.uk/sosa-arome-rum-50g/	
Liquid white chocolate flavour	0.5	Sosa	https://infusions4chefs.co.uk/sosa-arome-white-chocolate-50g/	

Powder red colour	0.5	Mallard Ferrière	https://www.meilleurduchef.com/fr/achat/patisserie/ingredients/colorant-alimentaire/mfe-colorant-poudre-rouge-framboise.html	
Brown edible shimmer	0.5	Sugarflair colours	http://www.sugarflair.com/flipbook1/flipbook-drupal-plugin.html	

Methods

Carrot moss

- a. Measure in a bowl:
 - 180g Water
 - 8g Lecithin
 - 12g Albumen
 - 20g Sugar
 - 20g Carrot powder
 - 20g Corn starch
 - 0.5g Liquid vanilla flavour
- b. Put in the siphon gun and let in the fridge to cool.
- c. Charge the siphon with 2 doses of gaz. Shake the siphon vigorously.
- d. Make a hole with a knife on the bottom of the disposable cups.
- e. Fill half of cups with mixture from the siphon.
- f. Microwave the cups for about 30 seconds.
- g. Turn the cups over to let them cool completely.

Cream

- a. Measure in a bowl:
 - 250g Water
 - 18g Skimmed milk powder
 - 5g Micellar casein
 - 30g Icing sugar
 - 3g Xanthan gum
 - 8g Lecithin
 - 0.5g Liquid white chocolate flavour
 - 2g Hyfoamer
- b. Mix the mixture using a mixing head on high speed for 2 minutes or until homogeneous with no lumps.
- c. Place the mixture inside a clean siphon and use 1 dose of gaz. Shake the siphon.

Whiskey gel

- a. Measure in a pan:
 - 50g Water
 - 50g Sucrose
- b. Heat this mixture until thickening.
- c. Measure in a bowl:

- 100g Hot water
- 1g Agar-Agar
- 1g Liquid yellow colour
- 0.5g Liquid whiskey flavour

d. Add mixture with Agar-Agar into pan with syrup, mix all together until smooth and cool down.

Walnut crust

- a. Measure in a pan:
 - 15 g Water
 - 30g Glucose syrup
- b. Mix and heat until browning on the wall of pan. Gently stir bringing browning to the centre.
- c. Pure on the baking paper and cool until hardness.
- d. Grind in thermomix until powder.
- e. Use necessary amount of this powder with 0.5g Powder red colour and 0.5g Powder orange colour to form the circle on the tray with the baking paper.
- f. Bake in the oven at 180 °C 5 minutes.
- g. Cool down.
- h. Sprinkle with liquid nut flavour and add a bit brown edible shimmer on the top with the help of brush.

Citrus drops

- a. Measure in a pan:
 - 100g Water
 - 20g Citrus powder
 - 15g Sugar
 - 2g Agar-Agar
 - 2g Calcium gluconate
- b. Blend together and heat until boiling.
- c. Using a pipette add the mixture drops by drops to the cold oil. Cover gently with the slotted spoon to ensure the sphere is completely immersed.
- d. Make sure the spheres don't stick together. After 2 minutes remove and rinse in a bath of water.

Results

Results regarding each element

Carrot moss

This element was real difficulty. The main criterion of it is texture which was too dense and not fluffy at the beginning. Trying new recipe, I reached desired fluffy and chewy texture. Besides, I decided to not to use carrot flavour because carrot powder was enough for aroma. For the first classes I used colour due to unavailability carrot powder on the kitchen. But in the end, it turned out to be unnecessary since colour was saturated enough. The texture and colour are represented on Figure 10.

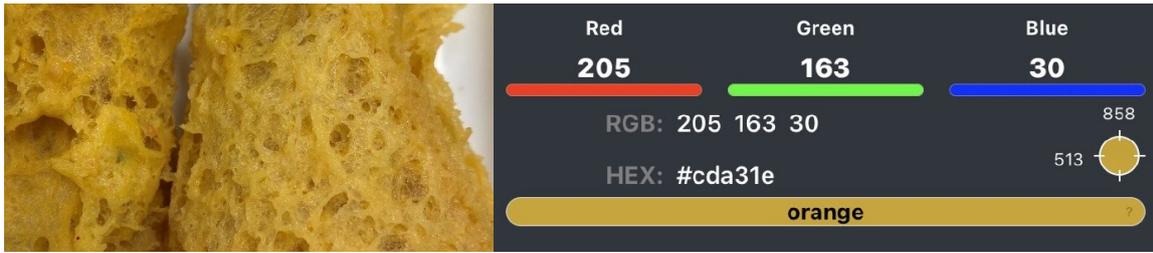


Figure 10 The texture and colour of the carrot moss

Cream

The cream was the second problem. It was too liquid in the beginning, but I fixed this problem with the help of lecithin. In accordance with feedback of my classmates, the taste and flavour were perfect. The texture and colour are represented on Figure 11.

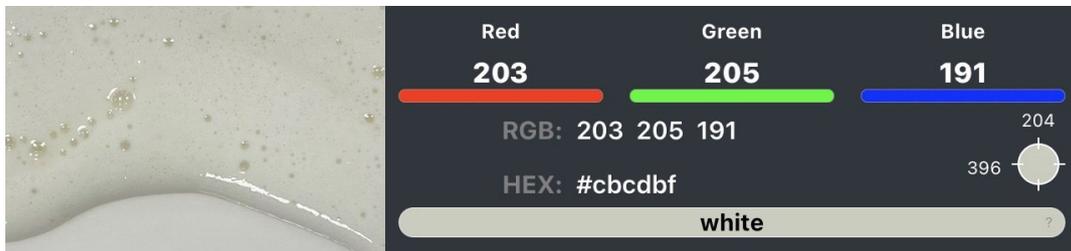


Figure 11 The texture and colour of the cream

Whiskey gel

For this element desired texture, thickening and colour was achieved from the first trial. The recipe worked perfectly. The flavour of whiskey added in the dish spiciness. The texture and colour are represented on Figure X.

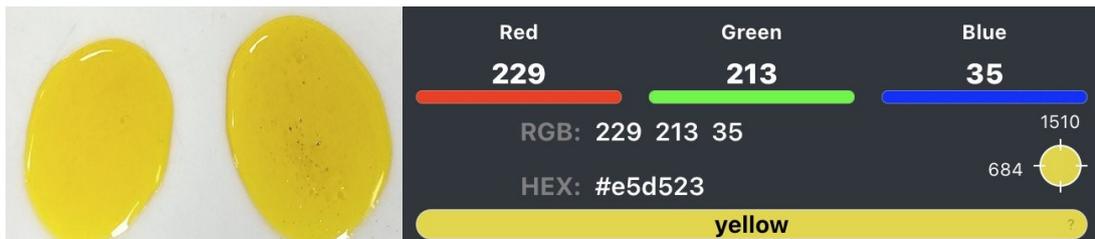


Figure 12 The texture and colour of the whiskey gel

Walnut crust

For this element desired texture, shape was achieved from the first trial. The recipe worked well. The sweet taste was embellished with nutty aroma. Unfortunately, the colour was not as expected because of unavailability of brown colour. Due to this purpose, I added red powder colour in a little more to rich the colour closer to brown but it still had red shade as might be seen on Figure 13.

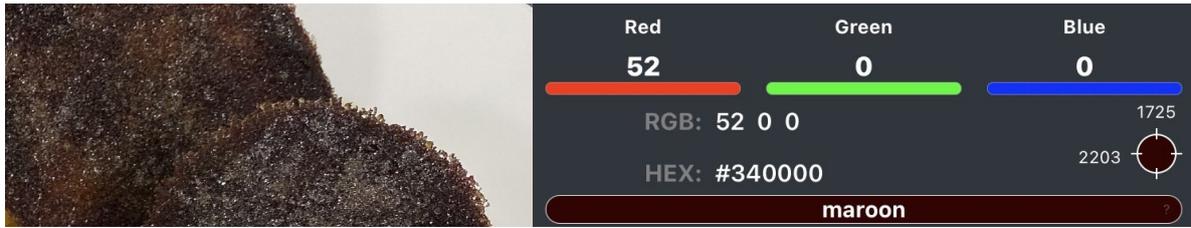


Figure 13 The texture and colour of the walnut crust

Citrus drops

For this element, at the beginning, I used recipe with alginate. But this recipe allows to receive only small spheres. Because of this I changed the recipe with reverse specification in cold vegetable oil. It helped to reach desired texture, shape and colour was achieved from the first trial. The recipe worked perfectly. The taste had pleasant zest notes. The texture and colour are represented on Figure 14.



Figure 14 The texture and colour of the citrus drops

Results regarding ingredients used

Besides considering each element, I assume, this exercise was success in terms of applied ingredients because it was pure compounds or close to being pure compounds (Table 2).

Table 2 Breakdown of the ingredients

Ingredient	Breakdown of the ingredients
Glucose syrup	Dextrose 17% Maltose 13% Maltotriose 13% Higher sugars 57%
Carrot powder	Carrot powder 90% Maltodextrin 10%
Citrus powder	Orange pulp powder 90% Maltodextrin 10%
Skimmed milk powder	Skimmed Milk Powder 24% Lactose Whey Powder Vegetable Oil (Coconut, Palm) Dried Glucose Syrup Milk Protein Sugar Acidity Regulator E340b Emulsifier E471 Vitamin D
Egg white powder	Powdered hen's egg albumin Xanthan gum E415

	Citric acid E330 Triethyl citrate E1505
Casein Protein	Casein Hydrosylate
Lecithin	Soy lecithin 12 DE
Xanthan gum	Xanthan gum E415
Hyfoamer	Dairy protein
Agar-agar	Agar-agar E406 Dextrose
Liquid green colour	Water Tartrazine E102 Patent blue E131 Sodium benzoate E211
Liquid yellow colour	Water Tartrazine E102 Quinoline yellow E104 Sodium benzoate E211
Liquid vanilla flavour	Vanilla extract Inverted sugar Glycerine E422
Liquid walnut flavour	Aroma
Liquid whiskey flavour	Whiskey natural extract Inverted sugar Glycerine E422
Liquid white chocolate flavour	Aroma Inverted sugar Glycerine E422
Powder red colour	Ponceau 4R E124
Brown edible shimmer	Potassium Aluminium silicate E555 Titanium Dioxide E171 Tartrazine E102 Carmoisine E122 Brilliant Blue FCF E133 Carbon Black E153
Corn flour	73% amylopectin 27% amylose
Refined vegetable oil	Palmitic acid (saturated): 5% Stearic acid (saturated): 6% Oleic acid (monounsaturated omega-9): 30% Linoleic acid (polyunsaturated omega-6): 59%
Sugar /Icing sugar	Sucrose

Results of sensory analysis

The results of the sensory analysis are represented on the Figures 15-21.

What gender do you identify as?

9 ОТВЕТОВ

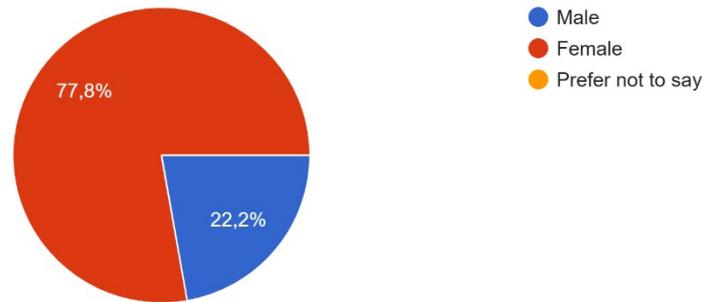


Figure 15 Gender of the panellists

How old are you?

9 ОТВЕТОВ

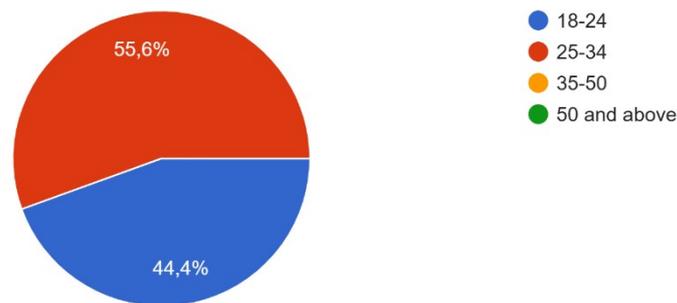


Figure 16 Age of the panellists

This carrot cake with cream, whiskey gel, citrus drops, and walnut crust was created by using food waste such as carrot and citrus powders. How would you rate the idea of the dish? (1-min., 5-max.)

9 ОТВЕТОВ

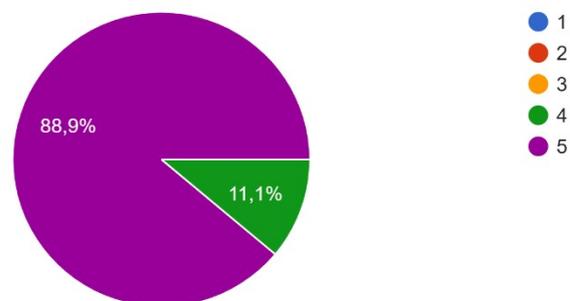


Figure 17 The results of the dish description evaluation

How would you rate the appearance of the dish? (1-min., 5-max.)

9 ОТВЕТОВ

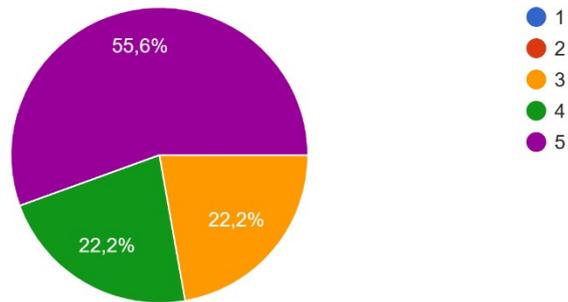


Figure 18 The results of the appearance evaluation

How would you rate the texture of the dish? (1-min., 5-max.)

9 ОТВЕТОВ

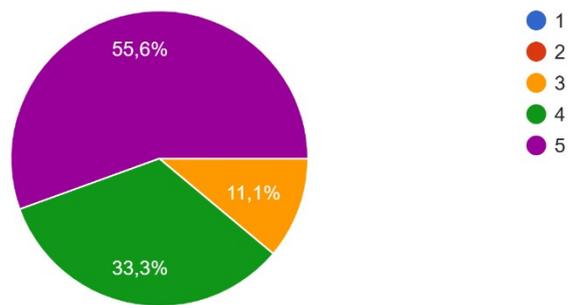


Figure 19 The results of the texture evaluation

How would you rate the flavour of the dish? (1-min., 5-max.)

9 ОТВЕТОВ

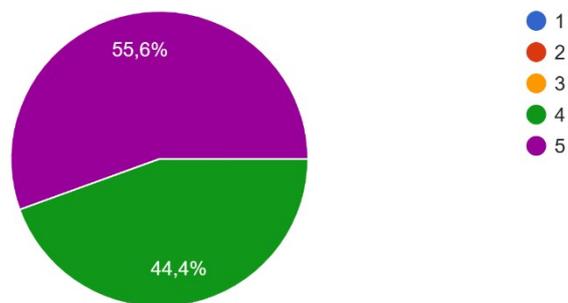


Figure 20 The results of the flavour evaluation

Please, write any comments, thank you!

4 ответа

You have a lot of creativity, congrats!

very original

overall. the flavor is really nice and the texture is well developed

A M A Z I N G!!! My friend <3

Figure 21 Given comments by panellists

The panellists were asked several questions about appearance, perception, texture, flavour and taste, overall to rate the dish. The questions about demography of panellists were asked as well. 2 males and 7 females between 18 and 34 participated in the evaluation.

All panellists rated the description of the dish with highest marks. More than 55% liked the appearance of the dish. Regarding organoleptic properties, again vast of panellists described it with the 5-points. Based on the feedback, people enjoyed the flavour profile.

Discussion

Food waste

“Food Waste” was chosen as the topic of this year Note-by-Note competition. And it is not surprising since it is hot topic nowadays. To assume this topic, I chose to create unique Carrot Cake with cream, whiskey gel, citrus drops, and walnut crust. This dish contains potential food waste without harm for human body and even bring some nourishing benefits, encloses conceptual idea, and inspires to look at Food Industry from the beauty part.

The recipe contained carrot powder, which could be made from food waste, such as pomace after juicing or peel after cooking. The statistic shows that 25% of the carrot remains behind as pulp and it's traditionally been lost as waste (Edwards, 2021). But the pomace might be turning into a powder reduces the storage space it requires and prolongs its shelf-life. Moreover, the carrot pomace is nourishing as it contains nutrients and fiber.

Besides carrot powder, I decided to use citrus powder because the citrus industry is one of the largest fruit industries worldwide. Around 40% of citrus fruit produced is used to make juice, mainly orange, that results in a total 24.3 mil tons of waste per year, mainly consisting of the peel, seeds, and pulp of the oranges (Pacheco, Moreno, and Villamiel, 2018). This waste also can be used in the food industry being a source of essential oils, sugars, natural antioxidants, organic acids, and pectin. The citrus powder apart from vitamin C, it improves taste and flavour of the food stimulating appetite. Based on this information, the hidden potential of food waste should be observed in the future.

Concept

Apart from using food waste in the dish, conceptual aspect was affected. The Carrot Cake gained popularity during World War II in England when supply of sugar was cut off for British. In this hard time, people had different and careful attitude to food (Tran, 2015). Thus, is not only the Carrot Cake containing food waste but also it is a symbol of wise consumption in this context.

At this stage, Molecular Gastronomy opens new horizons from waste to wealth. Precise management of food will allow in the future avoid accidental food wastes and prevent extra production. Extended shelf-life will help to transport dry products to remote places with severe and difficult weather conditions where production of exact ingredients is impossible. Probably through decades, the problem of malnutrition could be solved with the help of Molecular Gastronomy.

This task was challenging for me. It requires deep scientific understanding all used ingredients. As I am only gaining experience, I did some mistake at the beginning of the cooking classes. The most difficult part is desired texture of the carrot moss and cream.

Carrot moss

The carrot moss was expected to be very fluffy with relatively big air bubbles inside reminding real moss (Figure 22). I reached desired texture, but recipe still might be improved with its firmness.

Firstly, as I understood the problem was absence of emulsifier. Emulsifiers favour the incorporation of air in the batters, leading to uniform air bubbles that are stable during baking resulting in cakes with a high volume (Zhou, & Hui, 2014). Egg yolk performs this function in the recipes. This is why I used lecithin in the final recipe.

Secondly, reaction between protein (from egg) and nitrogen oxide contributes foam creation (Zhou, & Hui, 2014, Difford, 2014). For this purpose, I decided to use syphon with nitrogen capsule. Usually, wheat flour is source of nitrogen in bread making (around 0.7-1.2%). In my case, I used corn flour which contains only 0.02% of nitrogen. The addition of nitrogen in the recipe facilitates foam.

Thirdly, probably, the gluten network in wheat matrices might improve firmness of the dough because of the proper gas retention capability (Zhou, & Hui, 2014). But I did not use wheat flour hence this ingredient is complicated with its components including protein, starch, polysaccharides, lipides. In this case, if I had more time, I would try adding gluten in the recipe.

Most of the recipes used raw eggs. I tried to repeat the egg with pure components. Raw egg it is around 30% yolk and 70% white, and 90% water overall. There were 12g of albumen (as egg white), 8g lecithin (egg yolk) and 180g of water in my recipe.



Figure 22 Comparison of the carrot cake I made and real moss (from the left: cake without carrot powder whipped in a head mixer; cake with carrot powder with the help of syphon; real moss)

Cream

I wanted to create something similar with whipped cream. To create a foam, I used albumen and Hyfoamer. In most recipes Hyfoamer works alongside xanthan gum to achieve a stable foam. Because of this, I added xanthan gum to enhance efforts.

Besides, I used micellar casein. Micelles could facilitate emulsion formation by reducing the interfacial tension between the oil and water phases, facilitating the formation of the emulsion matrix, while remaining stable during storage (Tsioulpas, Lewis, and Grandison, 2007). Thus, in the emulsion matrix, proteins can form viscoelastic interfacial membranes around the fat globules, protecting them against coalescence and aggregation (Damodaran, 2005).

But these ingredients and fat content were not enough to create stable fluffy foam. Cream spread on the plate (Figure 23). Making research, I understood that it is very important for whipped cream to have high butterfat content more than 33% (Cauvain & Young, 2001). Because of unavailability of powdered butter on the kitchen, I found another method to enhance stability of my low-fat cream applying emulsifier. The main functionality of emulsifiers in imitation cream is to destabilize the fat globule membrane covering the fat globules formed during the homogenisation of the cream (Palsgaard). To conclude, emulsifier contributed desired foam and satisfied my goal.



Figure 23 Comparison of the creams (from the left: without emulsifier; with lecithin)

Citrus drops

At the beginning, I used alginate bath to create spheres. In the presence of calcium, alginate molecules will form a strong gel. The interaction between sodium alginate strands and calcium ions represents as an “egg- box” mechanism, where the calcium ions fit in between the alginate strands (Burke, This, Kelly, 2016). But spheres were too small and melted too fast (Figure 24), and it was impossible to do spheres bigger as galled liquid was too fluid. Due to this reason, I choose specification with agar-agar in cool vegetable oil where oil cooled agar immediately to the centre of the spheres and makes it firm.



Figure 24 Comparison of the alginate and agar drops

Nutrition profile

The total weight of the dish is about 130 g and about 853 kcal. The amounts of protein/fat/carbohydrates are 10g/8g/83g relatively from which 72g of sugar. These numbers are the opportunity to improve the profile of sugar content with, for example, inulin which is rich with fiber.

Crispy, Creamy, Chewy

Overall, the desired goal was successfully reached. My focus on the different textures was performed with the help of different dispersed systems (Table 3).

Table 3 Dispersed system in the dish

Continuous phase	Solid	Liquid	Gas
Disperse phase			
Solid	Walnut crumb	Citrus drops	-
Liquid	Cream	Whiskey gel	-
Gas	Carrot moss	-	

To conclude, I think it was interesting journey and insightful experience. I wish we had more time for improvement and immersion to this project. The final dish is represented on Figure 25.



Figure 25 Final dish

Conclusion

To conclude, the Note-by-Note competition was challenging, interesting and successful journey for the several reasons. The work done for the very limited time gave a lot of valuable insights regarding the texture, flavour, taste, influence of certain ingredients in the final dish. Separation of the well-known ingredients by their pure components gives a comprehensive understanding of the function of each of them. Besides, this knowledge about pure compounds might be revolution in food industry in the future as it allows to reach certain properties of the products and makes safe and long- lasting.

Thinking outside the box is an important skill for food scientist while Note-by-note is a novel way of thinking about food industry. Development this skill was very motivational and helpful for me especially working under supervision of professional chefs and experienced teachers.

This challenge gave a boost for my creativity as well as allow to implement my theoretical scientific knowledge into practice and learn on my experience. The topic for this year “Waste” is a hot topic around the world. Working on the kitchen with my colleagues allowed me to conclude that Molecular gastronomy is not just a pleasure for sophisticated but also practical discipline with guide on the Future.

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Logbook

MODULE CODE: TFCS9025

MODULE TITLE: Advanced Molecular Gastronomy

STUDENT NAME: Iuliia Ishunkina

PRECISION: Carrot moss with cream, whiskey gel, citrus drops, and walnut crust.

WEEK NO.: 1

DATE: 20/03/2023

Weekly Aims and Objectives

Aim: Try to prepare carrot moss and walnut crumbs.

Objectives: Adapt the recipe in accordance with available ingredients on the stock. For the first week I will try two elements of my product: carrot moss and nut crumbs.

Materials and Method (Ingredients, Equipment and Method)

Ingredients

Carrot moss

140 g Water
50 g Carrot flour
30 g Refined sunflower oil
15g Fructose
15g Egg white powder
5g Methylcellulose
2g Sodium bicarbonate
1g Citric acid
1g Liquid orange colour
0.5g Liquid carrot flavour

Walnut crumb

15g Water
30g Glucose syrup
0.5g Powder red colour
0.5g Powder orange colour

Equipment

Two bowls
Wisk
Spoon
4 disposable cups
Microwave
Thermomix
Baking paper
Pan
Oven tray
Oven

Method

Carrot moss

- a. Measure in a bowl:

- 120 g Water
- 30 g Carrot powder – was replaced with beetroot powder, because of unavailability at the stock
- 30 g Refined sunflower oil
- 15g Fructose
- 15g Egg white powder
- 5g Metylcellulose
- 2g Sodium bicarbonate
- 1g Citric acid
- 1g Liquid orange colour
- 0.5g Liquid carrot flavour

- b. Mix with whisk until no lumps are left.
- c. Fill the disposable cups about 1/3 of the way up.
- d. Microwave the cups for about 30 seconds.
- e. Turn the cups over to let them cool completely.

Walnut crust

- i. Measure in a pan:
 - 15 g Water
 - 30g Glucose syrup
- j. Mix and heat until browning on the wall of pan. Gently stir bringing browning to the centre.
- k. Pure on the baking paper and cool until hardness.
- l. Grind in thermomix until powder.
- m. Use necessary amount of this powder with 0.5g Powder red colour and 0.5g Powder orange colour to form the circle on the tray with the baking paper.
- n. Bake in the oven at 180 °C 5 minutes.
- o. Cool down.

Results and discussion

Carrot moss. Instead of carrot powder beetroot powder was used (Figure 26), because of unavailability at the stock. The mixture seemed too liquid at the beginning.



Figure 26 The mixture for cake

The recipe of sponge cake (moss) did not work properly – the cake was not fluffy, and firm as expected. Because of this I modified the recipe on the spot: I added in 20 g of the prepared mixture 10g of corn-starch/ 15g of corn starch/ 15 g on maltodextrin (Figure 27).



Figure 27 Samples of sponge cake (moss) (From left to right: 1. 20 g of the prepared mixture + 10g of corn-starch; 2. 20 g of the prepared mixture + 15g of corn starch; 3. 20 g of the prepared mixture + 15 g on maltodextrin; 4. the prepared mixture)

The first with 20 g of the prepared mixture and 10g of corn-starch demonstrated the best structure but still not fluffy as expected. The goal for the next week to try a bit change the structure.

Walnut crumbs.

I thought to do small pieces smashing the big piece. But a big one looked more creative, and I decided to use several big pieces in my recipe (Figure 28).



Figure 28 Walnut crumbs

Conclusions

The recipe for the carrot moss was changed because unsatisfied texture and corn-starch will be used in the next steps.

At the beginning, I wanted to use small pieces of the walnut crumbs. But the big pieces looked more impressive.

Recommendations for following week.

Fix the recipe for cake (moss) and try to apply a hand mixer to make it fully. To improve the aroma, I am planning to add some vanilla flavour.

Try the different elements of the recipe such as cream, whiskey gel and citrus drops.

Ingredients required for the following 2 weeks.

Carrot moss

65g Water

46g Sugar

33g Carrot powder

20g Egg powder
12g Refined sunflower oil
17g Corn flour
1g Salt
0.5g Liquid carrot flavour
0.5g Liquid vanilla flavour

Cream

132g Water
18g Skimmed milk powder
5g Sodium caseinate
30g Glucose
2g Xanthan gum
0.5g Liquid batter flavour
Hyfoamer

Whiskey gel

50g Water
50g Fructose
50g Hot water
1g Agar-Agar
1g Liquid yellow colour
0.5g Liquid whiskey flavour

Citrus drops

500g Water
2.5g Sodium alginate
Pinch of sugar
50g Water
20g Citrus powder
2g Calcium gluconate
1g Liquid green colour
0.5g Liquid citrus flavour
Pinch of salt

References

Burke, R., This, H., Kelly, L. A. (2016). Molecular Gastronomy. Reference Module in Food Science, Elsevier. Available at: <https://doi.org/10.1016/B978-0-08-100596-5.03302-3> [Accessed 19 March 2023]

MODULE CODE: TFCS9025

MODULE TITLE: Advanced Molecular Gastronomy

STUDENT NAME: Iuliia Ishunkina

PRECISION: Carrot moss with cream, whiskey gel, citrus drops, and walnut crust.

WEEK NO.: 2

DATE: 27/03/2023

Weekly Aims and Objectives

Aim: Try to cook different elements of the dish. Repeat carrot moss.

Objectives: Try to cook different elements of the dish such as cream, whiskey gel and citrus drops. Fix the recipe for carrot moss and try to apply a planetary mixer to make it fully. To improve the aroma, I am planning to add some vanilla flavour.

Materials and Method (Ingredients, Equipment and Method)

Ingredients

Carrot moss

65g Water
46g Sugar
33g Carrot powder
20g Egg powder
12g Refined sunflower oil
17g Corn flour
1g Salt
0.5g Liquid carrot flavour
0.5g Liquid vanilla flavour

Cream

132g Water
18g Skimmed milk powder
5g Sodium caseinate
30g Glucose
2g Xanthan gum
0.5g Liquid batter flavour
Hyfoamer

Whiskey gel

50g Water
50g Fructose
50g Hot water
1g Agar-Agar
1g Liquid yellow colour
0.5g Liquid whiskey flavour

Citrus drops

500g Water
2.5g Sodium alginate
Pinch of sugar

50g Water
20g Citrus powder
2g Calcium gluconate
1g Liquid green colour
0.5g Liquid citrus flavour
Pinch of salt

Equipment

Two bowls
Wisk
Spoon
4 disposable cups
Planetary mixer
Microwave
Two pans
Syphon
Pipette
Slotted spoon

Method

Carrot moss

- a. Measure in a bowl:
 - 65g Water
 - 46g Sugar
 - 33g Carrot powder – was replaced with corn flour, because of unavailability at the stock
 - 20g Egg white powder
 - 12g Refined sunflower oil
 - 17g Corn flour
 - 1g Salt
 - 0.5g Liquid carrot flavour
 - 0.5g Liquid vanilla flavour
- b. Using a planetary mixer, mix with whisk until fluffy and no lumps are left.
- c. Fill the disposable cups about 1/3 of the way up.
- d. Microwave the cups for about 30 seconds.
- e. Turn the cups over to let them cool completely.

Cream

- a. Measure in a bowl:
 - 132g Water
 - 18g Skimmed milk powder
 - 5g Micellar casein
 - 30g Icing sugar
 - 2g Xanthan gum
 - 0.5g Liquid batter flavour – was replaced with white chocolate
 - 2g Hyfoamer
- b. Mix the mixture using a mixing head on high speed for 2 minutes or until homogeneous with no lumps.
- c. Place the mixture inside a clean siphon and use 1 dose of gaz. Shake the siphon.

Whiskey gel

- d. Measure in a pan:

- 50g Water
- 50g Fructose
- e. Heat this mixture until thickening.
- f. Measure in a bowl:
 - 50g Hot water
 - 1g Agar-Agar
 - 1g Liquid yellow colour
 - 0.5g Liquid whiskey flavour
- d. Add mixture with Agar-Agar into pan with syrup, mix all together until smooth and cool down.

Citrus drops

- a. Measure in a bowl:
 - 500g Water
 - 2.5g Sodium alginate
 - Pinch of sugar
- b. Measure in a bowl:
 - 50g Water
 - 20g Citrus powder
 - 2g Calcium gluconate
 - 1g Liquid green colour
 - 0.5g Liquid citrus flavour
 - Pinch of salt
- c. Blend together the consistency is very important should be that of thick cream.
- d. Rest to remove excess air for 1 hour in the fridge or vac pac.
- e. Using a pipette add the mixture drops by drops to the alginate solution. Cover gently with the slotted spoon to ensure the sphere is completely immersed.
- f. Make sure the spheres don't stick together. After 2 minutes remove and rinse in a bath of water.

Results and discussion

Carrot moss

Today I used a planetary mixer whipping the blend for 10 minutes (speed 10). The texture of the product was satisfied (Figure 29) but flavour not due to carrot flavour. In this case, I will not use carrot flavour for the sponge cake, only vanilla. Besides, the colour was good, colorimeter represented the following parameters for the colour: RGB 201 148 59; HEX #c9943B.



Figure 29 The texture of the carrot moss

Cream

The cream was not stable as I expected (Figure 30). In this case, I will try to use emulsifier such as lecithin to improve stability (Shoemaker, 2019; Logsdon, 2010). Besides, I will add a bit more xanthan gum as a stabiliser (Logsdon, 2010). The taste was great.

Whiskey gel

The whiskey gel behaved perfectly (Figure 30). It was very stable and looked good.



Figure 30 The whiskey gel (yellow)

Citrus drops

The drops were too small and dark. The drops did not have the taste and smell. I will try new recipe for the next class to improve the size, taste and colour.

Conclusions

Most elements of the dish were tested. Small changes in the following recommendation part should be done to improve the finish presentation. The test representation of the dish on Figure 31.



Figure 31 The trial presentation of the dish

Recommendations for following week.

Carrot moss. Do not use carrot flavour next time, only vanilla.

Cream. Try to use lecithin to improve stability. Increase the amount of xanthan gum up to 3g.

Citrus drops. Adjust the taste and flavour using different recipe and ingredients are available in our kitchen. I will try agar-agar for these purposes.

Walnut crumb. Prepare powder for the final week._

Ingredients required for the following 2 weeks.

Carrot moss

65g Water
46g Sugar
33g Carrot powder
20g Egg powder
12g Refined sunflower oil
17g Corn flour
1g Salt
0.5g Liquid vanilla flavour

Cream

132g Water
18g Skimmed milk powder
5g Sodium caseinate
30g Glucose
8g **Lecithin**
3g **Xanthan gum**
0.5g Liquid white chocolate flavour
Hyfoamer

Whiskey gel

50g Water
50g Fructose
50g Hot water
1g Agar-Agar
1g Liquid yellow colour
0.5g Liquid whiskey flavour

Citrus drops

100g Water
20g Citrus powder
15g Sugar
2g Agar-Agar
50g Carrot powder
Bowl of cold refined oil

Walnut crumb

15g Water
30g Glucose syrup
0.5g Powder red colour
0.5g Powder orange colour

References

Shoemaker, S. (2019). Can Heavy Whipping Cream Be Part of a Healthy Diet? [Online] Healthline. Available at: <https://www.healthline.com/nutrition/heavy-whipping-cream> [Accessed 29 March 2023]

Logsdon, J. (2010). How to Make Whipped Cream with a Whipping Siphon. [online] Amazing Food Made Easy. Available at: <https://www.amazingfoodmadeeasy.com/info/modernist-cooking-blog/more/how-to-make-whipped-cream-with-a-whipping-siphon> [Accessed 29 Mar. 2023].

MODULE CODE: TFCS9025

MODULE TITLE: Advanced Molecular Gastronomy

STUDENT NAME: Iuliia Ishunkina

PRECISION: Carrot moss with cream, whiskey gel, citrus drops, and walnut crust.

WEEK NO.: 3

DATE: 17/04/2023

Weekly Aims and Objectives

Aim: Adjust flavour and taste of the carrot moss, adjust texture of the cream, prepare walnut crumbs, try new recipe for citrus drops.

Objectives: For carrot moss, do not use carrot flavour only vanilla. For cream, add emulsifier such as lecithin to improve stability and increase the amount of xanthan gum up to 3g. For citrus drops, try new recipe with agar specification in cold oil. Prepare walnut crumbs for the final week.

Materials and Method (Ingredients, Equipment and Method)

Ingredients

Carrot moss

65g Water
46g Sugar
33g Carrot powder
20g Egg powder
12g Refined sunflower oil
17g Corn flour
1g Salt
0.5g Liquid vanilla flavour

Cream

132g Water
18g Skimmed milk powder
5g Sodium caseinate
30g Glucose
3g Xanthan gum
8g Lecithin
0.5g Liquid white chocolate flavour
Hyfoamer

Citrus drops

100g Water
20g Citrus powder
15g Sugar
2g Agar-Agar
Bowl of cold refined oil

Walnut crumb

15g Water
30g Glucose syrup
0.5g Powder red colour

0.5g Powder orange colour
0.5g Liquid whiskey flavour

Equipment

Two bowls
Wisk
Spoon
4 disposable cups
Microwave
Baking paper
Two pans
Pipette
Slotted spoon

Method

Carrot moss

- f. Measure in a bowl:
 - 65g Water
 - 46g Sugar
 - 33g Carrot powder – was replaced with corn flour, because of unavailability at the stock
 - 20g Egg white powder
 - 12g Refined sunflower oil
 - 17g Corn flour
 - 1g Salt
 - 0.5g Liquid vanilla flavour
- g. Using a planetary mixer, mix with whisk until fluffy and no lumps are left.
- h. Fill the disposable cups about 1/3 of the way up.
- i. Microwave the cups for about 30 seconds.
- j. Turn the cups over to let them cool completely.

Cream

- d. Measure in a bowl:
 - 250g Water
 - 18g Skimmed milk powder
 - 5g Micellar casein
 - 30g Icing sugar
 - 3g Xanthan gum
 - 8g Lecithin
 - 0.5g Liquid white chocolate flavour
 - 2g Hyfoamer
- e. Mix the mixture using a mixing head on high speed for 2 minutes or until homogeneous with no lumps.
- f. Place the mixture inside a clean siphon and use 1 dose of gaz. Shake the siphon.

Citrus drops

- e. Measure in a pan:
 - 100g Water
 - 20g Citrus powder
 - 15g Sugar
 - 2g Agar-Agar

- 2g Calcium gluconate
- f. Blend together and heat until boiling.
 - g. Using a pipette add the mixture drops by drops to the cold oil. Cover gently with the slotted spoon to ensure the sphere is completely immersed.
 - h. Make sure the spheres don't stick together. After 2 minutes remove and rinse in a bath of water.

Walnut crust

- a. Measure in a pan:
 - 15 g Water
 - 30g Glucose syrup
- b. Mix and heat until browning on the wall of pan. Gently stir bringing browning to the centre.
- c. Pure on the baking paper and cool until hardness.
- d. Grind in thermomix until powder.

Results and discussion

Carrot moss

I tested the recipe one more time and result was the same. I would like to see fluffier structure. I will test to use syphon for the recipe next class (www.sosa.cat, Difford, 2014). With carrot powder the colour was bright enough what means it is not necessary to use colour.

Cream

I prepared the mixture with lecithin and xanthan gum for the next class.

Citrus drops

The drops were good (Figure 32). The colour was bright, and it had slight citrus flavour. The texture very stable. I saved drops for the final session.



Figure 32 Citrus drops

Walnut crumbs

The powder was prepared for the final recipe.

Conclusions

I prepared some elements of my dish in advance such as whiskey gel, citrus drops, walnut crumbs and cream.

Recommendations for following week.

Try one more recipe on carrot moss using syphon. Repeat all elements of the dish and take a picture.

Ingredients required for the following 2 weeks.

180g Water
8g Lecithin
12g Albumen
20g Sugar
20g Carrot powder
20g Corn starch
0.5g Liquid vanilla flavour

References

www.sosa.cat. Microwave tomato sponge cake / Sosa en-ww. [Online] Available at:
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MODULE CODE: TFCS9025

MODULE TITLE: Advanced Molecular Gastronomy

STUDENT NAME: Iuliia Ishunkina

PRECISION: Carrot moss with cream, whiskey gel, grassy drops and walnut crust.

WEEK NO.: 4

DATE: 21/04/2023

Weekly Aims and Objectives

Aim: Prepare dish with all details. Perform sensory analysis.

Objectives: Prepare dish with all details considering comments from the previous weeks. Perform sensory analysis and discuss the results.

Materials and Method (Ingredients, Equipment and Method)

Ingredients

Carrot moss

- 180g Water
- 8g Lecithin
- 12g Albumen
- 20g Sugar
- 20g Carrot powder
- 20g Corn starch
- 0.5g Liquid vanilla flavour

Equipment

Two bowls
Wisk
Spoon
4 disposable cups
Microwave
Baking paper
Oven tray
Oven
Syphon

Method

Carrot moss

- a. Measure in a bowl:
 - 180g Water
 - 8g Lecithin
 - 12g Albumen
 - 20g Sugar
 - 20g Carrot powder
 - 20g Corn starch
 - 0.5g Liquid vanilla flavour
- b. Put in the syphon gun and let in the fridge to cool.
- c. Charge the syphon with 2 doses of gaz. Shake the syphon vigorously.
- d. Make a hole with a knife on the bottom of the disposable cups.
- e. Fill half of cups with mixture from the syphon.

- f. Microwave the cups for about 30 seconds.
- g. Turn the cups over to let them cool completely.

Walnut crust

- a. Use necessary amount of this powder from the previous class with 0.5g Powder red colour and 0.5g Powder orange colour to form the circle on the tray with the baking paper.
- b. Bake in the oven at 180 °C 5 minutes.
- c. Cool down.
- d. Sprinkle with liquid nut flavour and add a bit brown edible shimmer on the top with the help of brush.

Results and discussion

Carrot moss

For today final trial I reached desired structure of the carrot moss. It was fluffy and looked as moss, taste was good (Figure 33).



Figure 33 The process of carrot moss making

The result of sensory analysis will be discussed in the main part of the report.

Walnut crust

The crust was a bit darker than I expected. The amount of the colour was too much. I used edible glitter to embellish the dish (Figure 34).



Figure 34 Powder for walnut crumb with colour

Conclusions

I was satisfied with the final dish. There are some aspects that might be improved. The moss could be firmer, the walnut crust could be lighter. Cream foam, whiskey gel and citrus drops were successful.