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# MOLECULAR GASTRONOMY

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Note by Note Assignment: Dirac's & Cocktails



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## 1. Introduction

Molecular Gastronomy allows cooking to be placed on more secure foundations by recognizing it as a ‘chemical art’, while Note by Note cooking specifically develops this concept further by allowing the possibility of creating new and more precise flavours, (This 2009).

Note by Note cooking refers to the culinary technique of preparing ‘pure compounds’ in order to build food while it avoids any specific limitations that would be present when using any whole plant or animal tissues. The complexity of this method of cooking requires an in-depth level of knowledge of the ingredients being used. It involves the use of the various elements (*or compounds*) of whole foods in their pure state in an effort to make ‘new foods’.

Barham et al (2010) states that Chemistry lies at the heart of the very finest food available in some of the world’s finest restaurants. Molecular Gastronomy and particularly Note by Note Cooking involves the merging of the scientist and the chef into one.

All food is made up with various combinations of pure compounds and by using the pure compounds directly, it can enable the creation of new food in terms of flavour, texture and appearance. Sucrose and Sodium Chloride are two examples of pure compounds that are used in their pure state currently in the kitchen, which would be more commonly referred to as sugar and salt. There are various other pure compounds that chefs would be familiar with using such as gluten, pectin or xanthan gum. These compounds (whether they are proteins, carbohydrates, fats, minerals or vitamins) are all consumed on a daily basis worldwide, however it’s the change in mindset that is the most difficult in Note by Note Cooking. The concept of using all ingredients from their pure form rather than in combinations which are commonly found in whole animal or plant tissues is quiet fascinating and allows opportunity for endless invention.

Note by Note Cooking is something that is seeing significant interest in the current climate, due to the growing concerns of regaining sustainability in the world. Factors such as food shortages and climate change are forcing discussions worldwide with regards to how we are going to combat and react to what’s happening around us.

The FAO (Food and Agricultural Organisation of the United Nations), (2011), suggest that roughly one-third of food produced for human consumption is lost or wasted globally. This is a significant level when it’s taken into consideration that in 2016 the number of chronically undernourished people in the world is estimated to have increased to 815 million (FAO, 2017). Intervention is immediately required to combat these issues.

There are two specific sustainability benefits that can come from ‘Note by Note’ Cooking: the potential of decreasing food waste while also potentially decreasing the quantity of ingredients required to be transported all over the world. Fruit and Vegetables for instance are made primarily of water; take Cucumbers for example which are made up of 96% water, if this water was removed there would be two significant sustainable benefits, one would include the lowering risk of food spoilage (*as the removal of water would allow the core components to be preserved for longer*), the second benefit would require the transport of those cucumbers to export markets, with 96% (water) removed, the remaining 4% (made up of the pure compounds such as Cellulose, Pectin etc.), would result in a significant smaller carbon footprint in terms of the quantity of food being transported around the world.

Note by Note Cooking is expected to see significant growth in the future due to these potential opportunities while its also believed to offer the consumer a larger choice in terms of the vast opportunities available during preparation. Potentially, the opportunities for creation are endless; a food that resembles a piece of meat could potentially taste like an orange while something that has the nutritional value of beetroot could resemble a fruit meringue.

Hervé This (2014) is a renowned chemist who is known colloquially as the ‘father’ of Molecular Gastronomy and he believes there is no doubt there will be an increase in Note by Note Cooking in the future due to the ominous factors such as the growth in population and the growing concerns with regards to the environment.

This Assignment aims to result in the creation of ‘Diracs & Cocktails’. This (2009) believes the aim in Note by Note Cooking is to ‘create’ and not ‘recreate’. He believes we should avoid calling our recreations the same name as typical foods such as steak or salmon but to eliminate confusion by calling it a ‘Dirac’. This created the word in honour of the British theoretical physicist Paul Dirac (Bird 2015). The Dirac Dish for this assignment must be nutritionally representative of meat. The Cocktail is simply required to be made solely out of pure compounds while experimenting with various flavours and textures.

## 2. Aim

The aim of this assignment is to create both a Dirac Dish and a Cocktail using only pure compounds through Note by Note Cooking. The Dirac element of this assignment must be representative of the nutritional content of meat in terms of its Protein Content (between 35 and 55%).

The production of both the Dirac Dish and the cocktail will not contain any plant tissues (fruits, vegetables) or animals (meat, eggs, fish) whole, but rather fractions of such compounds.

The theme of the Dirac Dish is based on a 'Cold *Dirac* Platter' while the cocktail is focusing on various textures and consistencies to create a Sweet Orange & Peanut Flavoured Drink.

## 3. Final Product

### 3.1. Ingredients

#### 3.1.1. Peanut, Chocolate & Orange Cocktail

##### Element Breakdown (One Glass Serving)

Orange Base 350g (83%), Choc Peanut 50g (12%), Foam 20g (5%)

##### Ingredient Declaration (QUID)

- **Orange Blend (83%)**  
(Water, Sugar, Whey Protein, Xanthan Gum, Colour (Glycerol, Proylene Glycol, E110, E129, E551), Orange Essential Oil),
- **Peanut/Chocolate Flavoured Swirls (12%)** (Vegan Protein Powder (Pea Protein Isolate, Brown Rice Protein, Quinoa Flour, Fat Reduced Cocoa Powder Flavouring (Chocolate Powder), Sunflower Lecithin, Xanthan Gum, Stevia, Digezyme), Sunflower Oil, Sugar, Soya Lecithin)
- **Sweet Foam (5%)** (Sugar, Egg White Powder, Water)

##### Compound Ingredient Declaration

**Orange Sweet Blend (83%)** (Water, Sucrose, Whey Protein Isolate, Xanthan Gum, Colour: (Glycerol, Proylene Glycol, E110, E129, E551), Flavour (Limonene, Myrcene, Sabinene,  $\beta$ -Pinene,  $\alpha$ -Pinene, Octanal, Linalool,  $\delta$ -3-Carene, Decanal)

**Peanut/Chocolate Swirls (12%)** (Pea Protein Isolate, Brown Rice Protein Isolate, Quinoa Flour (Starch, D-xylose, maltose, glucose, fructose, Histidine, Isoleucine, Lysine, Methionine, cysteine, phenylalanine, tyrosine, threonine, tryptophan, valine, linoleic acid, oleic acid), Cocoa Powder Flavour (Sucrose, Starch, Pectin, Cellulose, Pentosans, Mucilage, Albumin, Globulin, Methylxanthines, Theobromine), Sunflower Lecithin, Xanthan Gum, Stevia (stevioside, rebaudioside), Digezyme (Protease, Amylase, Lactase, Lipase, Cellulase)), Linoleic Acid, Oleic Acid, Sucrose, Soya Lecithin.

**Sweet Foam (5%)** (Sucrose, Egg White Powder (Albumin, mucoproteins, and globulins), Water)

#### 3.1.2. Cold Dirac Platter

##### Element Breakdown (One Platter Serving)

Protein Sticks 400g (66%), Peach Dip 100g (16%),



Green Dip 50g (8%), Balsamic Vinegar

Pearls 40g (7%), Bronze Spicy Powder 20g (3%).

### **Ingredient Breakdown (QUID)**

- **Protein Sticks (66%)** (Water, Pea Protein, Whey Powder, Corn Starch, Oil, Salt, Colour (Sugar, Glucose Syrup, Water, E422, E406, E330, E202))
- **Peach Dip (16%)**, (Oil, Vinegar, Water, Soya Protein, Xanthan Gum, Salt, *Colour (Glycerol, Proylene Glycol, E110, E129, E551)*)
- **Green Dip (8%)**, (Oil, Water, Sugar, Soya Protein, Xanthan Gum, Salt, Essential Orange Oil, Colour (Sugar, Glucose Syrup, Water, E422, E406, E330, E202), Colour Sodium Sulphate, E131))
- **Balsamic Vinegar Pearls (7%)** (Balsamic Vinegar, Agar Agar)
- **Bronze Spicy Powder (3%)**, (Sunflower Oil, Tapioca Maltodextrin, Bronze Colour (Potassium Aluminium Silicate E555, Iron Oxides E172), Chilli Flavour)

### **Compound Ingredient Breakdown**

**Protein Sticks (66%)** (*Water, Pea Protein Isolate, Whey Powder Isolate, Corn Starch, Linoleic Acid, Oleic Acid, Sodium Chloride, Colour (Sucrose, Glucose, Water, E422, E406, E330, E202)*).

**Peach Dip (16%)**, (*Linoleic Acid, Oleic Acid, Water Acetic Acid, Soya Protein Isolate, Xanthan Gum, Sodium Chloride, Colour (Glycerol, Proylene Glycol, E110, E129, E551)*)

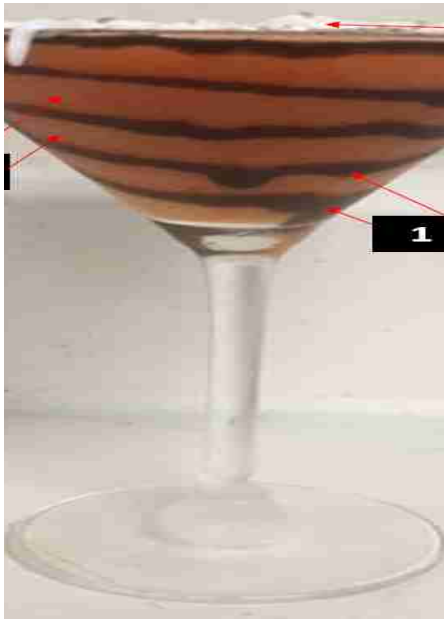
**Green Dip (8%)**, (*Linoleic Acid, Oleic Acid, Water, Sucrose, Soya Protein Isolate, Xanthan Gum, Sodium Chloride, Flavour (Limonene, Myrcene, Sabinene,  $\beta$ -Pinene,  $\alpha$ -Pinene, Octanal, Linalool,  $\delta$ -3-Carene, Decanal), Colour (Sucrose, Glucose, Water, E422, E406, E330, E202), Colour Sodium Sulphate, E131)*)

**Balsamic Vinegar Pearls (7%)** Water, Glucose, Fructose, Acetic Acid. Gluconic Acid, Malic Acid, Tartaric Acid, Succinic Acid, Agar Agar (agarose, agarpectin)

**Bronze Spicy Powder (3%)**, (*Linoleic Acid, Oleic Acid, Tapioca Maltodextrin, Bronze Colour (Potassium Aluminium Silicate, Iron Oxides), Flavour (Capsicum)*).

## 3.2. Methods

### 3.2.1. Peanut, Chocolate & Orange Cocktail



#### 3.2.1.A. Recipe

1. Peanut Chocolate Spiral	2. Orange Base	3. Sweet Foam
<ul style="list-style-type: none"><li>• 30g Complete Vegan Protein Powder (<i>Pea Protein Isolate, Brown Rice Protein, Quinoa Flour, Fat Reduced Cocoa Powder</i>)</li></ul>	<ul style="list-style-type: none"><li>• 20g Whey Protein</li><li>• 300ml Water</li><li>• 30g Sugar</li><li>• 3g Xanthan Gum</li><li>• .5g Colour Sugarflair 'Peach' (Glycerol E422,</li></ul>	<ul style="list-style-type: none"><li>• 40g Egg White Powder</li><li>• 30g Water</li><li>• 60g Sugar</li></ul>



<p><i>Flavouring (Chocolate Powder), Sunflower Lecithin, Xanthan Gum, Stevia, Digezyme)</i></p> <ul style="list-style-type: none"> <li>• 3g Soya Lecithin</li> <li>• 10g Sugar</li> <li>• 20g Sunflower Oil</li> </ul>	<p>Proylene Glycol, Food ColourE110, E129, Thickener E551)</p> <ul style="list-style-type: none"> <li>• 0.3g MSK Orange Flavour (Orange Essential Oil)</li> </ul>	<p><i>(Use 20g of Mix for Presentation)</i></p>
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### 3.2.1.B. Instructions


1. To prepare peanut & chocolate swirls. Weigh all of the ingredients (vegan chocolate protein powder, soya lecithin, sugar and oil), once weighed add into the thermo mixer. Set the thermo mixer onto speed number 6 for 40 seconds until the products is fully bound. Put the Peanut/Chocolate Sauce into the Syringe and move the syringe in circles in order to decorate the cocktail glass in swirls. Once glass is prepared place it into the freezer until ready.
2. Prepare the ‘Orange Base’ by weighing and blending the whey protein, water, sugar, xanthan gum, peach colouring and orange flavouring into the thermo mixer. Once fully blended. Place in Fridge until ready to use.
3. Prepare Sweet Foam for Decoration. Weigh the water and egg white powder into the Kitchen Aid bowl and whisk on speed number 6 for two minutes. Once the egg whites have formed a stiff peak, slowly add in the sugar (while continuing to mix at speed 6). Once all of the sugar is add continue to mix for one minute. At this stage the mix should resemble stiff white peaks.
4. Assembly of the cocktail takes place next. Remove the prepared cocktail glass from the freezer and remove the orange flavoured base from the fridge. Add the orange base into the prepared glass and allow to sit for 5 to ten minutes (to allow the peanut/chocolate flavour be absorbed by the orange base. Decorate by adding the white foam into the syringe and add some swirls to the top of the cocktail. Use a knife to cut the end of the foam off of the syringe in order to avoid a mess.
5. Serve

### **Equipment Required:**

Weighing Scales, Metal Mixing Bowl, Thermo Mix, Syringe, Cocktail Glass, Freezer, Fridge, Whisk (Kitchen Aid Stand Mixer), Knife

### 3.2.2. Cold Dirac Platter

#### 3.2.2.A. Recipe

1. Protein Sticks (A)	Protein Sticks (B)	2. Green Dipping Sauce
<ul style="list-style-type: none"> <li>• 50g Whey Powder</li> <li>• 40g Corn Starch</li> <li>• 60g Pea Protein</li> <li>• 60 ml water</li> <li>• 30ml oil</li> <li>• 4g Salt</li> </ul>	<ul style="list-style-type: none"> <li>• 50g Whey Powder</li> <li>• 40g Corn Starch</li> <li>• 60g Pea Protein</li> <li>• 60 ml water</li> <li>• 30ml oil</li> <li>• 4g Salt</li> <li>• 1g Black Food Colouring (Sugar, Glucose Syrup, Water, E422, E406, E330, E202)</li> </ul>	<ul style="list-style-type: none"> <li>• 160g Oil</li> <li>• 14g Soya Protein</li> <li>• 70ml Water</li> <li>• 60g Sugar</li> <li>• .3g Essential Orange Oil</li> <li>• 0.2g Yellow Colouring (Sugar, Glucose Syrup, Water, E422, E406, E330, E202)</li> <li>• 0.1g Blue (Sodium Sulphate, E131)</li> <li>• 5g Xanthan Gum</li> <li>• 3g Salt</li> </ul>
		
Vinegar Pearls	Peach Dipping Sauce	5. Bronze Spicy Powder
<ul style="list-style-type: none"> <li>• 100 g Balsamic Vinegar</li> <li>• 1.5 g Agar Agar</li> </ul> <p>250ml Oil (For Preparation – Not in Final Dish)</p>	<ul style="list-style-type: none"> <li>• 160g Oil</li> <li>• 14g Soya Protein</li> <li>• 70ml Water</li> <li>• 130g Vinegar</li> <li>• 0.1g Colour Sugarflair ‘Peach’ (Glycerol E422, Proylene Glycol, Food ColourE110, E129, Thickener E551)</li> <li>• 7.5g Xanthan Gum</li> <li>• 3g Salt</li> </ul>	<ul style="list-style-type: none"> <li>• 60ml Tapioca Maltodextrin</li> <li>• 120ml Sunflower Oil</li> <li>• 0.2g Chilli Flavour</li> <li>• 1 g Bronze Colour (Potassium Aluminium Silicate E555, Iron Oxides E172)</li> </ul>

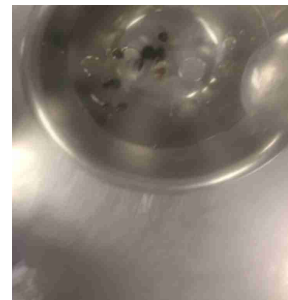
#### 3.2.2.B. Instructions

1. Preheat oven to 180°C.
2. Weigh 250ml Oil and Place into Freezer in a tall jug for use later on (Element 3. Balsamic Vinegar Pearls).

3. Prepare Element 5 (Spicy Bronze Powder) – Weigh ingredients (60ml Tapioca Maltodextrin, 120ml Sunflower Oil, 0.2g Chilli Flavour and 1 g Bronze Colour). Once ingredients are weighed put into a large metal bowl and mix using a metal whisk by hand. A ‘powder’ will form. Once formed. Set aside until required for plate presentation.
4. Prepare Element 2 (Green Dipping Sauce). Weigh and add all the ingredients into a Thermo Mixer (160g Oil, 14g Soya Protein, 70ml Water, 60g Sugar, 0.3g Essential Orange Oil, 0.2g Yellow Colouring, 0.1g Blue Colouring, 5g Xanthan Gum, 3g Salt). Place onto speed 5 for One minute until the sauce has been formed and there is a thick but smooth consistency. Remove from thermo mix bowl, cover with cling film and place into the fridge.
5. Prepare Element 4 (Peach Dipping Sauce). Weigh Ingredients (160g Oil, 14g Soya Protein, 70ml Water, 130g Vinegar, 0.1g Colour Peach, 7.5g Xanthan Gum, 3g Salt). Add into Thermo Mixer and place onto speed 5 for One minute until the sauce has been formed and there is a thick but smooth consistency. Remove from thermo mix bowl, cover with cling film and place into the fridge.
6. Prepare Element 1. Weigh Ingredients for The Protein Sticks A (50g Whey Powder, 40g Corn Starch, 60g Pea Protein, 60 ml water, 30ml oil, 4g Salt). Add the Blend to the Kitchen Aid mixer and attach the dough hook. Adjust the speed and set at number 4 for one minute thirty seconds until a dough ball is formed. Set aside the dough ball.
7. Weigh Ingredients for the Protein Sticks B (50g Whey Powder, 40g Corn Starch, 60g Pea Protein, 60 ml water, 30ml oil, 4g Salt, 1g Black Food Colouring). Add the Blend to the Kitchen Aid and attach the dough hook. Adjust the speed and set at number 4 for one minute thirty seconds until a dough ball is formed.
8. Set aside the two dough balls for ten minutes to rest.
  
9. Flour the surface and rolling pin (cornflour). Roll each dough ball into a flat sheet and cut into long narrow strings (1cm wide). Ensure all strips are similar in length and width. Twist both strings into Twirl and Place on a baking Tray. Continue until all of the strips are twisted. Sprinkle the tray with oil and place in the preheated oven at 180°C for ten minutes. Once baked remove and set aside to cool.



10. Prepare Element 3. Weigh the Balsamic Vinegar and Agar and add them into a saucepan. Bring the Saucepan to the boil (stirring continuously). Once bubbles start to form on the surface of the saucepan, remove from heat and set aside.
11. Take the oil that was placed in the freezer at step 2 out and set aside. Get a bowl of cold water and leave it in the preparation area. Allow the Balsamic Vinegar and Agar Solution to cool for approximately seven minutes (50-55°C).
12. Fill the Pipette with the balsamic vinegar solution and place the pipette approximately 2-3 inches above the oil which was removed from the freezer. Expel the Pipette, drop by drop into the oil. Remove the balls from the oil with a slotted spoon and rinse them in the bowl of cold water. Set aside on a dry plate once enough spheres have been formed.



13. Prepare the 'Cold Dirac Platter' Serving Board by Placing the Protein Sticks in a line across the centre of the board.
14. Pipe the Green Dipping Sauce on the board and once complete, in sequence repeat the same pattern with the peach dipping sauce.
15. Arrange the Balsamic Vinegar Pearls at the top of the board in the text 'Dirac'.

16. Place the Chilli Powder across the top of the board and also across the bottom of the board.
17. Serve.



**Equipment Required:**

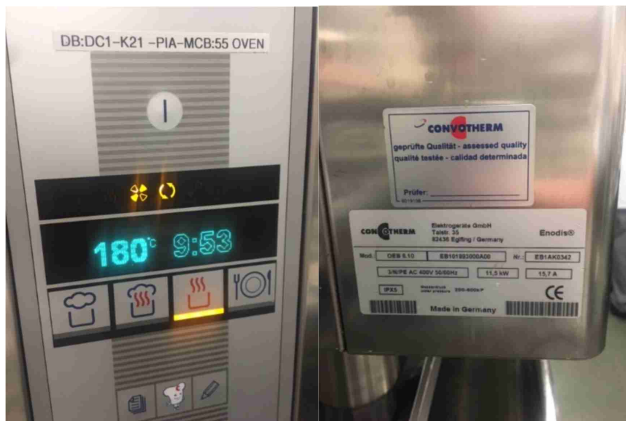
Weighing Scales, Metal Bowl x 5 , Kitchen Aid Mixer (Dough Hook & Whisk), Rolling Pin, Baking Tray, Oven, Freezer, Metal Hand Whisk, Tall Jug, Pipette, Slotted Spoon, Knife, Piping Bag,

## Equipment (Makes & Models)



### **Vorwerk Thermo Mixer**

Serial Number: 12343109



### **Convotherm Oven**

Serial Number: OEB 6.10 EB 101893000A00



### **Kitchen Aid Stand Mixer**

(Heavy Duty)

Serial Number: 12343109

## 4. Results

### 4.1. Week by Week Review – Cocktail

The main aim in the creation of this cocktail was to avoid using any plant tissues (fruits, vegetables) or animals (meat, eggs, fish) whole, but rather the pure compounds.

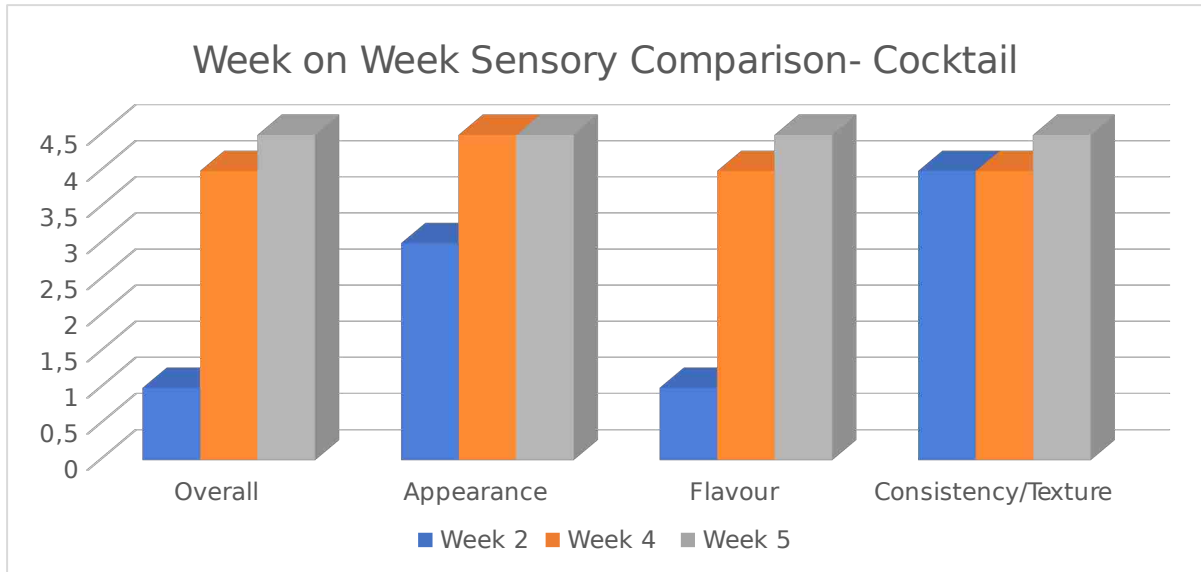
The design of the cocktail specifically was formed around implementing various textures and consistencies and the creation of a sweet cocktail with contrasting but complementing flavours.

The outcome resulted in the ‘Sweet Orange & Peanut Flavoured Cocktail’.

The cocktail was developed in weeks 2, 4 and 5.

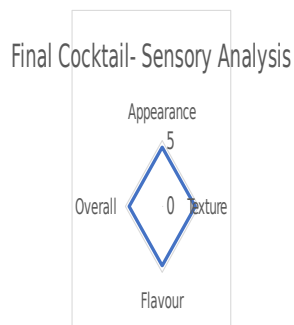
Week 2	Week 4	Week 5
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The Final Cocktail performed well on the Sensory Analysis at a consistent score of 4.5 out of 5 for all attributes (appearance, texture, flavour and Overall).

The core objective of combining different textures and flavours were achieved across the incorporation of all three elements.



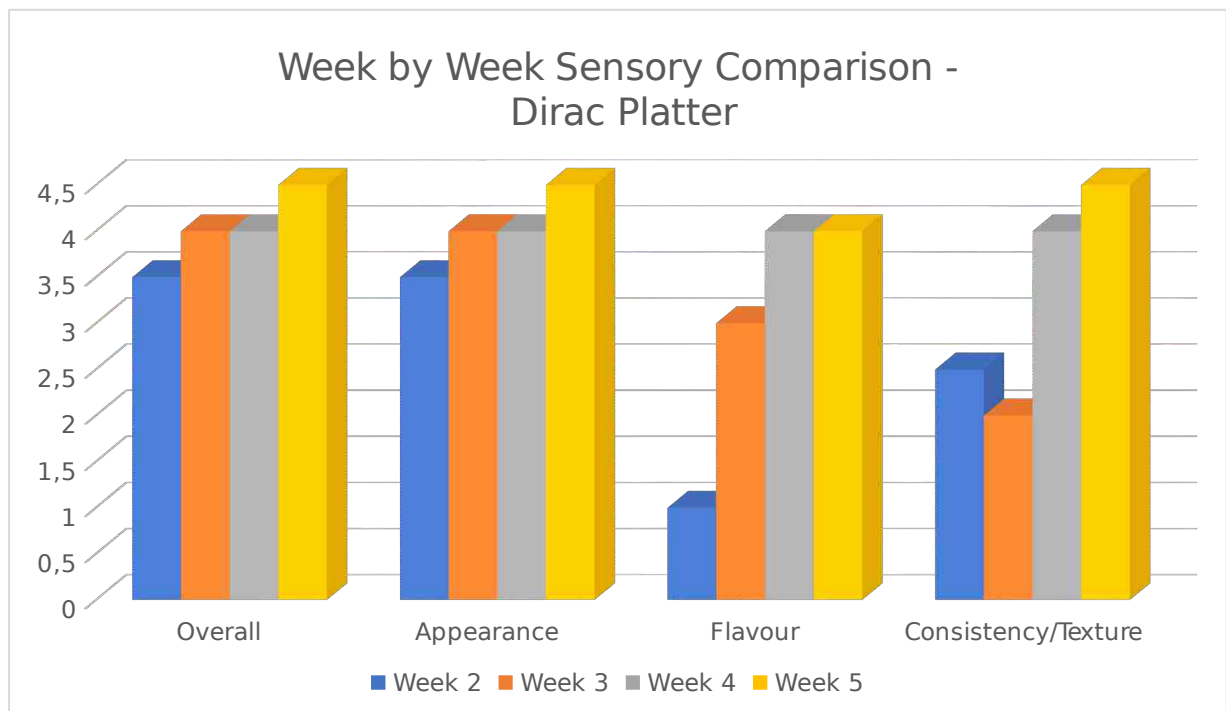
The finished product was successfully created through ‘Note by Note Cooking’ using primarily pure compounds.

#### 4.2. Week by Week Review - Dirac

The main objective of the Dirac Dish was to create the core component to a Protein Level representative of meat. As highlighted in appendices 8.1, the nutritional composition of the Dirac Component (Protein Sticks), in week 5 was made up of 41.5% Protein. This resulted in the brief being achieved. It was also required that again there was no animal or plant tissue present but rather just the pure components.

<i>Week 1</i>	
<i>Week 2</i>	
<i>Week 3</i>	
<i>Week 4</i>	

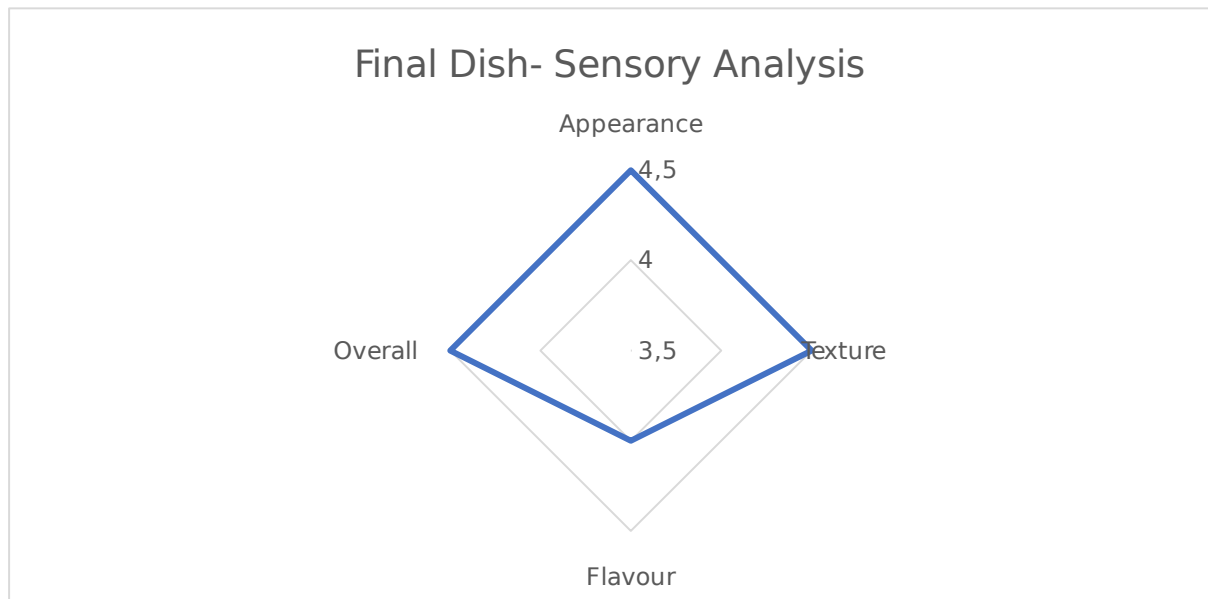
## Week 5



The final dish overall was created again with the use of only pure compounds. It was nutritionally representative of a meat product in terms of its Protein Content as it was 41.5% Protein, 38.9% Fat and 19.5% Carbohydrates.

The various textures and flavours from sweet to savoury enhanced the overall dish and enabled the theme of a 'Cold Dirac Platter' to be somewhat representative of a Cheese Board or Charcuterie board in terms of the various accompaniments and a selection of drips, pearls

and powder. Overall the final dish was successful.



## 5. Discussion

### 5.1 Cocktail

As previously highlighted the cocktail was developed on week 2, week 4 and week 5.

In week 2, the base of the cocktail was a chocolate protein 'milkshake' resembled drink and the second layer (sweet foam) was created in order to add a different element in terms of both flavour and texture. This product did not perform very well in the sensory analysis as it scored a 2 out of 5 in terms of Flavour and Overall. The main outcome from Week 2 and the objective for the following trial was to move away from the chocolate base as the flavour profile was just not being achieved, it was also required to improve on the texture of the Foam Layer, (needed to be thicker) and finally add a third element to the cocktail in order to achieve the contrasting textures and flavours which were set out as the main objective in creating this cocktail.

In Week 4, the base of the cocktail was changed to an orange flavoured blend. The desired consistency of the base of this drink was achieved through the addition of xanthan gum. An invaluable technique in kitchens today is the creation of foams that provide the chef with innumerable ways to present flavour, textures and aromas (Sanchez 2016). The addition of the xanthan gum to the base of the cocktail resulted in a light foam which possess a greater mouthfeel for the consumer and enhanced the entire cocktail.

The sweet foam element destined for the finishing design of the cocktail was improved in week 4 by ultimately increasing the beating time of the egg white, this resulted in a thicker foam which was desirable. Egg whites (Albumin) need to be beaten to the extent in which the protein denatures and coagulates around the many newly formed air cells (Vaclavik & Christian 2013). There was also a third element added to the cocktail this week. This element was a chocolate/peanut flavoured 'gel' which was made primarily from protein powder, xanthan gum, oil and flavourings. Gelling is another classical technique that has progressed in modern day cooking and which is very important in Note by Note Cooking due to into an ever-refining practice due to a better understanding of its nature and its tendencies (Sanchez 2016). Xanthan Gum is the gelling hydrocolloid required for a slightly firm elastic cold gel and hence why is was included in this product. This blend was then 'splattered' on the cocktail glass in order to achieve an obvious differentiated colour and flavour element for the consumer. The cocktail sensory analysis result in week 4 was much improved from week 2

with an overall rating of 4 out of 5. The main outcomes from week 4 and objectives for week 5 were focusing on improving the flavour and appearance of the drink.

In Week 5, the sugar content, orange flavour and the orange colour of the base blend was increased slightly which enhanced the overall flavour and appearance of the product as this is the core component. The Peanut/Chocolate Swirls on the glass were also carefully created with a syringe in order to improve the appearance of the cocktail and similarly the white foam was piped with a syringe on top of the cocktail in order to improve the overall appearance.

## 5.2 Dirac

In Week 1, the additional serving components were focused on rather than the Dirac. The first component which was developed was a yellow bacon flavoured powder. This powder was created by blending Maltodextrin with oil which created a good textured product however it did not perform well in terms of flavour or colour, so it was decided that this would be the objectives for week 2. Maltodextrin is a sweet polysaccharide typically composed of between three and twenty glucose units linked together, it is also water soluble, so this powdering process only works with oils or fats, if Maltodextrin was mixed with water, the water would dissolve the starch granules (Potter 2016). The second component that was trialled on week one was 'spheres' made through the process of Basic Spherification. The outcome of this trial results in a liquid which did not form into spheres, it was decided that this may have happened due to two possible elements. The first being the pH of the trial was very different to the recipe in which it was manipulated off. The recipe which was researched had fruit puree as the base (typically 3.4-4pH) however since this assignment does not allow the use of plant tissue, this was created out of water, protein isolate and some colours and flavourings which would be closer to a neutral pH of 7. For Basic Spherification a pH of the solution with the sodium alginate needs to be between 2 and 8 (Campbell 2017). The second element which may have inhibited the Spherification process was the fact that the sodium citrate, sodium alginate and water were not brought to the boil. This step was accidentally omitted and may have also contributed to the spheres not forming. It was decided after some research that the next step of pearl creation would be trialled with the use of acetic acid and agar agar. This would eliminate the variance in pH and it would also be important to bring the acetic acid and agar agar to the boil.

Week 2 focused on trialling the Dirac/Protein Component and also on making the alterations suggested following week one's trial on the powder component. The powder component was altered in terms of colour and flavour with the inclusion as bronze for the colour and 'chilli'

for the flavour. This performed well in the sensory analysis with an average score of 4.5 out of 5 and it was decided this element would be part of the final dish. The Dirac Component was trialled with the use of Soy and Whey Protein in order to achieve the protein content and the corn starch used was in order to aid the texture. This blend was trialled in two forms on week 2: a soft 'bread' like form and a harder 'cracker' form. Following trials and sensory analysis it was decided that the objective for week three would be to create something between the two in terms of texture. Both products performed similar in terms of sensory analysis. The texture of the softer 'bread' like product had a grainy mouthfeel whereas the crackers were too hard and were difficult to chew.

Week 3 focused on three elements: improving the dirac/protein component, creation of pearls and also the creation of a dipping sauce. The dirac/protein component was altered from week 2 by altering the shapes and also replacing the soya protein trialled with pea protein instead. Pea Protein, though slightly lower in protein has a higher carbohydrates and fat content. These changes resulted in the creation of the Protein Sticks which are baked in the oven. The sensory analysis highlighted improvements from week 2 however the flavour and consistency still needed to be developed. The balsamic vinegar 'pearls' were also trialled this week and they performed very well in terms of the texture, flavour and appearance. These pearls were formed using Agar Agar which is a seaweed derived polysaccharide used to thicken foods and create gels, when heated above 85°C the galactose in agar melts and on cooling below 32-40°C it forms a double helix structure (Potter 2016). It was decided that following this week the exact same trial would be undertaken next week to see what 'size' pearls would be achievable. Week three also involved the start of the creation of the dips. This trial performed well in terms of sensory analysis however improvements needed to be made in terms of the texture, colour and flavour. The dips were created using Xanthan Gum as the thickening agent. Xanthan Gum is a water-soluble polysaccharide with many uses in food applications, it is a food hydrocolloid and is used as a thickener and to provide viscosity, stabilizing and emulsifying properties (Sanchez 2016).

Week 4 focused on the same three elements of the Dish. The Protein Sticks saw great improvement in terms of texture and flavour. The decrease in thickness (from 2cm to 1cm) in terms of the strips made to create the twirls made a huge difference in terms of the texture and appearance of the finished product. It resulted in a slightly more brittle and less chewy mouth feel which was desirable. As highlighted in the week by week analysis in section 4, the texture improved drastically between weeks 3 and 4 from a sensory analysis rating score of 2

out of 5 to 4 out of 5. The dipping sauce was altered in terms of colour by adding a very small quantity of the peach colouring. The flavouring was altered by increasing the acetic acid content and the texture was improved by decreasing both the soya protein and xanthan gum content. This 20% reduction of the soya protein and the xanthan gum resulted in a smoother, less 'jelly' like consistency which was representative of a smooth pleasant addition to the protein sticks. This again performed better on an average of 3 out of 5 on week 3 to 4.5 out of five on week 4.

The final week resulted in a positive overall improvement in the Sensory Analysis of the Dirac dish. The Appearance, Texture and Overall were rated as 4.5 out of 5 while the flavour rated 4 out of 5.

Week 5 saw the creation of one more element which was not trialed during weeks 1 to 4 which was a green 'sweet' dip which was created in the same format as the peach dip trialed in the previous few weeks. This dip was created with a different colour and flavour profile just in order to add some depth to the overall dish. The Protein Sticks were created based on Week 4's sensory results in terms of size and creation technique however the inclusion of the black die for half of the dough was reincorporated in Week 5. The Powder component was recreated based on the outcome from week 2. The peach dipping sauce was also created based on the sensory analysis response from week 4. While the Balsamic Vinegar pearls were created in the same manor as week 4 however they were displayed in the text 'Dirac' on the serving platter.

## 6. Conclusion

Over all the dish was successfully created through 'Note by Note Cooking'.

The Dirac Platter and the Cocktail both saw week by week improvements in terms of their sensory analysis results. The various functional ingredients that were used in order to have a specific function such as the Agar Agar, Maltodextrin and Xanthan Gum were all researched and a good understanding of their properties and functions were achieved which is vitally important when applying them to food preparation. Molecular Gastronomy is ultimately beyond the act of cooking but more so the application of scientific knowledge (Sanchez 2016). The brief was also achieved in terms of achieving a nutritional composition of the Dirac Dish of 41.5% protein which is in a similar protein to meat, which is quiet ironic as the Dirac Dish resembled more so a high carbohydrate food.



In Conclusion, Note by Note Cooking is a very affective process of food preparation and ultimately there is huge potential for its implementation into everyday cooking in the future. It allows for huge diversity and there are less limitations than using pure animal and plant tissue.

## 7. References

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## 8. Appendices

### 8.1 Nutritional Analysis for Dirac



PER 100g	%DI
1436 <sup>kJ</sup>	17%
342 <sup>kcal</sup>	17%
15 <sup>g</sup>	21%
2 <sup>g</sup>	10%
17 <sup>g</sup>	7%
1 <sup>g</sup>	1%
1.2 <sup>g</sup>	5%

CONTAINS:



MLA



## 9. Log Book

### Week 1

#### (Cocktail Base, Powder Component & Sphere/Pearls)

**Aim 1:** Create the base of a flavoursome cocktail which looks appealing and has a good consistency similar to a 'milkshake'.

#### Ingredients:

- 50g Chocolate Peanut Flavour Protein Powder  
*(Pea Protein Isolate, Brown Rice Protein, Quinoa Flour, Fat Reduced Cocoa Powder, Flavouring (Chocolate Peanut), Sunflower Lecithin, Xanthan Gum, Natural Sweetener (Stevia), DigeZyme*
- 200ml Water
- 5g Xanthan Gum

#### Instructions

Weight and Blend all Ingredients in the Thermo Mixer, Chill and Serve.



#### Outcome:

Flavour and Colour need to be significantly improved, very bland and unappealing 'grey colour'

#### Next Steps:

Add Sugar to your blend the next day and add more protein powder to try improve the colour profile.

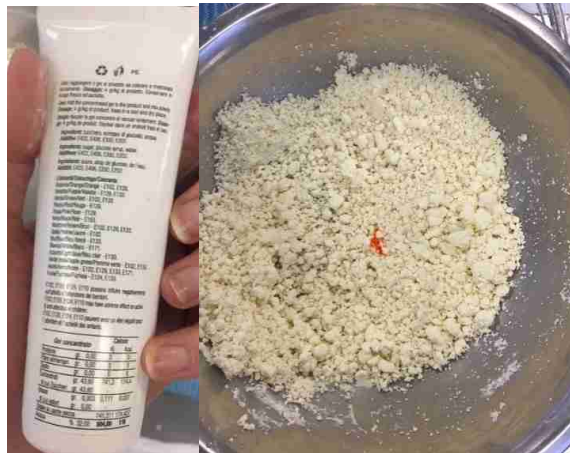
#### Aim 2

This week I aimed to make the Powdered Component - which I planned to create as an element of my finished product. I

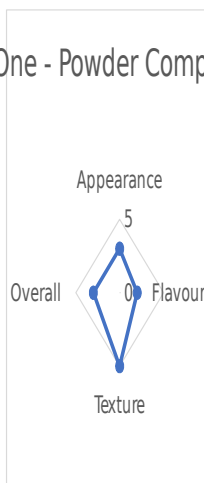
#### Ingredients

- 60ml Tapioca Maltodextrin

- 120ml Sunflower Oil
- 3 Drop Smokey Bacon Flavour
- 2 Drops Yellow Colour



Trial One - Powder Component



**Outcome:** Colour not appealing, flavour not appealing.

**Next Steps:** Change the Colour and Change the Flavour. Neither of these elements worked as part of the powder component this week. Needs to be altered next week.

### **Aim 3:** Sphere's

#### Spherical Ravioli

#### **Ingredients**

- 250g Water
- 1.3g Sodium Citrate
- 1.8g Sodium Alginate (0.36%)
- 250g Puree (We are unable to use puree so add 50g whey protein, 200g Water, Brown Food colouring, Bacon flavour)

**Setting Bath :** 1000g Water 5g Calcium Chloride (0.5%)

#### **Instructions**

Blend the sodium citrate with 350g of water, add the sodium alginate and blend once more. *Bring to a boil*, allow to cool and mix with the puree (whey, flavours and colour). Blend 1000g of water with calcium chloride for the bath). Leave for 2 minutes and wash in cold water. Repeat until all of the balls are made.

**Outcome:** During the process of making these sphere's, the sodium citrate, sodium alginate and water were not brought to the boil(*I forgot to do this element*). The recipe also called for a puree which would be a different PH to what I added (whey protein, water, food colour and flavour). In order to correct this recipe the correct PH would have to be determined and the alginate, citrate and water should also be brought to the boil to ensure correct coagulation occurs.

**Next Steps:** Try creating pearls/spheres out of agar agar instead. This will avoid trying to determine what the correct PH is as we are unable to use fruit purees (as per recipe used above). By trailing this recipe I will be able to bring in the spheres as I require and by using acetic acid, I will be able to include the harsh flavour in which I am looking for, for my finished product.





## Week 2

### (Powder Component, Dirac (Protein Sticks) & Cocktail)

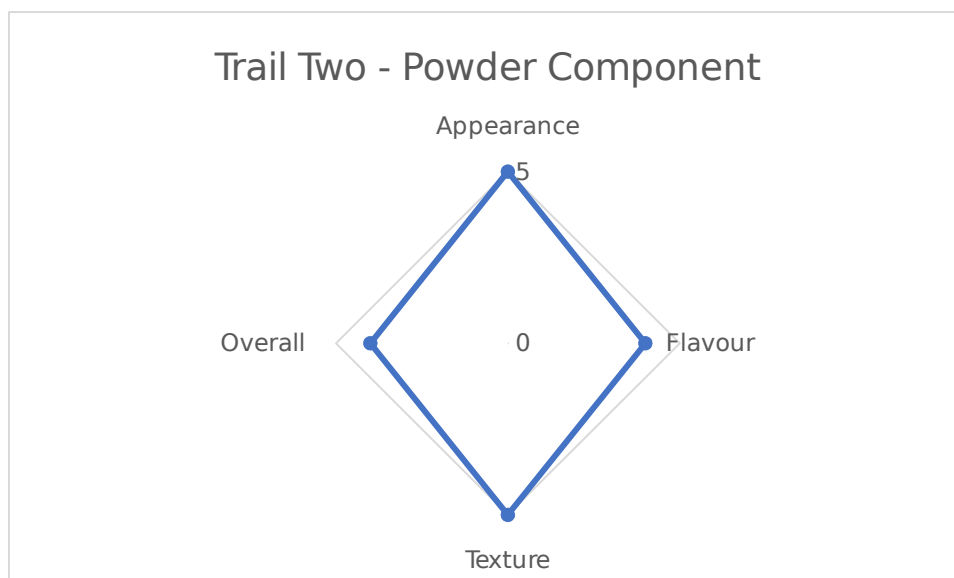
**Aim 1:** Trial 2 Powder Component: Improve Colour & Flavour Profile

#### **Ingredient**

- 60ml Tapioca Maltodextrin
- 120ml Sunflower Oil
- 0.2g Chilli Flavour
- 1 g Bronze Colour

#### **Instructions**

Weigh Ingredients out accurately into a Metal Bowl and use a whisk in order for the 'powder' to form.



#### **Findings:**

The flavour I had used in trial one was MSK's 'Smokey Bacon' – This was not coming across well in the blend. The colour I used in trial one was a Cake Decoration 'Yellow' which just came out too pale.

The second trial on this component I used a 'Chili' Flavour, this appeared to come across more favourable on the finished product and there was a nice 'after kick' to the component. I also changed the colour and used a bronze metallic colour which again appeared to be more favourable based on the sensory analysis results.

**Result:** Trial Two performed much better in the sensory analysis of the class mates. Appearance performed 5 out of 5 and flavour came in at 4 out of 5 which was significantly improved on since trial One. This recipe will be brought to the presentation on week 5.

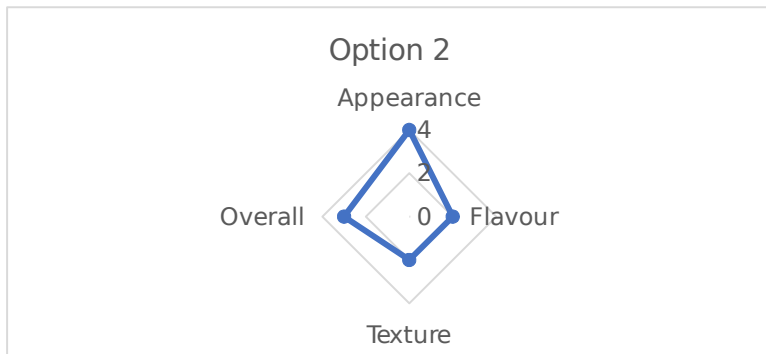
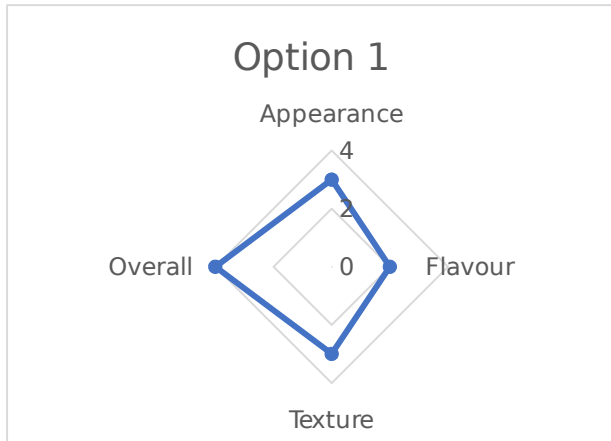
**Aim 2: Initiate Dirac Component:** This is the First Week of trialling the Dirac. Make the Dirac Component in the Form of a traditional bread/cracker/chip. Protein Level to achieve approximately 40%. Use the Same base ingredients in the trial of two different finished product.

- Option One – Softer Bread form
- Option Two – Harder More Like a Cracker

### **Ingredients**

- 40g Unflavoured Whey Protein
- 60g Soya Protein
- 60g Corn Flour
- ¼ teaspoon salt
- 65ml Water
- 1 ½ Tablespoon of Oil

**Instructions:** Mix ingredients into a dough in a food processor using a 'K' Hook. Once a dough is formed, knead on a floured surface (cornflour). Allow to rest for ten minutes. Once rested, roll dough out on a floured surface, cut into strips and lightly fry on a pan (one minute on either side) Option 1. Once fried, cut them into triangles and bake them in the oven for twenty mins at 200C (Option 2).



**Option 1.**



**Option2.**



**Findings:**

The Results from the Diraac on Week 2 Highlighted that both Option One and Option Two are somewhat acceptable as options however both can be significantly improved.

The Texture in Option One was quiet soft and almost representable of a ‘naan bread’, however was slightly undercooked where as the texture in Option 2 was way too hard and needed to reduce the overall cooking time.

The Flavour was not overly strong in either option so it is important that it is served alongside a component with a stronger and contrasting flavour.

The appearance on both can be improved, which can be ultimately done on the 'shaping of the dough'.

**Next Steps:**

Next Week, the findings of the two options will be combined and one option will be developed which will be representative of 'Protein sticks'.

These protein sticks will aim to be developed in order to improve sensory rating from a 2 or 3 out of five in terms of texture. This will be done by following an element of the directions of option 2, by baking the protein sticks, however the baking time will be decreased to ten minutes.

The appearance will also be more structured and will include the use of two different colours which will be moulded into one stick (spiralled)..

The flavour of this dish will be aided by the creation of a dip during next weeks class also.

## Aim 4. Cocktail

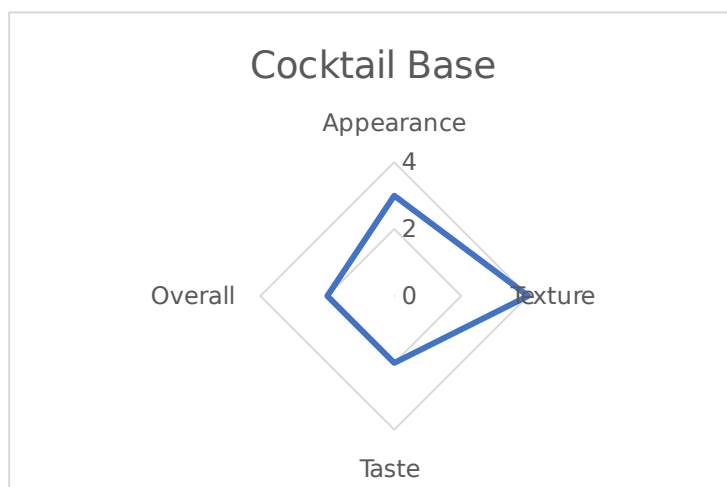
### 1.Base (Choc)

- 50g Rocky Road Flavour Whey Powder,
- 200ml Water
- 5g Xanthan Gum

### Instructions:

Add all ingredients to the Thermo Mixer & Blend Together

### Sensory Results



**Next Steps:** The base needs to be significantly improved. Perhaps move away from the 'chocolate base', need to investigate further flavours and textures that can be used.

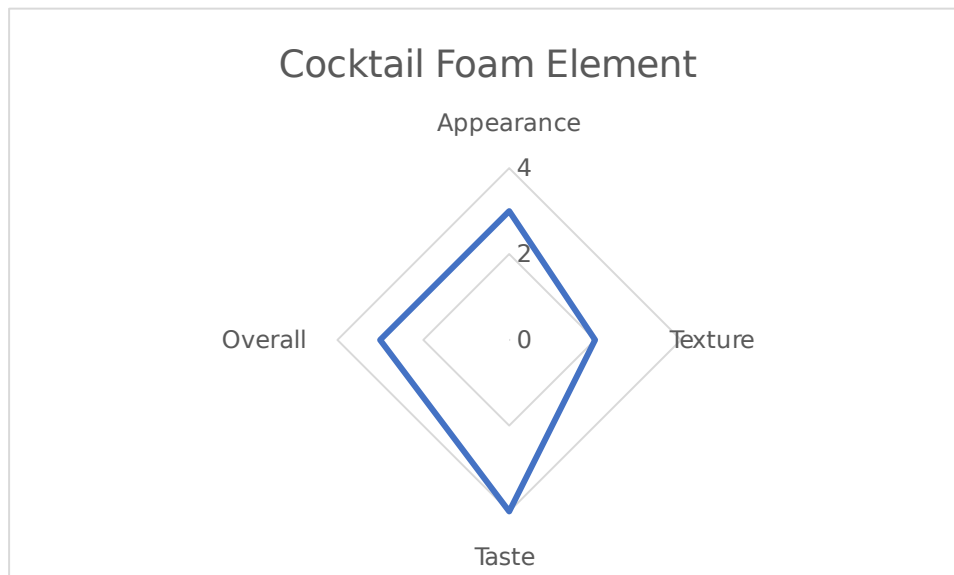
## 2. Foam Layer on Top of Cocktail

### Ingredients

- 2 Large Egg Whites
- 60 Caster
- 60g Icing

### Instructions:

Beat eggs first, then add caster slowly, then add icing. Once fully whipped, spread into a design on the side of the glass and set aside in the Fridge.



**Next Steps:** Improve the Foam Layer, needs to be thicker. Add another element to the cocktail for the next trial. There needs to be at least three elements to the cocktail to achieve the comparison in textures and flavours of which is the overall aim of the creation of this cocktail.



## Week 3

(Dip for Dirac, Pearls/Spheres & Dirac (Protein Sticks))

### **Aim 1.** Traditional Dip

#### **Ingredients**

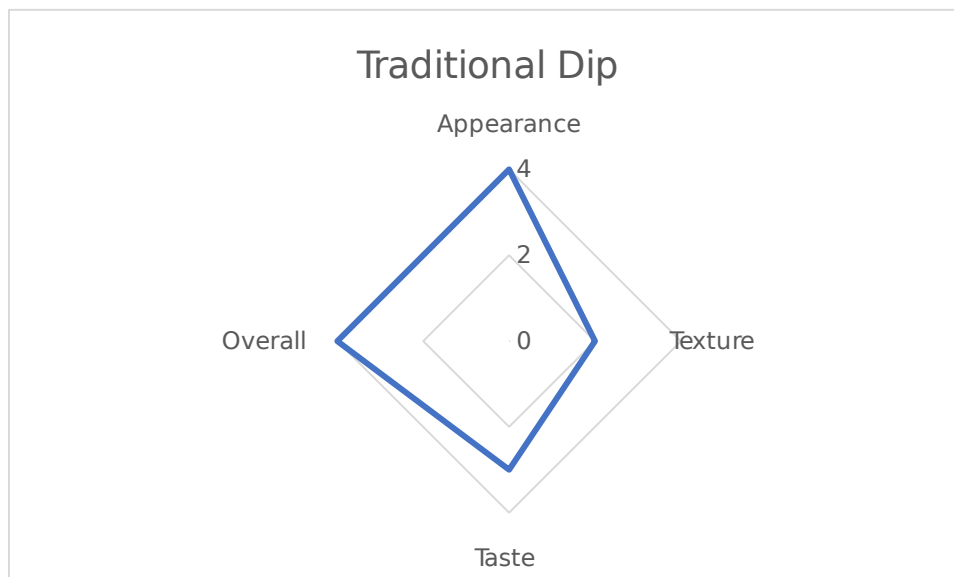
- 110g Oil
- 20g Soya Protein
- 60ml Water
- 30g Vinegar
- 10g Xanthan Gum

#### **Instructions:**

Blend all in a Thermo Mix & Chill in the Fridge

#### **Outcome**

Overall it is the Texture of this product which is the most disappointing. The texture is a little bit too thick and there is also a presence of some 'grainyness'. This would be coming from the soya protein and the xanthan gum.



**Next Steps:** Reduce the soya powder and xanthan content slightly (20%). Season the product also (salt & more vinegar). Improve Colour: there is a 'grey tinge' that is not appealing.

## **Aim 2: Balsamic Vinegar Pearls**

### **Ingredients**

- 100 g Balsamic Vinegar
- 1.5 g (1.5%) Agar Agar

### **Oil Bath**

- 250ml cup of oil, cold from being in the freezer for at least 30 min

### **Instructions**

Start by placing the oil in a tall glass in the freezer for at least 30 minutes. It is better if you use a tall glass so there is more time for the balsamic vinegar droplets to get cold and gel before reaching the bottom.

Once the oil has been in the freezer for at least 30 minutes, put the balsamic vinegar in a saucepan, dissolve the agar agar and bring it to the boil, stirring constantly with a beater. Take off the heat and skim to eliminate any impurities.

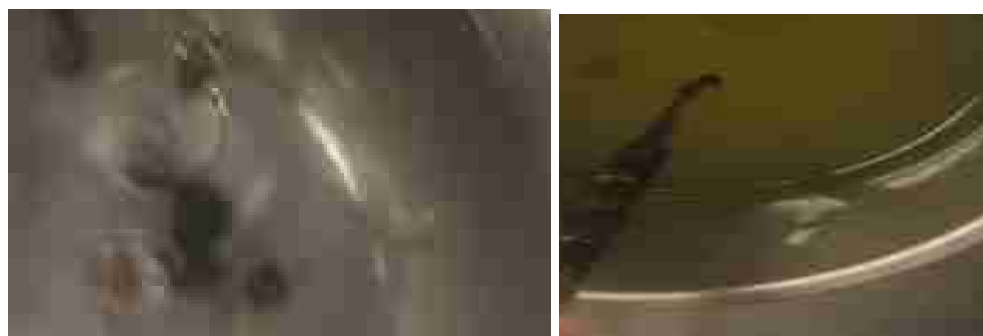
Wait a few minutes until the temperature drops to 50-55 °C. If the liquid is too hot, the droplets may not cool down enough and therefore not gel completely before reaching the bottom of the glass resulting in deformed spheres.

Fill a syringe with the hot balsamic agar solution and expel it drop by drop into the cold oil. The syringe needs to be high enough for the drops to sink when they get in contact with the oil but not too high or the drops may break into smaller drops creating “baby” spheres. Wait a few minutes and then carefully remove them from the oil bath using a slotted spoon and rinse them in water. You can keep them in a container in the fridge for later use.

**Outcome:** There was a good formation of the balsamic vinegar agar pearls.

The Texture, Flavour and appearance were all very positive also.

**Next Steps:** This will be created again next week to try perfect the size/shape of the balls



### **Aim 3. Protein Sticks (Dirac)**

#### **Ingredients**

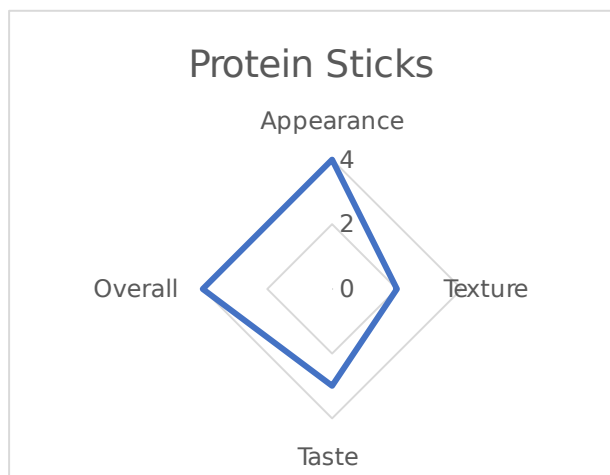
- 40g Whey Powder
- 40g Corn Starch
- 60g Pea Protein
- 65 ml water
- 30ml oil
- ½ teasp Salt
- (Mix This by two – Plain in one Batch & Black Die in another)

#### **Instructions:**

Create the above Batch twice. To one batch add the Black Food Dye. Form two dough balls in a Kenwood. Knead and allow both balls to rest. Roll each dough ball into a flat sheet and cut into long narrow strings (2cm). Twist both strings into a plait. Sprinkle the baking tray with oil and bake at 180C for ten minutes.

**Outcome:** The product was an improvement to last week’s dirac. The product was edible and visibly it was appealing, however the texture needs to be improved.

**Next Steps:** The Strips of dough will be 1cm thick rather than 2cm thick. This should hopefully result in a more ‘crisp’ stick which will have a better mouth feel. The appearance of the sticks should then also look less chunky and more ‘appealing’.



**Finished Dirac Dish Week 3**



## Week 4

### (Cocktail, Protein Sticks(Dirac), Pearls & Dip)

#### **Aim 1: Cocktail:** Prepare Glass

(Splatter the Coco on the Glass and Place in the Freezer)

#### **Ingredients**

- 30g Complete Vegan Protein Powder
- 3g Soya Lecithin
- 10g Sugar
- 20g Sunflower Oil

#### **Instructions**

Blend all of the above Ingredients together in a Thermo Mixer. Once fully blended, get your cocktail glass. Splatter the glass with the chocolate sauce with a spoon. Place in Freezer until ready to use,

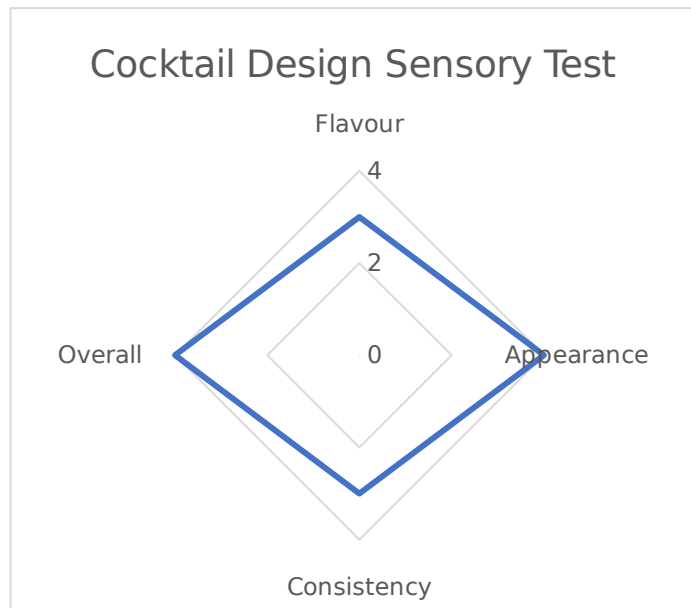
#### **Outcome**

This element to the cocktail enhanced the overall appearance of the cocktail and added an extra element. The texture of the chocolate peanut sauce was hard enough to stick to the glass but soft enough that the flavour complemented the finished orange base drink.

#### **Next Steps**

Repeat for next week, check with Lecturer if the complete protein powder blend is sufficient for the Assignment, is it fully considered 'pure compounds'.

Perfect the Design Technique on the Glass



## **Aim 2: Cocktail Base**

### **Ingredients**

- 20g Whey Protein
- 300ml Water
- 20g Sugar
- 3g Xanthan Gum
- 0.1g Colour Sugarflair 'Peach' (Glycerol E422, Proylene Glycol, Food Colour E110, E129, Thickener E551)
- 0.3g Flavour (MSK Orange Essential Oil)

**Instructions:** Blend all ingredients together in a thermo mix, Chill, Pour into prepared Glass

## **Aim 3: Cocktail Foam**

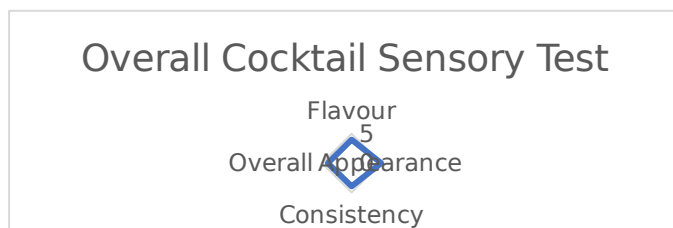
## **Ingredients**

- 1 Egg White
- 30g Sugar
- 30g Icing Sugar

**Instructions:** Whip Egg White, once whipped into soft peaks, slowly add the sugar until still white peaks appear. Serve on top of Orange Base.

**Overall Outcome:** This was a positive development on the last prepared cocktail base. The flavour and appearance profile was of a higher calibre. The orange aroma also mixed well with the chocolate peanut base.

**Next Steps:** Improve Overall Appearance of the Product & the Flavour profile



## **Aim 4: Protein Sticks**

### **Ingredients**

- 40g Whey Powder
- 40g Corn Starch
- 60g Pea Protein
- 65 ml water
- 30ml oil
- ½ teasp Salt

### **Instructions**

Form a dough ball in a Kenwood. Split ball in half once formed and Knead and allow both balls to rest.

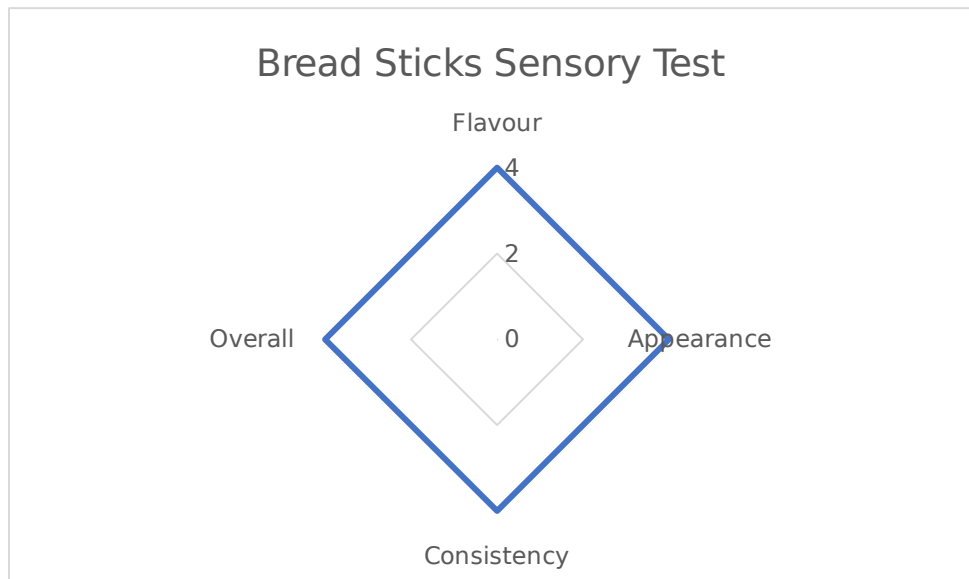
Roll each dough ball into a flat sheet and cut into long narrow strings (1cm versus the 2cm of last week).

Twist both strings into a plait. Sprinkle the baking tray with oil and bake at 180C for ten minutes.

**Outcome:** The product was an improvement to last week's dirac. The product was edible and visibly it was appealing. The texture was much improved and there was a better mouthfeel.

**Next Steps:** Undertake the same recipe as this week however create the dough twice and add the food die to one batch to make the plaits more obvious to the consumer.





### **Aim 5: Dipping Sauce**

#### **Ingredients**

- 160g Oil
- 14g Soya Protein
- 70ml Water
- 130g Vinegar
- 0.1g Colour Sugarflair 'Peach' (Glycerol E422, Proylene Glycol, Food ColourE110, E129, Thickener E551)
- 7.5g Xantham Gum

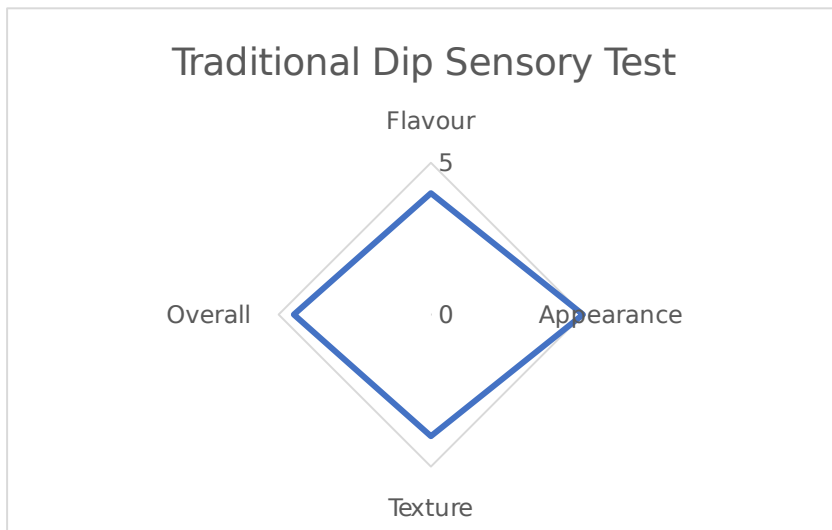
- Salt

### **Instructions**

Blend all in a Thermo Mix & Chill in the Fridge

### **Outcome**

Overall it is the Texture of this product was much improved this week due to the reduction in xanthan and soya protein. The graininess was certainly reduced. The colour was also much improved as there was no grey tinge present with the pale peach colour making the dish look appealing



**Next Steps:** Create the same recipe for next weeks presentation. No changes required.



**Final Dish – Week 4**



## Week 5

### (Cocktail, Protein Sticks (Dirac), Pearls & Dip)

**Aim 1: Cocktail:** Prepare Glass

(Splatter the Coco on the Glass and Place in the Freezer)

#### **Ingredients**

- 30g Complete Vegan Protein Powder (*Pea Protein Isolate, Brown Rice Protein, Quinoa Flour, Fat Reduced Cocoa Powder Flavouring (Chocolate Powder), Sunflower Lecithin, Xanthan Gum, Stevia, Digezyme*)
- 3g Soya Lecithin
- 10g Sugar
- 20g Sunflower Oil

#### **Instructions**

Blend all of the above Ingredients together in a Thermo Mixer. Once fully blended, get your cocktail glass. Splatter the glass with the chocolate sauce with a spoon. Place in Freezer until ready to use,

#### **Equipment Required:**

Weighing Scales, Metal Bowl, Thermo Mix, Syringe, Cocktail Glass, Freezer

## **Aim 2: Cocktail Base**

### **Ingredients**

- 20g Whey Protein
- 300ml Water
- 30g Sugar
- 3g Xanthan Gum
- .5g Colour Sugarflair 'Peach' (Glycerol E422, Proylene Glycol, Food Colour E110, E129, Thickener E551)
- 0.3g MSK Orange Flavour (Orange Essential Oil)

**Instructions:** Blend all ingredients together in a thermo mix, Chill. Pour into prepared Glass

### **Equipment Required:**

Weighing Scales, Metal Bowl, Thermo Mix. Fridge.

## **Aim 3: Cocktail Foam**

### **Ingredients**

- 40g Egg White
- 60g Sugar

**Instructions:** Whip Egg White, once whipped into soft peaks, slowly add the sugar until still white peaks appear. Serve on top of Orange Base and Sprinkle with some Chocolate Whey Protein

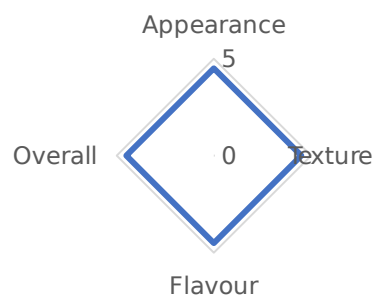
**Overall Outcome:** This was a positive development on the last prepared cocktail base. The flavour and appearance profile was of a higher calibre. The orange aroma also mixed well with the chocolate peanut base.

### **Equipment Required:**

Weighing Scales, Metal Bowl, Kenwood, Fridge



### **Final Cocktail- Sensory Analysis**



## **Aim 4: Protein Sticks**

## **Ingredients**

- 50g Whey Powder
- 40g Corn Starch
- 60g Pea Protein
- 60 ml water
- 30ml oil
- ½ teaspoon Salt
- 1g Black Food Colouring (Sugar, Glucose Syrup, Water, E422, E406, E330, E202)

## **Instructions**

Weigh Ingredients and form a dough ball in a Kenwood. Split ball in half once formed and add the black food colouring. Knead and allow both balls to rest.

Roll each dough ball into a flat sheet and cut into long narrow strings (1cm).

Twist both strings into a plait.

Sprinkle the baking tray with oil and bake at 180C for ten minutes.

## **Equipment Required:**

Weighing Scales, Metal Bowl, Kenwood, Rolling Pin, Baking Tray

## **Outcome**

The Protein Sticks were good this week in terms of texture, flavour and appearance. They have improved dramatically over the last couple of weeks and the Protein Content of this element of the dish was 41.5%.

## **Aim 5: Green Dipping Sauce**

### **Ingredients**

- 160g Oil
- 14g Soya Protein
- 70ml Water
- 60g Sugar
- .3g Essential Orange Oil
- 0.2g Yellow Colouring (Sugar, Glucose Syrup, Water, E422, E406, E330, E202)
- 0.1g Blue (Sodium Sulphate, E131)
- 5g Xanthan Gum
- Salt

### **Instructions**

Blend all in a Thermo Mix & Chill in the Fridge. Pipe and serve alongside the Vinegar Flavoured Peach coloured dip prepared last week.

### **Equipment Required:**

Weighing Scales, Metal Bowl, Thermo Mix, Fridge.

### **Outcome:**

This dipping sauce was a good addition to the overall dish, enhancing both the flavour by adding an element of sweetness and also the appearance by adding a contrasting colour.

## **Aim 6: Balsamic Vinegar Spheres.**

### **Ingredients**

- 100 g Balsamic Vinegar
- 1.5 g Agar Agar

### **Oil Bath**

250ml cup of oil, cold from being in the freezer for at least 30 min

### **Preparation**

Start by placing the oil in a tall glass in the freezer for at least 30 minutes. It is better if you use a tall glass so there is more time for the balsamic vinegar droplets to get cold and gel before reaching the bottom.

Once the oil has been in the freezer for at least 30 minutes, put the balsamic vinegar in a saucepan, dissolve the agar agar and bring it to the boil, stirring constantly with a beater. Take off the heat and skim to eliminate any impurities.

Wait a few minutes until the temperature drops to 50-55 °C. If the liquid is too hot, the droplets may not cool down enough and therefore not gel completely before reaching the bottom of the glass resulting in deformed spheres.

Fill a syringe with the hot balsamic agar solution and expel it drop by drop into the cold oil. The syringe needs to be high enough for the drops to sink when they get in contact with the oil but not too high or the drops may break into smaller drops creating “baby” spheres. Wait a few minutes and then carefully remove them from the oil bath using a slotted spoon and rinse them in water. Arrange them in the text of ‘Dirac’.

### **Equipment Required:**

Weighing Scales, Metal Bowl, Plastic Syringe, Saucepan, Whisk, Freezer.

### **Ingredients**

Slotted Spoon, Freezer, Saucepan, Whisk, Metal Jug, Metal Bowl, Plastic Dropper.





**Outcome:**

The overall Dish was rated at a high score of 4.5 out of 5 which, week on week was a significant improvement.

The contrasting flavours of the two dipping sauces complimented each other and the 'chilli powder' and balsamic pearls also added an extra element of diversity.

The various textures of the compliments to the Dirac (Protein Sticks) was interesting and added an element of complexity to a simple dish.

## Final Dish- Sensory Analysis

