



Molecular Gastronomy Note by Note Assignment

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DT 421/4

“Playing with pectins and a minimum content of sugar”



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1. Background Information

Molecular gastronomy is known as the scientific discipline concerned with the physical and chemical transformations that occur during cooking. It is defined as the application of science of culinary practice. It includes using new tools, and methods, and many consider it as gastronomical phenomenon. The style of cooking is also known as avant-garde cuisine, modern cuisine and experimental cuisine (Sanchez, 2015).

Molecular gastronomy is often confused with cooking or culinary arts. Cooking is considered a craft, but it is the ideas and thoughts that make cooking or food into an art form. Culinary arts are defined as the skill of preparing and/or cooking foods (Sanchez, 2015).

Cooking can be defined as the process of preparing food by applying heat in some instances. Cooking methods include baking, roasting, sautéing etc. whereas molecular gastronomy is beyond the act of cooking, it focuses on the physical and chemical changes that occur while cooking and incorporates the transformation of food ingredients and sensory phenomena associated with eating. One of the important principles of molecular gastronomy is to respect the ingredients and to present the food in its purest form, known as note-by-note cuisine (Sanchez, 2015).

Note-by-note is a style of cooking based on molecular gastronomy that replaces traditional ingredients such as meat and vegetables with their chemical constituents. It was first proposed in 1994 by French scientist Hervé This, the co-creator of molecular gastronomy and co author of the famous book “Note-by-note Cooking”. After identifying the fundamental chemical make-up of dishes, this then mixes those raw compounds to reconstruct the essence of traditional dishes (Chandran, 2018)

In the case of ‘Note-by-Note cooking,’ meat, fish, vegetables, or fruits are not used to make dishes, but instead compounds, either pure or in mixtures, are assembled by the chef to design the shapes, colours, tastes, odours, temperatures, trigeminal stimulation, textures, nutritional aspects, and more of the desired dish (This, 2013).

An example of breaking apart a food into its component is the cherry. The cherry has a consistency directly linked with pectin and cellulose which form a network where water is imprisoned, creating the pulp.

The cherry has a smell, due to the joining of hundreds of odorant compounds. Those compounds have a major role, since the smell takes part to the taste. The cherry has a colour, which can be explained by anthocyanins and beta-carotene. Finally, the cherry has a taste, which can be defined as everything captured by the taste buds of the tongue: sweet, acids, bitter, salted, and also spicy and fresh tastes which are called trigeminal sensations. These compounds are not only presenting cherries but other doo products but in different proportions. The compounds call Amerise is shared with almonds, scallops and strawberries (Ponti, 2017)

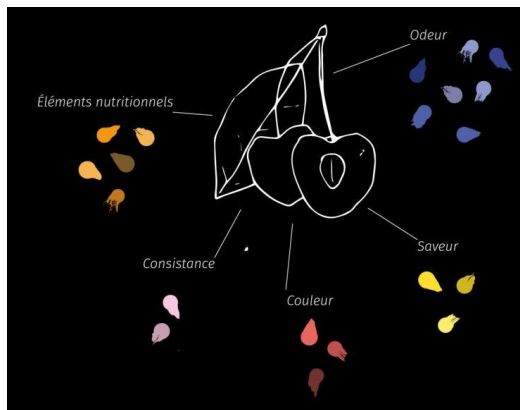


Figure 1: Compounds of The Cherry (Ponti, 2017)

For this note-by-note assignment, the compounds used are pectins. Pectin can be used in molecular gastronomy to make a wide variety of dishes. Pectin is a natural and commercially produced essential ingredient in preserves, like jellies and jams. Without pectin, jellies and jams won't gel. Pectin is a type of starch, that occurs naturally in the cell walls of fruits and vegetables and gives them structure. When combined with sugar and acid it is what makes jams and jellies develop a semi-solid texture when they cool (Timberlake, 2019). There are two main types of commercial pectin commonly used: HM (high methoxyl) and LM (low methoxyl). High methoxyl pectin can be rapid set or slow set. Rapid-set pectin works best to suspend solid ingredients within a jelly, while slow set works best for clear jellies made from clarified fruit juices such as grape juice. LM pectin can be used to make low-sugar and no-sugar jams and jellies. LM pectin is often labelled “light” or for “low sugar or no sugar recipes.” (David Joachim, 2018). The pectin molecules in raw, uncut fruit have an alkaline negative charge, which causes them to repel each other and to bond with water. When fruit is chopped and cooked to make preserves, acids in the fruit are released. This acid neutralizes some of the negative charges, allowing the pectin molecules to repel each other less. In the case of preserves thickened with HM pectin, added sugar attracts water molecules, bringing the pectin chains

closer together to form a loose, fluid matrix. As the mixture cools, it gels into a firmer mesh-like network that cradles and supports the liquid and dissolved sugar. When you use LM pectin, sugar and acid don't bind the pectin molecules together. Calcium does, which is why chemists call that type of gel a calcium gel (David Joachim, 2018)








2. Aim of project



The purpose was to make a dish with interesting consistencies and/or flavours using pectins and at the same time reducing the sugar content for gelling and to demonstrate the use of pectins and gelling using only pure compounds.

3. Note-by-Note 'Cupcake'

3.1 Materials used

Saucepan	
Wooden spoon	
Stainless steel Whisk	

<p>Stainless steel measuring jug</p>		
<p>Plastic measuring jug</p>		
<p>Weighing scales (Hanson electric weighing scales)</p>		
<p>Handheld blender</p>		
<p>Large stainless-steel bowl</p>		
<p>Small stainless-steel bowl</p>		
<p>Slotted spoon</p>		

Silicon moulds	
syringe	

4. “Cupcake” Recipe

Ingredients

“Cupcake” Base

8g Sosa low sugar pectin
 ½ teaspoon bulk powders stevia
 200ml water
 1 gelatin sheet
 ½ teaspoon Sosa red food colouring powder
 4 drops Amerise (cherry) flavouring

“Cupcake” icing

8g Sosa low sugar pectin powder
 ½ teaspoon bulk powders stevia
 200ml water
 1 gelatin sheet

“Cupcake” cherry-

Specification

Fruit cordial:

½ teaspoon of Amerise (cherry) flavouring drops

1g Texturas Spherification Align sodium alginate powder

½ teaspoon stevia

Calcium bath:

495g water

5g Texturas Spherification Calcic calcium salt granules

Method of preparation

Cupcake base

1. Weighed out all ingredients
2. Mixed pectin, water, stevia, cherry food flavouring and red food colouring together in a bowl
3. Added to a saucepan, put on high heat, stirring constantly
4. Added in gelatin leaves
5. Stirred until mixture reached boil
6. Took off heat and immediately added to silicon moulds
7. Placed moulds in the fridge to allow to set

Cupcake icing

Same as base excluding colouring

Cherry- Spherification

1. Mixed sodium alginate and sugar and added 98g of the 'fruit cordial' mixture and blended with handheld blender for 2-3 minutes
2. Left aside for one hour
3. Prepared calcium bath

Calcium bath

1. Measured 495g of water in a large bowl
2. Added calcium chloride making sure to stir well
3. Left to rest for an hour
4. Prepared a cold-water bath in a large bowl

5. After both mixtures were rested, a syringe was filled with the sodium solution
6. The syringe was held above the calcium bath and applied steady slow pressure to ensure even droplets
7. Left the solution to harden for 60 seconds
8. Carefully removed using a slotted spoon
9. The cherry spheres were then cleaned with cold water
10. Once all the moulds were set, they were ensembled on top of each other to resemble a cupcake
11. The dish was then tasted by 14 panellists

4. Results



Image 1: Dish from week one



Image 2: Result from week two



Image 3: Dish from week three



Image 4: Final dish from week four

5. Sensory results

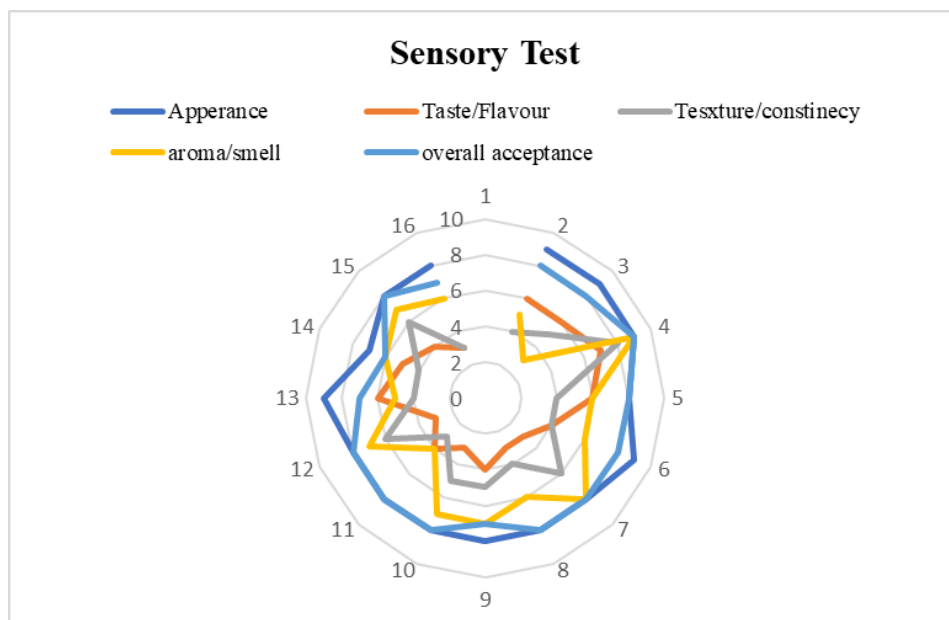


Figure 2: Spider plot for sensory analysis results

The dish was tasted a scaling test was done for appearance, taste/flavour, texture/consistency aroma/smell and overall acceptability by 14 panellist and rated from with numbers 1-9 corresponding to:

- 1=Dislike extremely
- 2= Dislike very much
- 3=Dislike moderately
- 4=Dislike slightly
- 5= Neither like nor dislike
- 6=Like slightly
- 7=Like moderately
- 8=Like very much
- 9= Like extremely

6. Discussion

To get the gel in a traditional jam or jelly recipe, there must be a certain ration of pectin-acid-sugar. Pectin most responsible for getting the gel in jams/jellies, fruit in acid is high but more is always added in the form of lemon juice to guarantee there's enough to get the ratio and finally a large amount of sugar is used (CompoundChemistry, 2014). However, because this assignment is note-by-note, only pure compounds must be and low sugar contents. It was a challenge to substitute the main components of jellies for pure compounds and to reduce the sugar and at the same time getting a recipe that gelled well. Low-methoxyl pectin was used in the dish as it doesn't require a lot of sugar. Most reduced sugar pectins are low-methoxyl pectins and do not use the traditional pectin-acid-sugar ratio, instead they use the ratio of pectin-acid-calcium and various of sweeteners can be used to add sweetness without using any sugar. To substitute for the lemon juice, citric acid powder was used, and calcium powder was used for the calcium

The results from week one was a jelly with a gritty soft consistency that did not set fully. This week was used to test pectin and sugar concentrations to get a recipe with the lowest sugar content but that can still gel. Orange flavouring and colouring were tested this week as well. Originally the dish that was in mind was low sugar pectin jellies with an orange flavour.

The second week was the second test for a recipe that set well and that had a lower sugar content. The result from week two was inclusive as the jellies did not set and was not the right consistency. This is most likely due to the fact that fruit pectin was used and the sugar content was lowered meaning there was not enough sugar in the mixture to attract some of the water away from the pectin there for the mixture did not form a strong structure and gel and set.

By week three a recipe that gelled and set was created, and the dish changed from jellies to a “cupcake” made out of only pure compounds and pectin. The idea was to make a cherry flavoured base, white icing and a cherry made from Spherification on top. Week three was to test different “bases” and “icings”. The base was made and set well. The two types of icing made was the same recipe for the base but with no colouring and a reverse Spherification method to try and achieve a round shape to resemble a cupcake icing. The reverse Spherification method did not work as well as yoghurt could not be used which is usually used and was substituted for milk powder and water. The pectin icing method was used to create the dish as seen in figure 3.

On week four the final dish was made with the base and icing from week 3. Spherification and was done for the cherry topping to resemble a round cherry. The final dish was then ensembled and tasted by 14 panellists using a scaling test and tasted based on appearance, taste/flavour, texture/consistency aroma/smell and overall acceptability

From the spider plot in figure 2 you can see that the appearance and overall acceptance was the highest ranked and the texture and taste was the lowest. This is due to the close resemblance of a cupcake without it being a real cupcake and having of the normal ingredients associated with a cupcake. The taste and texture were ranked the lowest and the texture was moulds were not fully set when presented and the perhaps more stevia and flavouring could have been used to and more sweetness.

7. Conclusion

To conclude, this is was somewhat successful however more than 4 weeks would have been needed to plan and make a recipe that gelled and set perfectly with a small amount of sugar and only using pure compounds.

References

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LOGBOOK

Week One: Pectin Jellies test

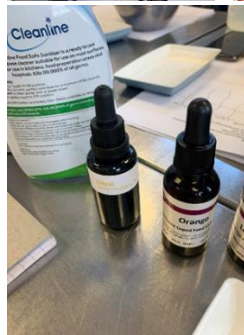
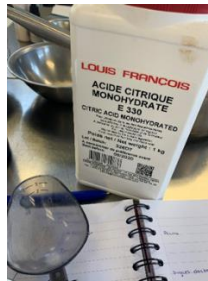
15/11/2019

Aims and objectives:

- To test varies pectin and sugar concentrations to find lowest sugar concentration

- Materials

- 946 ml 'fruit juice'- 946ml of water and 3 drop s of lemon flavouring & 3 drops of orange food colouring
- 200 grams of sugar
- 1 teaspoon of citric acid
- 1.5 tablespoons low methoxyl pectin powder
- Calcium water - ½ teaspoon calcium powder & 125ml water
- Saucepan
- Large jug
- 2 measuring jugs
- Whisk
- Rectangle moulds
- Weighing scales
- Small plates



Method

1. Prepared a fruit juice made up of water and cherry flavouring drops



2. Prepared calcium solution with ½ teaspoon of calcium powder and 125ml of water



3. Mixed citric acid into 'fruit juice', added calcium powder mixture and mixed well
4. In a separate bowl, mixed together half the sugar with the pectin powder. Set aside the remaining sugar
5. Brought fruit juice mixture to a boil
6. Added the pectin and sugar mixture while whisking continuously to avoid lumps then added the remaining sugar
7. Stirred vigorously for a few minutes to dissolve the pectin
8. Returned to the boil, then removed from heat



9. Poured the mixture into rectangle moulds and left set

Results



Image 5: Jelly mixture set in mould after freezer



Image 6: Jelly mixture out of mould after setting

- The jelly mixture did not set fully and became gritty
- Set once put in the freezer for 10 minutes but became too hard

Recommendations for next week

- Try different pectins, flavour and colour combination
- Lower the sugar content or substitute with stevia
- Half the recipe to make less

Week Two: Pectin jelly Test

22/11/2019

Aims and objectives

- Make a recipe that sets with lower sugar
- Use different moulds to help jellies slide out

Materials

2-3 tablespoons of sugar

¼ teaspoon citric acid

250ml water with orange flavouring

3 gelatin leaves

1 tablespoon Sosa fruit pectin

2 saucepans

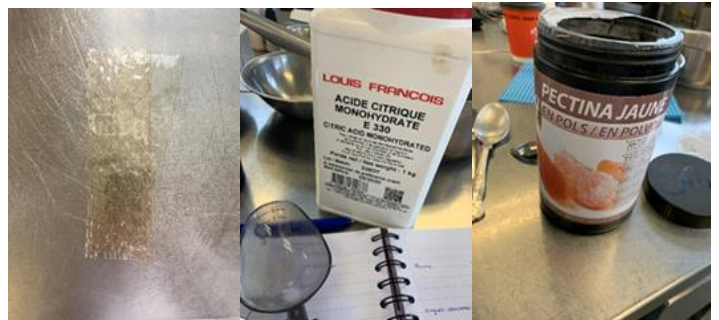
Wooden spoon

Measuring jug

Silicone moulds

Weighing scales

Teaspoons and tablespoons



Method

1. Mixed sugar and citric acid in one saucepan
2. Mixed sugar, flavoured water in another pan
3. Put both saucepans on the stove top over medium heat, stirring occasionally



4. When both were boiling, pour the sugar and citric acid mixture into the saucepan with sugar and flavoured water
5. Added the gelatin leaves and stirred continuously for one minute
6. Removed from the heat
7. Poured immediately into the moulds and allowed to set



Results

- The mixture did not set when allowed to cool

Recommendations for next week

- Change recipe or product
- Use calcium powder when using low sugar pectin
- Use different pectins
- Add more gelatin leaves
- Substitute stevia for sugar

Week Three: “Cupcakes” making & Sensory Testing

29/11/2019

Aims and objectives

- To make a dish that resembles a cupcake using pectin and pure compounds
- To incorporate reverse Spherification

Materials

- 2 saucepans
- Wooden spoon
- Whisk
- Measuring jug
- Silicone moulds
- Weighing scales
- Teaspoons and tablespoons

“Cupcake” Base

8g Sosa low pectin sugar

200ml water

3 Gelatin leaves

½ teaspoon bulk powder stevia

3 drops blackcurrant food colouring

3 drops cherry flavouring

“Cupcake icing” Test

8g Sosa low pectin sugar

200ml water

½ bulk powders teaspoon stevia

3 Gelatin leaves



Cupcake icing- reverse Spherification

5g of texturas sodium alginate

495g of water

“yoghurt”- milk powder and water

Method

1. Weighed out all ingredients using weighing scales
2. Mixed cupcake “base” ingredients together in a saucepan except the gelatin leaves



3. Mixed cupcake “icing” in a separate icing except the gelatin leaves



4. Put on high heat until boiling and added gelatin leaves to both saucepans
5. Took off the heat and pour both mixtures into silicone moulds



6. Once set ensemble the cupcake “icing” onto the cupcake “base”



8. the product was tested on flavour, aroma, texture and taste by 12 panellists

Reverse Spherification “icing”

1. Water and milk powder were mixed together to get the rich consistency that resembled yoghurt
2. The alginate bath was prepared by mixing water and sodium alginate together and blending with a hand-held blender
3. The bath was left to rest
4. Once rested, a spoonful of the milk powder mixture was gently lowered into the alginate bath to get a round structure



Results:



Image 7: “Cupcake” using Spherification “icing” Image 8: “Cupcake” using pectin “icing”

The reverse Spherification method did not work as well as perhaps there was not enough calcium in the milk powder to allow it to work, however the pectin method worked better but was not set enough for it to stay upright for long enough.

Recommendations for next week

- Try reverse Spherification method again
- Try pectin icing recipe again
- Try Spherification to make cherry top

Informal sensory testing results

Panellists	Flavour	Texture	Appearance
1	3	3	8
2	4	3	7
3	5	3	9
4	4	3	8
5	3	5	8
6	2	6	8
7	3	5	7
8	3	3	7
9	3	3	8
10	2	5	7
11	4	4	8
12	3	5	8

1=Dislike extremely

2= Dislike very much

3=Dislike moderately

4=Dislike slightly

5= Neither like nor dislike

6=Like slightly

7=Like moderately

8=Like very much

9= Like extremely

Week Four:

6/12/2019

Aims and objectives

- Finalise dish
- Demonstrate Spherification method for the cherry top

Materials

2 saucepans

Wooden spoon

Whisk

Measuring jug

Silicone moulds

Weighing scales

Teaspoons and tablespoons

Handheld blender

2 Large bowl

1 small bowl

Slotted spoon

Plastic syringe



“Cupcake” Base

8g Sosa low sugar pectin

4g sugar

200ml water

1 Gelatin sheet

½ teaspoon bulk powders stevia

½ teaspoon Sosa red food colouring powder

4 drops cherry flavouring



“Cupcake icing”

8g Sosa low sugar pectin

4g sugar

200ml water

½ teaspoon bulk powders stevia

1 Gelatin sheet



“Cupcake cherry”-

Specification

Fruit cordial:

½ teaspoon of cheery flavouring drops

1g texturas sodium alginate

½ bulk powders teaspoon stevia

Calcium bath:

495g water

5g texturas calcium chloride



Method:

Cupcake base

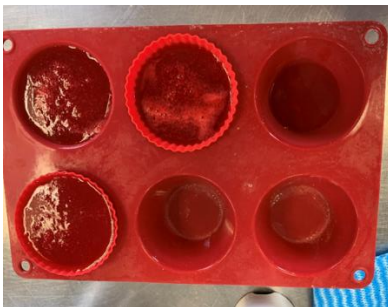
1. Weighed out all ingredients
2. Mixed pectin, water, stevia, cherry food flavouring and red food colouring together in a bowl
3. Added to a saucepan



4. Put on high heat, stirring constantly
5. Added in gelatin leaves
6. Stirred until mixture reached boil



7. Took off heat and immediately added to silicon moulds
8. Placed moulds in the fridge to allow to set

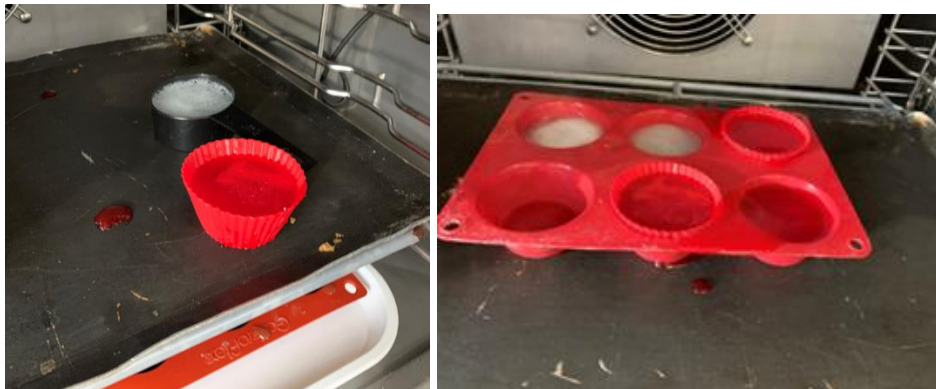


Cupcake icing

1. Weighed out all ingredients
2. Mixed pectin, water, stevia and cherry food flavouring together in a bowl
3. Added to a saucepan



4. Put on high heat, stirring constantly
5. Added in gelatin leaves
6. Stirred until mixture reached boil
7. Took off heat and immediately added to silicon moulds
8. Placed moulds in the fridge to allow to set



Cherry- Spherification

1. Mixed sodium alginate and sugar and added 98g of the 'fruit cordial' mixture and blended with handheld blender for 2-3 minutes



2. Left aside for one hour
3. Prepared calcium bath

Calcium bath

4. Put water in a large bowl
5. Added calcium chloride making sure to stir well
6. Left to rest for an hour
7. Prepared a cold-water bath in a large bowl



8. After both mixtures were rested, a syringe was filled with the sodium solution
9. The syringe was held above the calcium bath and applied steady slow pressure to ensure even droplets
10. Left the solution to harden for 60 seconds
11. Carefully removed using a slotted spoon
12. The cherry spheres were then cleaned with cold water



13. Once all the moulds were set, they were ensembled on top of each other to resemble a cupcake



