Note by Note Cuisine

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TFCS9025: Introduction to the Advanced Molecular Gastronomy

MSc in Culinary Innovation and Food Product Development

DT414-1

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Contents

Introduction

Note by note cuisine was first introduced in 1994 in the scientific American magazine by Herve This. HervePP This is a renowned French physical chemist and is a member of staff at the Institute national de La Recherche Agronomique in Paris. He is also the scientific director of the Foundation Science & Cultural Alimentary at the Académie des Sciences (Kitchen Theory, 2011).

In 1988 Herve this and Nicholas Kurti, former professor of Physics in Oxford, created the scientific discipline of Molecular Gastronomy. Molecular Gastronomy looks to the mechanisms of phenomenon occurring during dish preparation and consumption. It is a scientific discipline (This, 2011). Herve this defines Molecular cooking also called molecular cuisine as cooking with new tools, ingredients, methods. "New" in the above definition stands for that which was not present in western kitchens in 1980s (Kitchen Theory, 2011). These are two distinct terms not to be confused with each other.

Note by note Cuisine involves preparing dishes using pure compounds, or more practically mixture of compounds obtained by fractioning plant or animal tissues, instead of using these tissues themselves. Note by note cuisine raises issues in various fields: science, technology, nutrition, physiology, toxicology and politics (This, 2013).

The first note by note dish was made in Hong king by French chef Pierre Gagnaire on 24 April 2009.however the first note by note by note meal was not served until October 2010 by chefs of the Cordon Bleu School in Paris, to the participants of the 2010 courses at the Institute for Advanced Studies in Gastronomy (This, 2013).

The culinary world already uses very pure compounds, such as water, sodium chloride, sucrose and gelatine During the assembly, the various biological properties of food must be considered. The nutrition, vision, odour, taste, trigeminal system and temperature of a meal need to be considered (This & DeBevoise, 2014).

Note by note cooking could lead to energy savings reduction of cost of food production. The mass-produced compounds to lead to lowering costs. It is not necessary that these been synthesised they can also be extracted from plant material. Note by note can use either synthetized or extracted products, regardless of where they came from (This & DeBevoise, 2014).

By 2050 the world's population will reach 9.1 billion, 34 percent higher than today. Nearly all this population increase will occur in developing countries. Urbanization will continue at an accelerated pace, and about 70 percent of the world's population will be urban (compared to 49 percent today). Income levels will be many multiples of what they are now. To feed this larger, more urban and richer population, food production (net of food used for biofuels) must increase by 70 percent. Annual cereal production will need to rise to about 3 billion tonnes from 2.1 billion today and annual meat production will need to rise by over 200 million tonnes to reach 470 million tonnes (Food and Agriculture Organization of the United Nation, 2009).

Population explosion and global food security due to climate change is a real threat facing the world. Currently world can only grow and increase food production at a certain pace due to agricultural land constrains and growth in urban dwellings. Note by note cuisine could provide relief in terms of nutrition and cost effectiveness in the future for mass produced foods to reach the public easily.

Aim

To produce a Dirac, and other elements to create a complete dish using note by note techniques.

To produce a cocktail using Note by Note Techniques

Material and Method

The elements that make up the dish can be broken down into:

- Fried Dirac
- Set Whey Dirac
- Set Hemp Dirac
- 3D Printed Dirac
- Coconut sand
- Crustacean thick cold sauce
- Honeycomb dust

Fired Dirac:

Ingredients:

Whey protein powder: 200 g

Tapioca pearls: 50gm

Water (Dihydrogen oxide; H2O): 75 ml

Gelatine 2 leaves

Tapioca starch:10 g

Egg white powder:5 g

Salt (Sodium Chloride): 4 g

Oil: for frying

Method:

Bloom gelatine.

Heat Water (Dihydrogen oxide; H2O) and dissolve gelatine in it.

Cook tapioca balls in Water (Dihydrogen oxide; H2O) on a rolling boil and strain.

Add Whey protein and tapioca balls to Water (Dihydrogen oxide; H2O).

Let it set in a gastro tub. Cut once cooled.

Set up a pane station with tapioca starch and egg whites mixture.

Coat the cubes in tapioca starch egg whites and back in tapioca starch and deep fry the mixture.

Season with salt.

Set Whey Dirac:

Ingredients:

Whey protein powder: 70 g

Tapioca pearls: 10gm

Water (Dihydrogen oxide; H2O): 60 ml

Gelatine: 2 leaves

Directions:

Bloom gelatine.

Heat Water (Dihydrogen oxide; H2O) and dissolve gelatine in it.

Cook tapioca balls in Water (Dihydrogen oxide; H2O) on a rolling boil and strain.

Add Whey protein and tapioca balls to Water (Dihydrogen oxide; H2O).

Let it set in rectangular silicone mould.

Pop out once set.

Set Hemp Dirac:

Ingredients:

Hemp protein powder: 70 g

Water (Dihydrogen oxide; H2O): 60 ml

Gelatine: 2 leaves

Directions:

Bloom gelatine.

Heat Water (Dihydrogen oxide; H2O) and dissolve gelatine in it.

Add hemp protein and mix.

Let it set in a gastro-tub

Cut to size once set.

3D Printed Dirac:

Ingredients:

Hemp protein powder: 200 g

Egg white powder: 20 g

Tapioca starch: 10 ml

Oil: 20 ml

Water (Dihydrogen oxide; H2O): 80 ml

Salt: 4 g

Directions:

Mix all ingredients to the right consistency.

Use the 3d food printer to print a lobster.

Cook on the silpat at 100 degrees for 7 minutes.

Coconut Sand:

Ingredients:

Sunflower oil: 10 g

Sugar(Sucrose): 3 g

Coconut flavouring (butyl heptanoate): 1 drop

Guaiacol: 1 ml

Abzorbit (Modified Starch) (modified starch): 25 g

Directions:

Mix oil, sugar and flavour and aroma compounds.

Whisk these into Abzorbit (Modified Starch) to achieve the right texture.

Crustacean Thick Cold Sauce:

Ingredients:

Egg white powder (ovalbumin): 10 g

Mustard flavouring(Allyl isothiocyanate): 1 drop

Crustacean flavouring (Bromophenol): 2 drops

Water (Dihydrogen oxide; H2O): 20 ml

White wine vinegar (Acetic acid): 3 g

Sunflower oil:70 g

Salt (Sodium Chloride): 2 g

Directions:

Whisk Egg white powder (ovalbumin)and Water (Dihydrogen oxide; H2O) till fluffy, continue whisking while gradually adding in oil to emulsify.

Once all the oil has been emulsified flavour with vinegar, salt, and flavouring compounds.

Honeycomb:

Ingredients:

Caster sugar(sucrose):100 gm

Glucose: 100gm

Sodium Bicarbonate: 10 gm

Directions:

Heat sugar with glucose till 165 degrees.

Sprinkle 10g bi carb of soda, mix well.

Pour onto a line baking tray and let it set.

Cocktails:

Ingredients:

Sosa dehydrated cabernet powder (Anthocyanins): 15 g

Passion fruit powder (Ethyl Acetate): 3 g

Sparkling Water (Dihydrogen oxide; H2O): 200 ml

Tartaric acid: 5 grams

Sugar: 3 grams

Directions:

Mix all the ingredients together till dissolved and pour into a glass from height to create froth on the top.

The materials used for the above elements are: -

1. Flavouring: Sosa alphabet flavour box

a) 16- Mustard

b) 103- Coconut (butyl heptanoate)

c) 185- crustacean

2. Bulk powders: protein powders

a) Whey protein

b) Hemp protein

3. Gem Tapioca pearls (Tapioca Starch):

4. Gelatine (Collagen):

5. Tapioca starch:

6. White wine vinegar (Acetic Acid):

7. Egg white powder:

8. Glucose:

9. Sosa red wine powder (Anthocyanins):

10. Sosa Passion Fruit Powder (ethyl acetate):

11. MSK Abzorbit (modified starch):

12. Gem Bread soda:

13. Sparkling water (H2O+C02):

14. Wood chips:

The Equipment used for to create the above elements are:

1. Convotherm oven:

2. Stove top:

3. Procuisine 3D printer:

4. Vacuum packing:

5. Fridge:

Result

Week 1:

The first week the elements made were the sand, Dirac and cocktail.

The full method and conclusions is available in the Log book.

The sand produced was not the right flavour but consisted of the right textures.

Fig.1: Coconut sand week 1

The cocktail produced did not have any of the characteristics I intended for the drink. It was too mild in flavour and lacked the sensation of bubbles.

Fig.2: Wine cocktail

The Dirac that was produced did not cook right. this lead to me trying to coat and fry it in oil which lead to it disintegrating in the oil and turning the oil green.

Fig.4: Hemp protein mix before it was in the oven

The sensory analysis conducted for the same was an informal sensory analysis.

The scale used was:

1: Highly Unappealing

2: Unappealing

3: Neutral

4: Appealing

5: Highly Appealing

The Coconut Sand displayed the below sensory results.

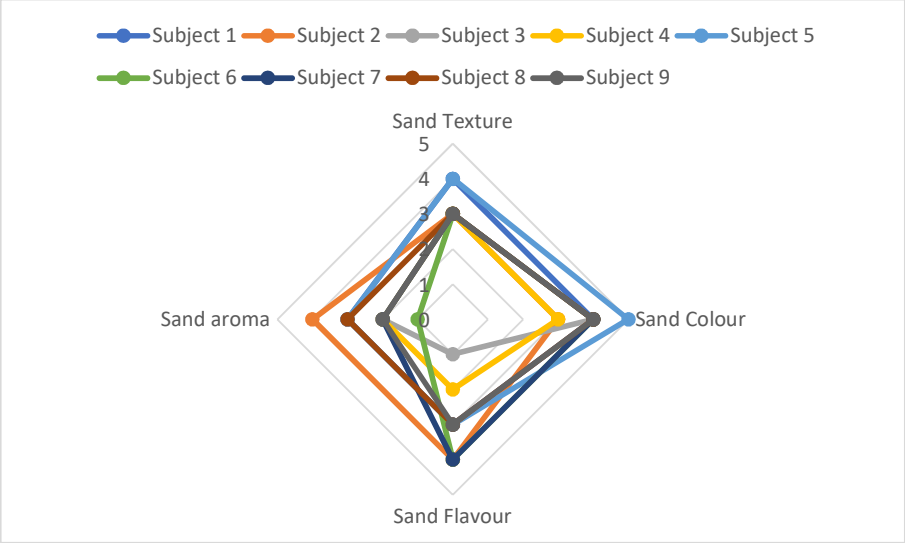

Chart 1: Sensory analysis of coconut flavoured sand.

The above chart shows the sensory analysis of taste aroma, flavour, colour and texture of the sand produced and tested by 9 subjects.

Most of the subjects show to be neutral about the texture. This indicated that the texture could be better. Many of the subjects find the colour to be appealing. This indicates that the colour can remain the same as most find it to be appealing. Flavour has varying results majority fins the flavour appealing whereas a few also find it highly unappealing. Majority find the aroma to be unappealing.

The Cocktail displayed the below sensory results.

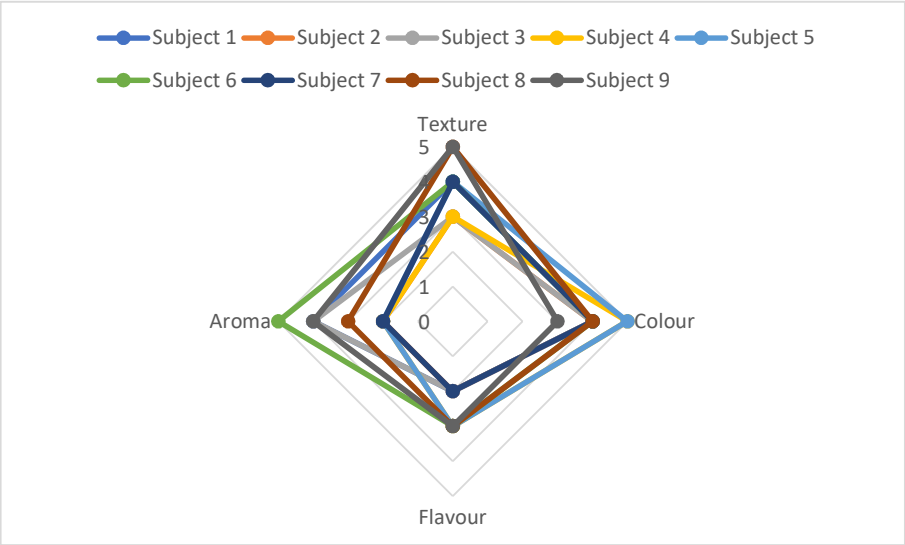

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Chart 2: Sensory analysis of Wine flavoured cocktail.

The Wine cocktail has scored better in terms of texture, aroma and colour. Majority of the subjects find it to be either highly appealing or appealing. The flavour most of the subjects have found to be neutral about. This indicated there needs to be a stronger flavour

Week 2:

The element attempted this week was the Dirac. It was tried two ways one in the oven and one in the 3 D printer.

The full method and conclusions is available in the Log book.

The one in the oven did not work as it turned to dry but wet sand and could not be stacked to create the texture required.

Fig.5: Cooked Dirac

The Dirac on the 3D printer did not work as we could not achieve the right consistency to draw a picture with the printer.

Week 3:

The elements produced were the sand, cocktail, thick cold sauce and honeycomb.

The full method and conclusions is available in the Log book.

The sand with the change in the recipe and method the right texture, flavour and aroma were achieved.

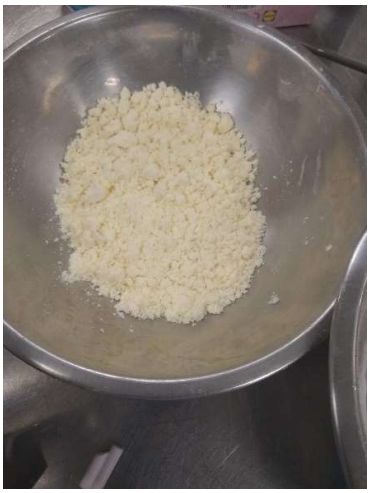

Fig.6: Coconut flavoured sand

Sensory analysis for Sand:

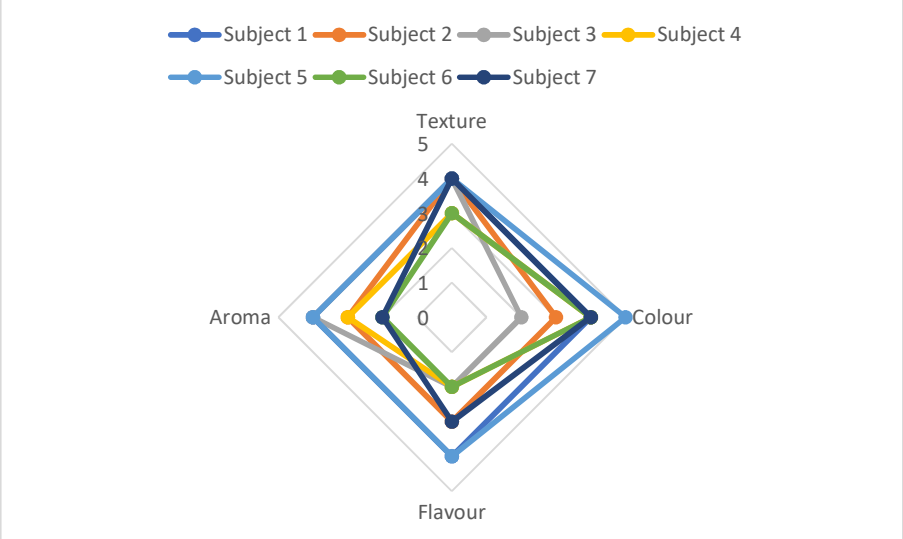

Chart 3: Sensory analysis for sand

Scale for sand							
Texture		Colour		Flavour		Aroma	
1	Terrible	1	Terrible	1	Terrible	1	Terrible
2	Bad	2	Bad	2	Bad	2	Bad
3	Acceptable	3	Acceptable	3	Acceptable	3	Acceptable
4	Good	4	Good	4	Good	4	Good
5	Great	5	Great	5	Great	5	Great

The subjects greatly varied in their analysis of the element.

Majority found the texture, to be good.

The colour, flavour and aroma got varied responses from bad to great

Wine Cocktail:

The cocktail this time had better flavour, colour and aroma but lacked the texture I was looking for.

Fig.7: Wine cocktail

Sensory Analysis of Cocktail:

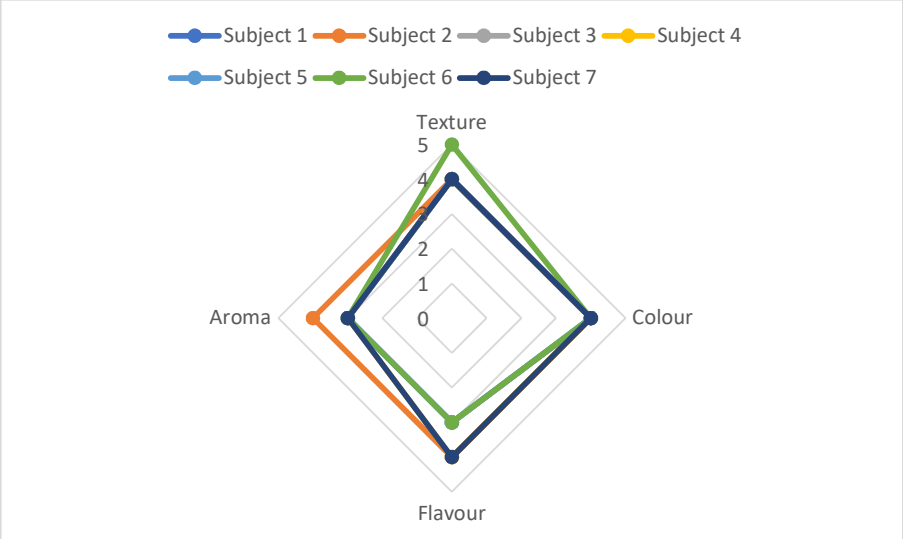

Chart 4: Sensory analysis for cocktail

Scale for cocktails							
Texture		Colour		Flavour		Aroma	
1	too gummy	1	light pink	1	too strong	1	too strong
2	sort of gummy	2	pink	2	strong	2	strong
3	thick	3	purple pinkish	3	inbetween	3	inbetween
4	watery	4	purple	4	light	4	light
5	too watery	5	too purple	5	too light	5	too light

The subjects found the texture to be Water (Dihydrogen oxide; H2O) y

The colour was purple and not too dark or light for the subjects. The subjects found the flavour to be light and not too strong or too light. Many of the subjects found the aroma to be in-between.

Thick Cold Sauce:

The thick cold sauce had good, texture, aroma, mouthfeel and colour. This element did not need any changes.

Fig.8: Thick cold sauce

Sensory analysis for Thick cold sauce:

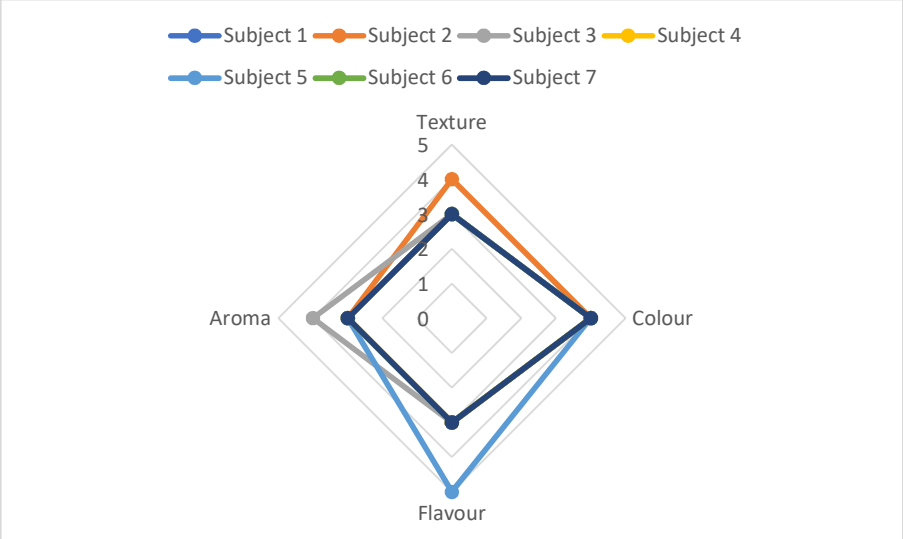

Chart 5: Sensory analysis for the thick cold sauce

Scale for Thick cold sauce							
Texture		Colour		Flavour		Aroma	
1	too gummy	1	terrible	1	too strong	1	too strong
2	sort of gummy	2	not appealing	2	strong	2	strong
3	thick	3	sorta appealing	3	inbetween	3	inbetween
4	liquid	4	appealing	4	light	4	light
5	watery	5	very appealing	5	tooo light	5	tooo light

Majority of the subjects found the texture to be thick and the colour to be appealing.

Many found the flavour and aroma to be in-between.

Honeycomb:

The honeycomb displayed good texture, colour and flavour. The element did not need any changes.

Fig.9: Honeycomb

Sensory analysis of Honeycomb:

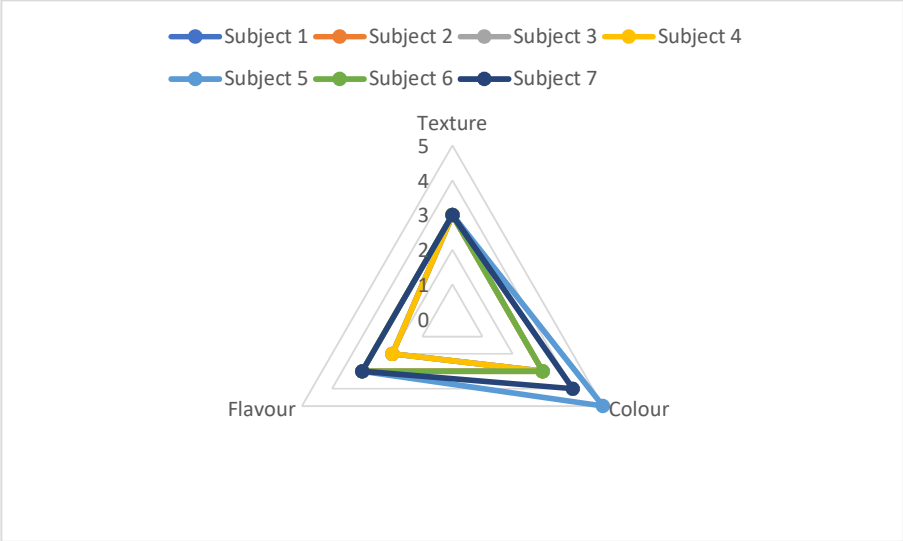

Chart 6: Sensory analysis for honeycomb

Scale for honeycomb					
Texture		Colour		Flavour	
1	too hard	1	too dark	1	too strong
2	hard	2	dark	2	strong
3	just right	3	medium	3	inbetween
4	too soft	4	light	4	light
5	too soft	5	very light	5	too light

Majority of the subjects found the flavour to be in between, the colour to be medium and the texture to be just right.

Week 4:

This week was back to testing Dirac's.

The full method and conclusions is available in the Log book.

We were able to achieve the right consistency for the 3D printer using the egg white powder as an additional ingredient.

Fig.10: Right consistency required for dough to work in the Procuisine 3D printer.

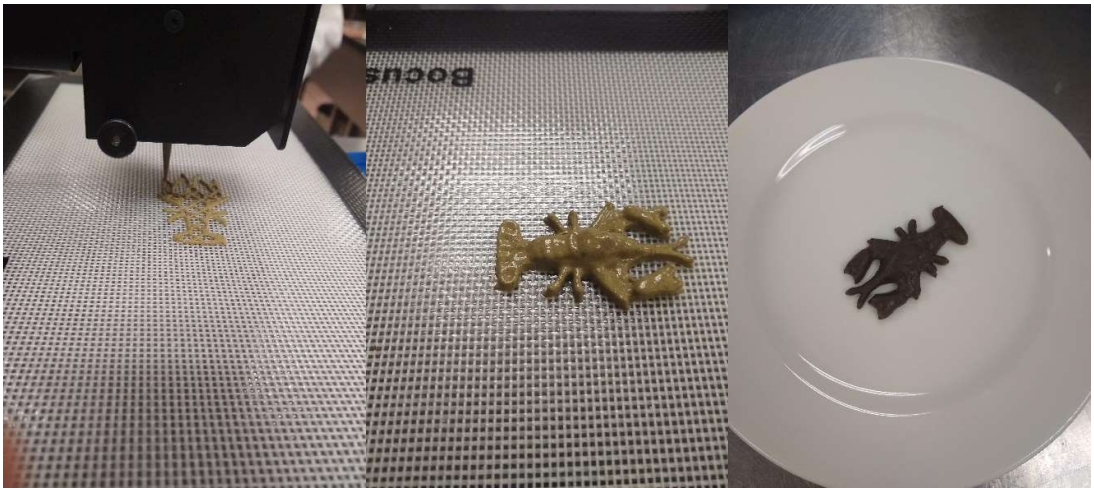

Fig.11: Stages of the 3D printed lobster.

The other Dirac tested was the whey and tapioca pearls. This proved fruitful by staying crunchy on the outside and soft on the inside.

Fig.12: Stages of the Whey and tapioca pearls fried Dirac.

Week 5:

The last week the elements that worked out the week before had been vac-packed and were used to complete the dish. The sand, honeycomb and thick cold sauce did not need to be made again as they were still good from the weeks before.

The cocktail was made again using sparkling water this time to achieve the right texture. The colour, aroma and flavour had already been corrected in the past weeks.

Fig.13: Final complete cocktail

The Dirac's were made again to better the process done in the previous weeks.

Fig.14: Stages of making the fried Dirac.

The completed dish had a lot of components but could have been presented better. All the elements work together to form a balanced dish.

Fig.15: Final Complete dish

Discussion

The dish aims to compromise the five basic tastes. The five basic tastes are sweet, saltiness, bitterness, umami and sourness (Umami information center, 2019). The table below depicts the basic compounds that create these flavour sensations.

Taste	Taste substance	Common foods				
Sweet	Sucrose Fructose Glucose	Sugar 	Honey 	Candy 		
Sour	Acetic acid Citric acid Lactic acid	Vinegar 	Lemons 	Limes 	Yogurt 	
Salty	Sodium chloride	Salt 				
Bitter	Caffeine Alkaloids Momordicin	Coffee 	Bitter melon 	Chocolate (90% cacao mass) 		
Umami	Glutamate Inosinate Guanylate	Tomatoes 	Cheese 	Meat 	Fish 	Dried shiitake mushrooms 

©Umami Information Center

The dish consists of a few different elements. The coconut smoky sand contributes to the sweet taste of the dish. Whereas the Dirac's provide texture, saltiness and umami to the dish. The crustacean flavoured sauce also provides a balance of sourness and umami. The final component of bitterness is accompanied by sweetness in the caramel of the honeycomb.

The cocktail has a balance of bubbles and foam for texture. the flavour is like that of red wine. Wine is made up of over 1000 different compounds. Ethanol which is usually in the range of 12 % makes up a large part of the wine. This can differ depending on the type of wine. The other four major compounds that make up wine are anthocyanins, which originate from the skins of the grapes used to make the wine, flavan-3-ols, contribute to the bitterness of wine.

They originate primarily from the seeds of the grapes, flavanols, have antioxidant properties, and finally tannis which create the sensation of tannis in wine (Compound Interest, 2018). The dried red wine powder used consists of the first three but lacks the tannis and this was introduced by adding in tartaric acid which would create the sensation of tannins on tasting it. the drink also has some passion fruit powder in it to add a depth of flavour. Passion fruit is mainly made up of ethyl acetate.

Sparkling water which is water (H2O) that has been carbonated with carbon dioxide (CO2 (Farr, 2016). The addition of sparkling water to the drink create the sensation of bubbles on the tough which makes it more palatable.

The elements of the final dish contain many components which each have distinct flavours and aromas. The common ingredients through the dish has been water, sugar, salt, sunflower oil, eggs, cornflour and tapioca starch.

Water is a pure compound made up of two hydrogen atoms and one oxygen atom(H20). Sugar is made up completely of sucrose. The chemical formula for the same would be $C_{12}H_{22}O_{11}$. Salt is made up one atom of sodium and one atom of chlorine or NaCl. Sunflower oil is made up of 59% Linoleic acid and 30% of oleic acid (British Pharmacopoeia Commission., 2005). Eggs are made up of 90% water and 10% protein. The most abundant protein in this is albumen (Incredible Egg, 2019). Cornflour and tapioca starch which are mainly starch which is a pure compound. Starch is made up of 70-80% amylopectin depending on the plant it has been taken from (Brown & Poon, 2005).

Firstly, the coconut sand is made using coconut flavouring, absorbed, sugar, sunflower oil and guaiacol. Abzorbit is a modified starch which helps make oils into powders. Coconut flavouring used was from the Sosa alphabet box of flavours. This coconut flavouring is majorly made up by the compound lauric acid. lauric acid constitutes 45-53% of the composition of a coconut (Dayrit, 2014). Guaiacol was used to contribute to the smoky flavour of the dish. Guaiacol is a phenolic natural product first isolated from Guaiac resin and the oxidation of lignin (National Center for Biotechnology Information., 2019).

The honeycomb was made by making a caramel of sucrose and glucose and adding to this sodium bi carbonate to let it create bubbles and cooling the mixture down till it is hard and set.

The thick cold sauce is an emulsion of egg white, water and oil. This has then been seasoned with salt, mustard, crustacean flavouring and white wine vinegar. The mustard flavouring and

the crustacean flavouring was used from the Sosa alphabet flavour box. The major compound that makes up mustard is Allyl isothiocyanate. Allyl isothiocyanate (AITC) is a constituent of mustard, horseradish and wasabi and certain vegetables found in the human diet (National Center for Biotechnology Information., 2019) Bromophenol is a flavour component of marine fish, molluscs and crustaceans. Imparts and intense shrimp-like flavour (Human Metabolome Database, 2019). White wine vinegar is mainly made up of acetic acid.

The Dirac's are all made up of different compositions of proteins, water and oils. the Dirac needs to be minimum 45% protein to be considered a Dirac. The Whey protein is made up majorly of Beta-lactoglobulin (50-55%) and Alpha-lactalbumin (20-25%) (Whey Protein Institute, 2019). Hemp protein is made up of two globulin types of proteins, edestin (60–80%) and albumin.

A note by note dish is one that has been made using pure compounds. The above dish and cocktail have been made using pure compounds making it a pure note by note dish.

Conclusion

By 2050 the world's population will reach 9.1 billion, 34 percent higher than today. The world has the resources and technology to eradicate hunger. It needs to mobilize political will and build the necessary institutions to ensure that key decisions on investment levels and allocation as well as on agricultural and food security policies are taken with the goal of hunger eradication in mind (Food and Agriculture Organization of the United Nation, 2009).

Note by Note cuisine does not use meat, fish, vegetable or fruits to make dishes, but instead uses compounds, either pure compounds or mixtures (This, 2013). Note by note as it still seems will not be terribly difficult once cooks have become acquainted with the new ingredients and methods (This & DeBevoise, 2014). Note by note cuisine allows cooks to modify the flavour, odour and nutrition just like in traditional cooking. Note by note cuisine could provide relief in terms of nutrition, unaltered food and cost effectiveness in the future for mass produced foods to reach the public easily.

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Log Book

Day 1

Aim:

To make a smoky flavoured sand, a wine like fizzy cocktail and a Dirac.

Objective:

1. To make a sand textured coconut flavoured sand using maltodextrin
2. To make a wine coloured and flavoured drink.
3. To make a Dirac using hemp protein.

Method:

Coconut Sand:

Ingredients:

Coconut oil (Lauric Acid): 10 gm
Guaiacol: 1 ml
Abzorbit (Modified Starch) (Modified Starch): 25 gm

Directions:

Heat Coconut oil to melt, add one drop of the Guaiacol (smoky aroma).

Whisk into Abzorbit (Modified Starch) to attain the right texture.

Cocktail:

Ingredients:

Sosa dehydrated cabernet powder (Anthocyanins): 10 grams
Water (Dihydrogen oxide; H2O): 200 ml
Tartaric acid: 5 grams

Directions:
Mix all the ingredients together fill into a siphon charge with 1 soda charge and let it sit.
Release into a wine glass.

Dirac:

Ingredients:

Hemp Protein: 140 gm
Olive Oil: 10 gm
Water (Dihydrogen oxide; H2O): 50 ml
Salt (Sodium Chloride): 4 gm

Directions:
Mix all the ingredients together.
Spread onto a Silpat mat and cook at 65 degrees steam for 15 minutes.
Roll to form strands and cook for 10 more minutes to form fibrous texture.

Result:

Sand:

The texture was soft and melts in your mouth. But the coconut flavour was too strong with the smoky aroma not really coming through.

Cocktail:

The colour of the drink was right but, the flavour was not strong enough. The use of the siphon lead to a lot of foam on the top but not a very bubbly sensation throughout the drink.

Dirac:

The Dirac did not work out at all. The spread on the silpat mat would not cook. It could not be rolled. This lead to making balls and coating it in corn starch to find out if it would fry well. The mixture disintegrated into the hot oil making the oil green.

Sensory:

The sensory conducted is an informal sensory.

Scale:

1: Highly Unappealing

2: Unappealing

3: Neutral

4: Appealing

5: Highly Appealing

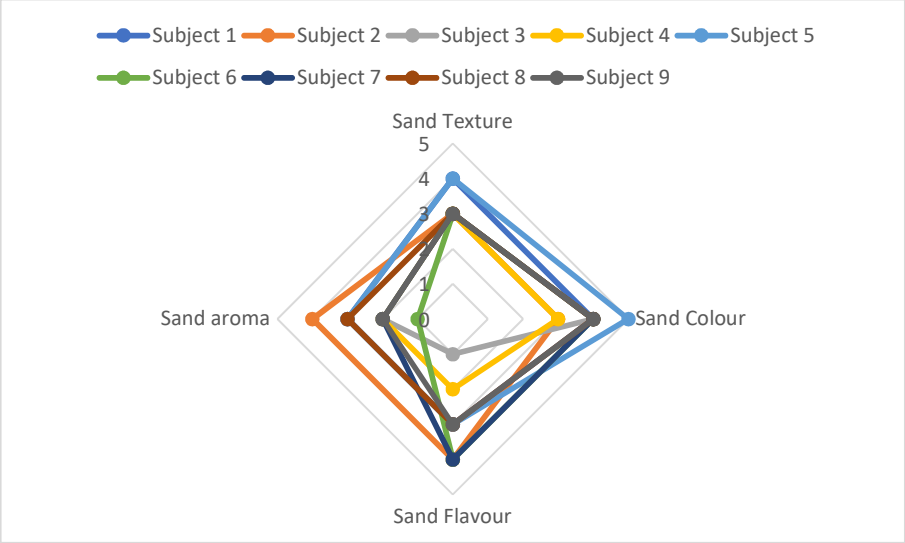

Chart 1: Sensory analysis of coconut flavoured sand.

The above chart shows the sensory analysis of taste aroma, flavour, colour and texture of the sand produced and tested by 9 subjects.

Most of the subjects show to be neutral about the texture. This indicated that the texture could be better.

Many of the subjects find the colour to be appealing. This indicates that the colour can remain the same as most find it to be appealing.

Flavour has varying results majority fins the flavour appealing whereas a few also find it highly unappealing.

Majority Find the aroma to be unappealing. This requires a decrease in the coconut aroma and an increase in smoky aroma used.

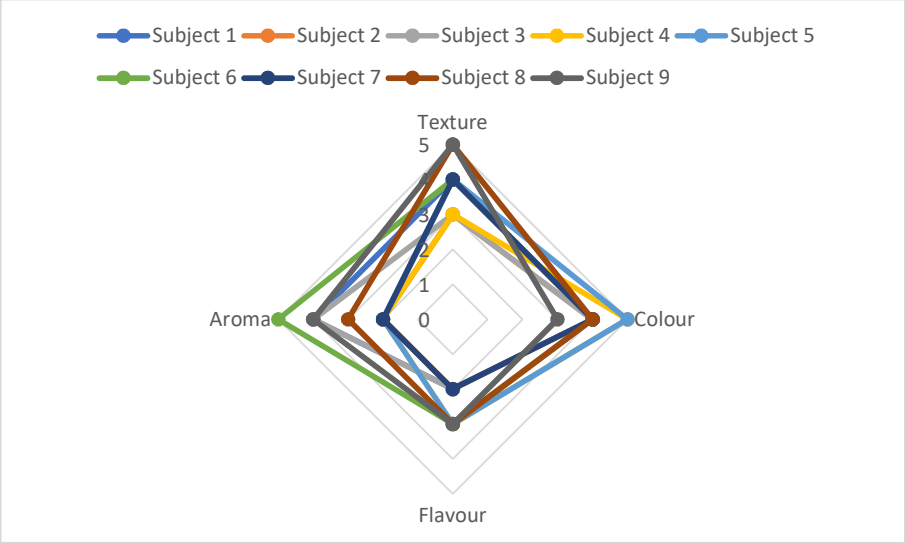

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Chart 2: Sensory analysis of Wine flavoured cocktail.

The Wine cocktail has scored better in terms of texture, aroma and colour. Majority of the subjects find it to be either highly appealing or appealing.

The flavour most of the subjects have found to be neutral about. This indicated there needs to be a stronger flavour

Conclusion:

The sand recipe needs to be tweaked to decrease the flavour of the coconut in it and to help the smoky aroma come through.

The cocktail needs to be modified to have a more intense flavour and a better mouthfeel.

The Dirac was a failure. There needs to be a better recipe and method to complete this part of the dish.

Day 2

Aim:

To produce a Dirac using hemp protein

Objective:

Are to:

1. Make a Dirac using the 3D printer
2. Make a Dirac using the oven

Method:

Dirac:

Ingredients:

Hemp protein: 80 g

Tapioca Starch: 60 g

Water (Dihydrogen oxide; H2O) :60 ml

Salt (Sodium Chloride): 4 g

Directions:

Mix all ingredients together to form a paste.

Spread a thin sheet onto a silpat cook for 15 minutes at 125 steam.

Cut and transfer on top of each other to form layers and steam again.

Use same mixture in the 3D food printer to print a lobster.

Result:

The Dirac did not work out in any of the methods. The one placed in the oven bubbled and would not hold its shape it was still sticky and would only reform into a ball.

The 3D printer requires the right consistency from the product. the mix initially made was not the right consistency. This had to then be loosened with Water (Dihydrogen oxide; H2O) or thickened with more starch to find the right consistency. At the end of the class we could not find the right consistency. Add more starch only made the mixture more doughy and stretchy. Either the mix would not come out of the small hole in the syringe or when the picture was being drawn only inconsistent drops would come out.

Conclusion:

The oven method for the Dirac will not work and a better method to find a Dirac needs to be found. The 3D printer for the Dirac can be fixed by finding the right consistency of the ingredients and rethinking the ingredients in it.

Day 3

Aim:

To produce some major components of the dish

Objective:

Are to:

1. To produce a wine flavour cocktail
2. Produce a coconut flavour smoky smelling sand
3. To produce a crustacean flavour thick cold sauce.
4. To produce some spicy honeycomb

Method:

Cocktail:

Ingredients:

Sosa dehydrated cabernet powder (Anthocyanins): 15 grams

Water (Dihydrogen oxide; H2O): 200 ml

Tartaric acid: 5 grams

Sugar: 3 grams

Directions:

Mix all the ingredients together till dissolved and pour into a glass from height to create froth on the top.

Sand:

Ingredients:

Sunflower oil: 10 g

Sugar(Sucrose): 3 g

Coconut flavouring (butyl heptanoate): 1 drop

Guaiacol: 1 ml

Abzorbit (Modified Starch) (modified starch): 25 g

Directions:

Mix oil, sugar and flavour and aroma compounds.

Whisk these into Abzorbit (Modified Starch) to achieve the right texture.

Thick Cold Sauce:

Ingredients:
Egg white powder (ovalbumin): 10 g
Mustard flavouring(Allyl isothiocyanate): 1 drop
Crustacean flavouring (Bromophenol): 2 drops
Water (Dihydrogen oxide; H2O): 20 ml
White wine vinegar (Acetic acid): 3 g
Sunflower oil:70 g
Salt (Sodium Chloride): 2 g

Directions:
Whisk Egg white powder (ovalbumin)and Water (Dihydrogen oxide; H2O) till fluffy, continue whisking while gradually adding in oil to emulsify.
Once all the oil has been emulsified flavour with vinegar, salt, and flavouring compounds.

Honeycomb:

Ingredients:
Caster sugar(sucrose):100 gm
Glucose: 100gm
Sodium Bicarbonate: 10 gm

Directions:

Heat sugar with glucose till 165 degrees.

Sprinkle 10g bi carb of soda, mix well.

Pour onto a line baking tray and let it set.

Result:

The cocktail tastes diluted, and the foam does not stay. There needs to be improvement in this dish.

The sand tastes and smells like smoky coconut making it right for the dish.

The thick cold sauce has the right mouthfeel and texture leading to no changes in it.

The honeycomb has big air pockets and can be used for the dish as is.

Sensory:

The sensory conducted is an informal sensory.

Cocktail:

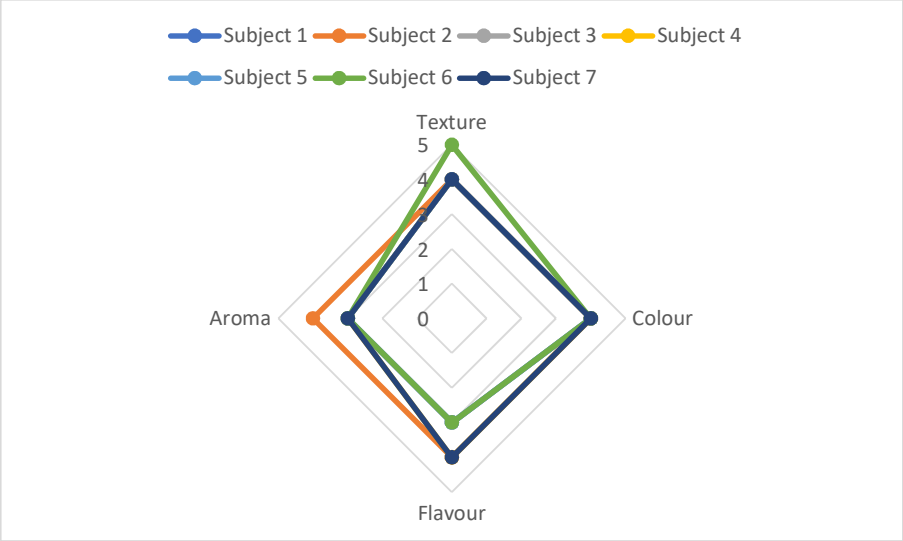

Chart 4: Sensory analysis for cocktail

Scale for cocktails							
Texture		Colour		Flavour		Aroma	
1	too gummy	1	light pink	1	too strong	1	too strong
2	sort of gummy	2	pink	2	strong	2	strong
3	thick	3	purple pinkish	3	inbetween	3	inbetween
4	watery	4	purple	4	light	4	light
5	too watery	5	too purple	5	too light	5	too light

The subjects found the texture to be Water (Dihydrogen oxide; H2O) y

The colour was purple and not too dark or light for the subjects.

The subjects found the flavour to be light and not too strong or too light.

Many of the subjects found the aroma to be in-between.

Sand:

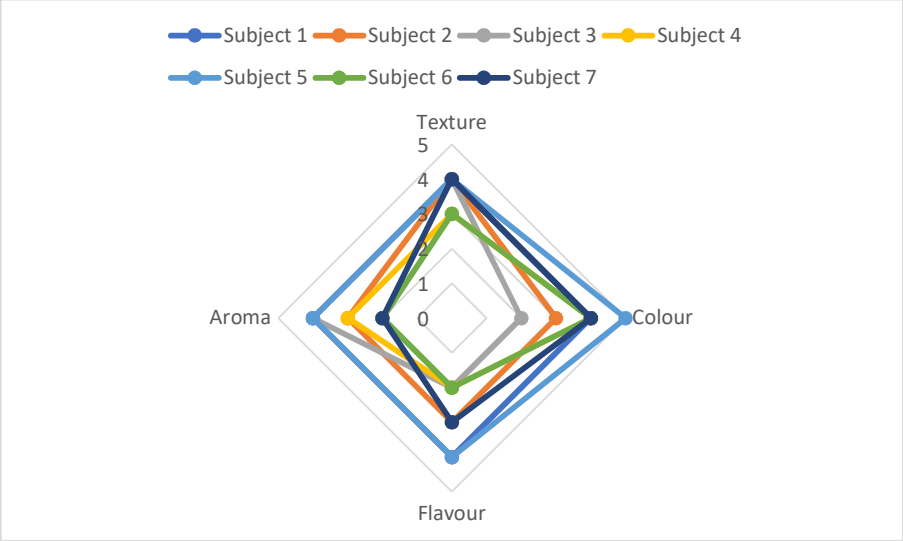

Chart 3: Sensory analysis for sand

Scale for sand							
Texture		Colour		Flavour		Aroma	
1	Terrible	1	Terrible	1	Terrible	1	Terrible
2	Bad	2	Bad	2	Bad	2	Bad
3	Acceptable	3	Acceptable	3	Acceptable	3	Acceptable
4	Good	4	Good	4	Good	4	Good
5	Great	5	Great	5	Great	5	Great

The subjects greatly varied in their analysis of the element.

Majority found the texture, to be good.

The colour, flavour and aroma got varied responses from bad to great

Thick cold sauce:

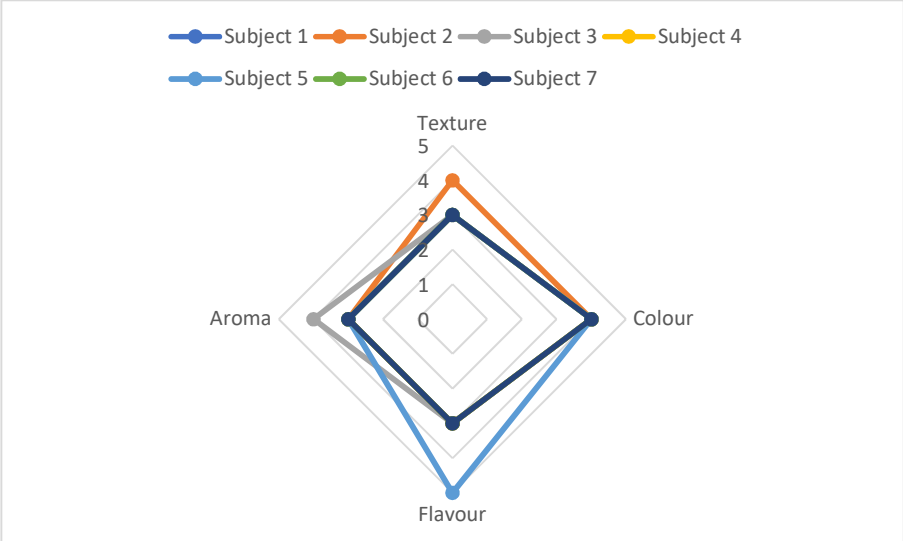

Chart 5: Sensory analysis for the thick cold sauce

Scale for Thick cold sauce							
Texture		Colour		Flavour		Aroma	
1	too gummy	1	terrible	1	too strong	1	too strong
2	sort of gummy	2	not appealing	2	strong	2	strong
3	thick	3	sorta appealing	3	inbetween	3	inbetween
4	liquid	4	appealing	4	light	4	light
5	watery	5	very appealing	5	tooo light	5	tooo light

Majority of the subjects found the texture to be thick and the colour to be appealing.

Many found the flavour and aroma to be in-between.

Honeycomb:

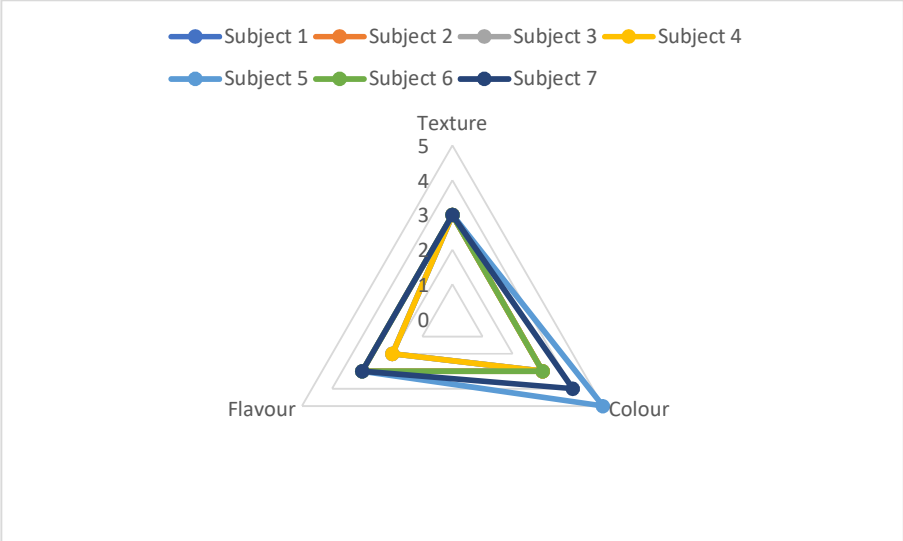

Chart 6: Sensory analysis for honeycomb

Scale for honeycomb					
Texture		Colour		Flavour	
1	too hard	1	too dark	1	too strong
2	hard	2	dark	2	strong
3	just right	3	medium	3	inbetween
4	too soft	4	light	4	light
5	too soft	5	very light	5	too light

Majority of the subjects found the flavour to be in between, the colour to be medium and the texture to be just right.

Conclusion:

The texture and aroma of the cocktail needs to be improved. The flavour and colour need to be maintained.

The new sand does not need any changes it is a good element.

The thick cold sauce does not require any changes.

The honeycomb does not require any changes,

Day 4

Aim:

To produce a Dirac using hemp protein

Objective:

Are to:

1. Produce a Dirac using the 3 D printer
2. Produce a deep-fried Dirac.

Method:

1st Dirac:

Ingredients:

Hemp protein powder: 200 g

Egg white powder: 20 g

Tapioca starch: 10 ml

Oil: 20 ml

Water (Dihydrogen oxide; H2O): 80 ml

Salt: 4 g

Directions:

Mix all ingredients to the right consistency.

Use the 3d food printer to print a lobster.

Cook on the silpat at 100 degrees for 7 minutes.

2nd Dirac:

Ingredients:

Whey protein powder: 200 g

Tapioca pearls: 50gm

Water (Dihydrogen oxide; H2O): 75 ml

Gelatine 2 leaves

Tapioca starch:10 g

Egg white powder:5 g

Salt: 4 g

Oil: for frying

Direction:
Bloom gelatine.

Heat Water (Dihydrogen oxide; H2O) and dissolve gelatine in it.

Cook tapioca balls in Water (Dihydrogen oxide; H2O) on a rolling boil and strain.

Add Whey protein and tapioca balls to Water (Dihydrogen oxide; H2O).

Let it set in a gastro tub. Cut once cooled.

Set up a pane station with tapioca starch and egg whites mixture.

Coat the cubes in tapioca starch egg whites and back in tapioca starch and deep fry the mixture.

Season with salt.

Result:
The 3D printer lobster worked with the addition of whole egg powder making it more pliable and less starchy. The lobster cooked well in the oven.

The deep-fried Dirac worked well with a crispy outside layer and a soft interior.

Conclusion:
Both the Dirac's can be used for the final dish.