Title of Work	**Playing with Pectin's and a minimum content of sugar**
Submission Date	**10/01/2020**
Name of Module	**Molecular Gastronomy**
Module Code	**TFCS4025**
Name of Lecturer	**Dr Roisin Burke, Pauline Danaher**
Name of Student	**Philipp Zimmermann**
Student Number	**C16737961**
Name of Course	**Culinary Science**
Course Code	**DT405/4**

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Background

Cooking nowadays has changed a lot to the original ways. Fire and burning wood were changed to inductions hubs and ovens. Even the ingredients used have developed from tiny lemons to citric acid and ascorbic acid in pure compound form. The first steps to a modernist cooking were made by Hervé This and Nicholas Kurti who together founded molecular gastronomy in 1988. Nicholas Kurti was a Hungarian physicist at Oxford who said that the physics in the molecules was also important which meant that the term should be ``*molecular and physical gastronomy´´*. (This, 2012 / This, 1999) The definition of ``*Molecular Gastronomy is the scientific discipline (between chemistry, physics and food sciences) investigating the phenomena which occur during the preparation and consumption of dishes´´* according to This, 2019. The term *´´gastronomy´´* was chosen because it relates to everything that concerns human nourishment and because technology and cooking bot were not scientific. Molecular gastronomy had nothing to do with cooking but the actual science behind it, ``*chemical analysis´´*. (This, 2012) Note by Note cooking is an application of molecular gastronomy and uses pure compounds to create new dishes. `` Note-by-Note´´ was first mentioned in 1994 by Hervé This and Nicholas Kurti. The idea of `` Note-by-Note´´ is based on the idea that most of the food sold nowadays is mainly made up of water. The food wasting has also become an issue, so why not purify the compounds at the beginning and add them together again later and create new dishes. (This, 2019) Hervé says its like "a painter using primary colours, or a musician composing electroacoustic music, wave by wave, using a computer" in an interview with Gales (2013). Pure compounds like pectin are the base ingredients for the `` Note-by-Note´´ cooking. Pectin is a polysaccharide that can be derived from the peels of citrus or apples. There are two types of pectin: Low methoxyl Pectin and High methoxyl Pectin. The low methoxyl pectin is a pectin that forms a thermo reversible gel which is clear and transparent. This type of pectin also requires calcium ions to form gels. High sugar concentrations act as inhibitors. The high methoxyl pectins form thermo irreversible gel which mean that they are temperature independent. The setting temperature of HM pectins are between 40-80°C which depend on the pH of the solution. The LM pectins act similar to calcium as alginates which can also be used for spherification. ()LM pectin can also be amidated which is the treatment of the pectin to react with even lower calcium concentration. () According to the Modernist Pantry(n. d.) , amidated LM pectin requires only 10 - 30 mg

of calcium per gram of Pectin. The gelling with calcium can be used for spherification with pectin. (Herbstreith & Fox 2019).

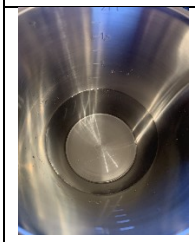
Aim of the project

The aim of the project was to create a dish which focuses on the gelling of pectin with the minimum sugar content. The aim of the forest oyster was to prove the spherification with pectins was possible.

Materials & Methods

Ingredients

Base Solution

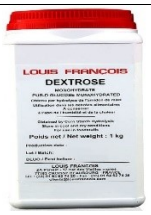
Picture of Ingredient	Name of Ingredient	Producer	Quantity
	Pectine Jaune	Louis Francoise	6g
	Calcium Lactate	Texturas	4.4g
	Citric acid water	Selfmade	10g
	Dextrose solution (65° Brix)	Selfmade	46g

	Water	Volvic	142g
	Cocci	Iquemusu	3 drops
	Eug	Iquemusu	3 drops
	Rain	Iquemusu	3 drops
	Jaune Citron	Mallard Ferrière	2 drops

Spherification Solution

Picture of Ingredient	Name of Ingredient	Producer	Quantity
	Pectagel Rose	Louis Francoise	3g
	Water	Volvic	197g

65°Brix Dextrose Solution

Picture of Ingredient	Name of Ingredient	Producer	Quantity
	Dextrose	Louis Francoise	167g
	Water	Volvic	84.88g

Citric acid Solution

Picture of Ingredient	Name of Ingredient	Producer	Quantity
	Citric Acid	Louis Francoise	2.5g
	Water	Volvic	200g

Truffle Sand

Picture of Ingredient	Name of Ingredient	Producer	Quantity
	Truffle Oil	Deluxe	10g
	Black oil-based food colouring	Colour Mill	2 drops
	Maltodextrin	MSK	20g

Equipment

Picture of Product	Name of Product	Producer
	HBCS Hand Blender	Richard Morphy
	Stainless Steel Saucepan 900ml	Vogue
	General Purpose Bowl 0.5 Ltr	Vogue
	Light Whisk 12"	Vogue
	High Heat Spatula 10.2"	Vogue
	Bead Table Spoon	Olympia
	PACK 20B	La Minerva

	Small High Accuracy Weighing Scales	Trumweigh
	Spherification Spoon	Molecular-R
	BW Series Scales	Ohaus
	Heavy Duty Sieves	Vogue
	Small Plastic tray	Unknown
	Good Grips Chef's Precision Digital Instant Read Thermometer	Oxo
	viale spagna 12 stove	Berto´s Spa

	Refracto 30PX	Mettler Toledo
	Maxima Freezer	Froster
	Formaflex Silicone Half Sphere Mould 15 Cup	Pavoni
	Syringe	Terumo
	pH Paper	BYS2012
	Ring Mold 6 cm Diameter	Vogue
	Stainless Steel Round Tip Tweezer Tongs 300mm	Clifton Food Range
	Single Tank Single Basket Countertop Electric Fryer LD50	Falcon

Method of preparation

65°Brix Dextrose Solution

- Turn on Trumweigh precision scales
- Place the weighing tray on scales
- Tare the scales
- Weigh 167g of Louis François Dextrose
- Add to saucepan
- Place clean weighing tray/boat on the scales
- Weigh 84.88g of Volvic water
- Add water to the dextrose in the saucepan
- Take a vogue whisk
- Mix water and dextrose
- Place on Berto´s Viale Spagna 12 stove over medium heat
- Whisk until dextrose is fully dissolved
- Prepare the Mettler Toledo Refracto 30PX
- Set to Brix%
- Take a dropper
- Add 3 drops of the dextrose solution on the refractive scanner
- Press measure until the refractometer gives the result
- The Refracto 30PX shows 65.3 °Brix
- Solution done

Cirtic Acid Solution

- Turn on Trumweigh precision scales
- Place the weighing tray on scales
- Tare the scales
- Weigh 2.5g of Louis François Citric Acid
- Add to a bowl
- Turn on BW series scales
- Place a new bowl on the scale
- Tare the scales
- Weigh 200 g Volvic water
- Add the weighed water to the bowl with the citric acid
- Mix well with Vogue whisk until fully dissolved
- Take BYS2012 pH indicator paper
- Remove one strip
- Dip the strip into the citric acid solution
- The strip turns orange (pH range 3-4)
- Citric acid solution done

Spherification Solution

- Turn on Trumweigh precision scales
- Place the weighing tray on scales
- Tare the scales
- Weigh 3 g of Louis François Pectagel Rose
- Add to a saucepan
- Turn on BW series scales
- Place a new bowl on the scale
- Tare the scales
- Weigh 197g Volvic water
- Add the weighed water to the saucepan with the Louis François Pectagel Rose
- Take the Richard Morphy hand blender
- Blend the mixture until the pectin mostly dissolved
- Place on Berto´s Viale Spagna 12 stove over medium heat
- Whisk until dextrose is fully dissolved
- Place the Oxo thermometer into the saucepan (end of the probe has to be in the middle of the liquid, do not touch bottom of the pan)
- Heat until the temperature reaches at least 75°C or until boiling
- Remove the saucepan from heat
- Leave to cool until
- Place mixture into a small bowl (300ml bowl)
- Place into the La Minerva Vacuum machine
- Set the sealing time to 3
- Set vacuum time to 25 seconds
- Place bowl in the vacuum machine
- Do three rounds of vacuum pumping (Caution: if solution over boils press sealing time and the vacuum will stop and prevent overflowing)
- Spherification solution done

Dripping (Base) Solution

- Turn on Trumweigh precision scales
- Place the weighing tray on scales
- Tare the scales
- Weigh 6g of Louis François Pectine Jaune
- Add to a saucepan
- Place clean weighing tray/boat on the scales
- Weigh 4.4g of Texturas Gluco (calcium lactate)
- Add to saucepan

- Place clean weighing tray/boat on the scales
- Weigh 10g of Citric Acid solution
- Place clean weighing tray/boat on the scales
- Weigh 46g of 65°Brix solution
- Turn on BW series scales
- Place a small bowl (300ml) on the scale
- Tare scales
- Weigh 142g of Volvic Water
- Add water to saucepan
- Take the Richard Morphy hand blender
- Blend the mixture until the pectin mostly dissolved
- Place on Berto´s Viale Spagna 12 stove over medium heat
- Whisk until dextrose is fully dissolved
- Place the Oxo thermometer into the saucepan (end of the probe has to be in the middle of the liquid, do not touch bottom of the pan)
- Heat until the temperature reaches at least 75°C or until boiling
- Remove the saucepan from heat
- Leave to cool until
- Place mixture into a small bowl (300ml bowl)
- Place into the La Minerva Vacuum machine
- Set the sealing time to 3
- Set vacuum time to 25 seconds
- Place bowl in the vacuum machine
- Do three rounds of vacuum pumping (Caution: if solution over boils press sealing time and the vacuum will stop and prevent overflowing)
- Dripping (Base) solution done

Pectin Spherification

- Turn on BW series scales
- Place a small bowl (300ml) on the scale
- Tare scales
- Weigh 100g of the spherification solution
- Add 3 drops of Iquemusu Cocci
- Add 3 drops of Iquemusu Eug
- Add 3 drops of Iquemusu Rain
- Add 3 drops of Mallard Ferrière Jaune Citron
- Mix with a vogue whisk
- If air bubbles are created repeat the vacuum process from spherification solution
- Take the pavoni silicone mold

- Add 6ml of the dripping (base) solution with the terumo syringe into the semi sphere molds
- Once all the 15 molds are filled place the silicone mold into the Froster Maxima Freezer at -22°C
- Freeze for 1 hour or until fully frozen
- Remove the frozen semispheres from mold
- Place quickly into the frozen dripping (base) semipheres into the spherification solution
- Leave the spheres in the spherification solution for at least 5 minutes or until completely melted and fully spherified
- Take a clean small bowl(300ml)
- Add volvic water (enough to cover spheres)
- Remove the spheres from the spherification solution
- Place into the fresh-water bowl
- Pectin spherification done

Truffle Sand

- Turn on Trumweigh precision scales
- Place the weighing tray on scales
- Tare the scales
- Weigh 10g of Deluxe Truffle oil
- Place into a small bowl (300ml)
- Add 2 drops of Colour Mill black oil-based colouring
- Mix with vogue whisk until oil turns fully black
- Place clean weighing tray on scales
- Tare the scales
- Weigh 20g of MSK Maltodextrin
- Add the weighed maltodextrin to the bowl with the truffle oil
- Whisk the oil and the maltodextrin together with the whisk
- Whisk until fully incorporated and dry powder is reached
- Take a vogue heavy duty sieve
- Sieve the powder through the sieve to get a loose fine powder
- Truffle sand done

Rice Paper Oyster Shell

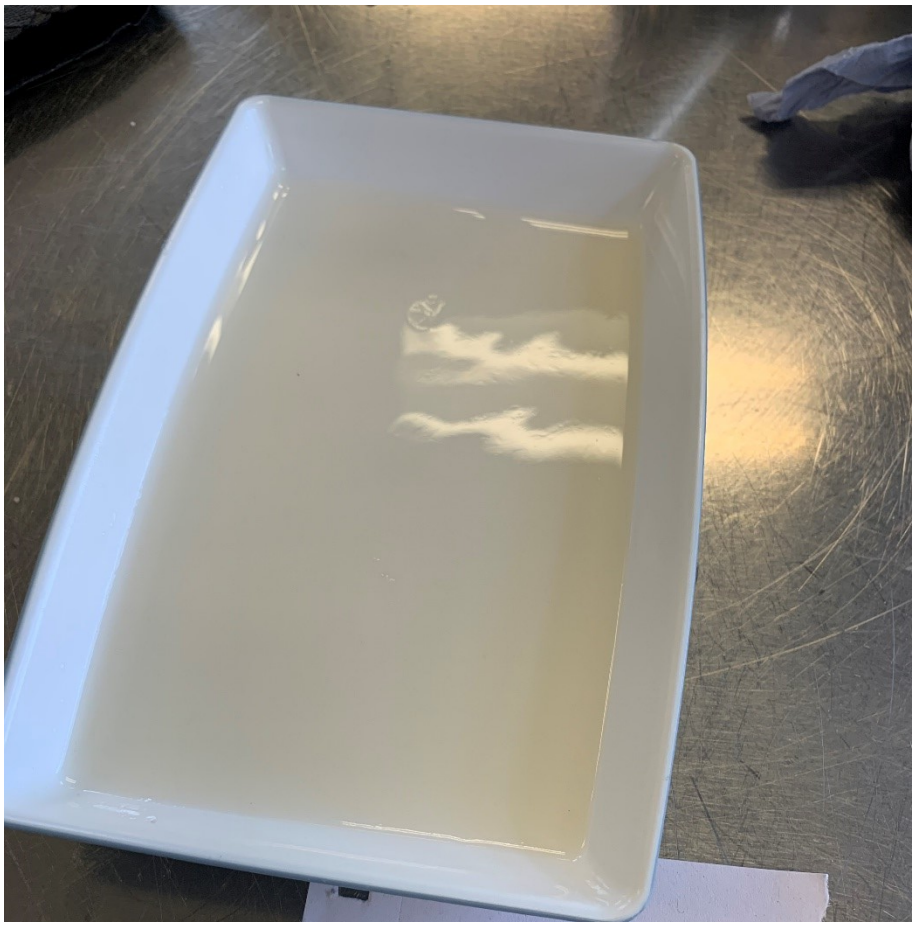
- Take one sheet of rice paper
- Take a 6 cm diameter ring mold
- Cut an oyster shell shape out of the rice paper sheet
- Preheat the falcon fryer to 180°C
- When fryer reaches 180°C
- Place the rice paper oyster shell into the hot oil with vogue tweezer
- Keep the tweezers in the centre of the rice paper sheet to create shell shape
- Remove once puffed up
- Oyster shell done

Rice Paper Oyster Shell

- Take a plate of wish
- Take a half tablespoon of the truffle sand
- Place in the centre of the plate
- With the back of the spoon form a small indentation where the oyster shell will be placed on
- Remove the pectin spheres from the water bath with the help of the spherification spoon
- Place on a piece of blue paper to remove excess water
- Place the sphere into the oyster shell carefully
- Place the oyster shell with oyster (sphere) on the prepared truffle sand bed
- Serve- eat in one bite

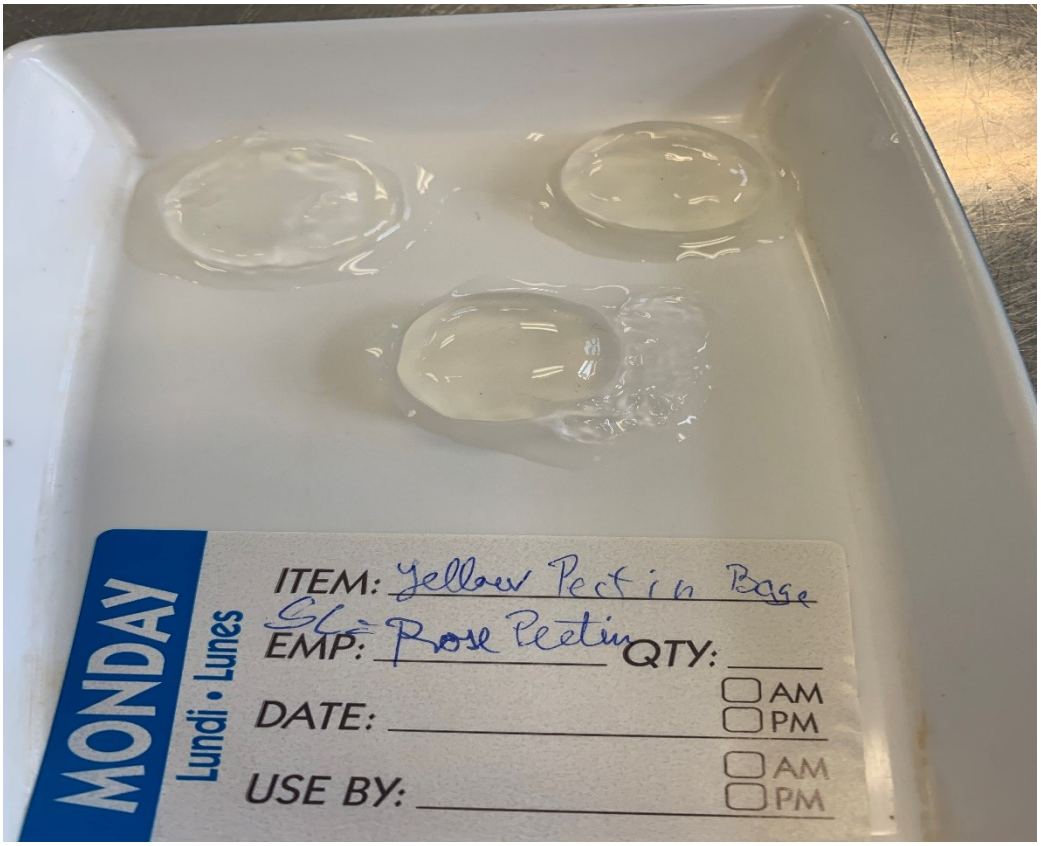
Results

Picture 1 Pectine Jaune Gel Week 1



Picture 2 Sosa Pectina Xoco Nappage X58 Gel Week 1

Picture 3 65°Brix Dextrose Solution week 2



Picture 4 Pectin Spherification week 3

Picture 5 Proto-Type Product: Forest Oyster week 4

Picture 6 Final Presentation: Forest Oyster on Truffle Sand week 4

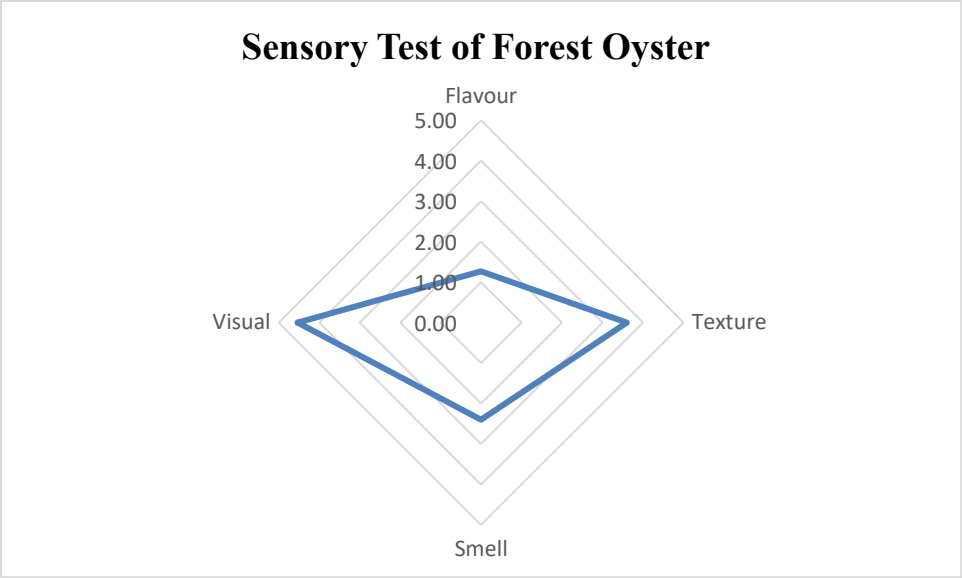


Table 1 Results of sensory analysis for final dish

Scales of sensory test:

1,00 – Very dislike

2,00 – Dislike

3,00 – Neutral

4,00 – Like

5,00 – Very Like

Judges	Taste	Texture	Smell	Visual
1	1	4	3	5
2	2	4	2	4
3	1	3	3	4
4	2	5	2	4
5	2	3	2	4
6	1	3	2	4
7	1	4	2	5
8	1	4	3	5
9	2	4	3	5
10	1	5	2	4
11	1	3	2	5
12	1	3	3	5
13	1	2	2	5
14	1	4	3	4
15	1	3	2	5
Means	1,27	3,60	2,40	4,53

Table 2 Results from sensory test of the forest oyster

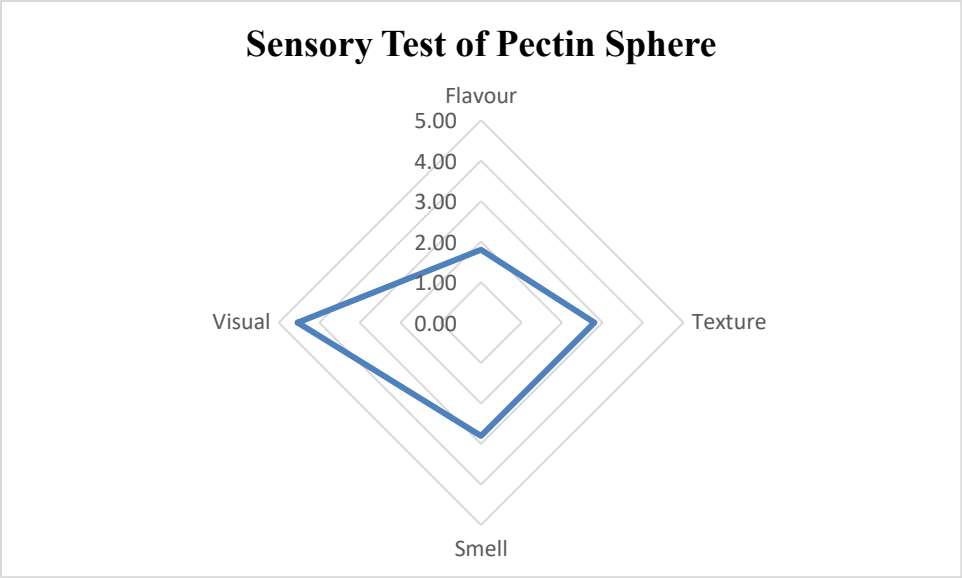


Table 3 Sensory Test of Pectin Spheres

Judges	Taste	Texture	Smell	Visual
1	2	3	4	5
2	2	2	2	4
3	3	3	3	4
4	1	4	2	4
5	1	3	4	4
6	2	2	2	4
7	2	3	2	5
8	1	2	4	5
9	2	2	3	5
10	1	4	2	4
11	3	3	4	5
12	2	3	3	5
13	3	2	2	5
14	1	3	3	4
15	1	3	2	5
Means	1,80	2,80	2,80	4,53

Table 4 Results of sensory test of pectin spheres

Scales of sensory test:

1,00 – Very dislike

2,00 – Dislike

3,00 – Neutral

4,00 – Like

5,00 – Very Like

Discussion

Note-by-Note cooking was invented by Hervé This who also was one of the founding fathers of molecular gastronomy. (This, 2012 & This, 2014) The idea of using pure compounds was developed to reduce food waste and be able to feed large numbers of people. Breaking down foods into their compounds removes the water which was seen to be the highest weight in a food product. This cooking also allowed the creation of new food combinations and dishes. Pierre Gagnaire was and is a good friend of Hervé and was one of the first big names in the culinary world to create note-by-note dishes. (This, 2019)

The note-by-note project was focusing on pectins with the use of the minimum quantity of sugar. Pectin were polysaccharides which originated from the peels of citrus fruit and other fruits, such as apples. These polysaccharides had two main types: Low methoxly pectins and high methoxly pectins. (Lersch, 2008) Low methoxyl pectins were found to react and gel best at low sugar concentrations and had similar gelling properties to sodium alginate due to creating a gel in the presence of calcium. (Lersch, 2008 & Herbstreith & Fox, 2013) The topic of the project was to use pectin as a part of a dish with the minimum amount of sugar which meant that the use of low methoxyl pectins, also named amidated pectins, where a good type of pectin to focus on. The topic also said the use of pectins which meant that the use of other pectins could also be used to create the dish. The dish presented in the last week of the project was a spherification done with pectins using both low methoxyl (LM) pectins and high methoxyl pectins. The main principle was based on the gelling property of LM pectins which gelled only in the presence of divalent cations, such as calcium ions. (BeMiller, 2019)

The final dish presented was comprised of a pectin sphere, representing the oyster, in a fried rice paper shell, imitating the shell of an oyster and served on a bed of truffle sand. (See results Picture 6) The dish was called the ``Forest Oyster´´ imitating the look of a food usually found in the sea or water but having the flavours of the forest. The game of contrast in the name was also used in the actual creation of the dish creating a product with pectin in which the sugar content did not have a big role.

The idea of the creation of this dish was thought of when learning about spherification and the gelling of sodium alginate with the help of calcium ions which were similar properties that pectin had, especially LM pectin. The other important factor for the creation of this was the focus on creating a dish where pectin was in the main element and not only found as one side element of the dish.

Note-by-note cooking was based on the use of pure compounds only for the creation of new dishes. The pure compounds included the also the flavours which were used in the process of creating of the dish. The flavour compounds used in this project were made by the French company Iqemusu. The company was the first company to produce pure flavour compounds based on deodorised organic sunflower oils for the note-by-note cooking. (Pontif, 2017) These flavour compounds did not have a limit of use which meant that the pure compounds were completely safe for human consumption. The pectins and other pure compounds were supplied by Louis François. Louis François was one of the sponsors of the international competition for note-by-note cooking. The French company focuses on the entire range of

pure compounds and food additives that were used in molecular gastronomy and in industry. (Louis François, 2020)

The creation of the dish was done over the time period of four (4) weeks. Every week focused on one special element of the final dish. The first week was used to experiment with the pectins found in the kitchens. The pectins in class were not pure compounds and all contained an undefined amount of sugar and other additives. The only pectin that was produced by Louis Francois was the Pectine Jaune or translated Yellow pectin in the first week. The second week was used to make the 65°Brix dextrose solution with the help of the Mettler Toledo Refracto 30PX and the testing of the pectins produced by Louis Francois. The pectin found to be best for the use of purpose was the yellow pectin and the rose pectin both produced by Louis Francois. The third week was spent focusing on the spherification of the pectin solutions. This was the most important process in the development of the project and was managed successfully. The sphere formation worked out and the addition of flavours and colour was also tested. The last week was used to produce the side elements, shell and sand, and the production of the final dish.

The problems found during the development process were mostly found in the spherification of the pectin solutions. The first tries were made with liquid dripping solutions which had formed gels but did not hold the sphere shape. The knowledge of reverse spherification using alginates was used to fix this problem. In reverse spherification the dripping solution was frozen in semi sphere shape and placed frozen into the spherification solution. The slow melting of the dripping solution allowed the even formation of the gel membrane, encapsulating the liquid centre. The same happened with the amidated (LM) pectin solution after freezing and placing into the spherification solution.

The main principle of the gelling of LM pectins with calcium was explained by the ``egg-box´´ model. (Gawkowska *et al.* , 2018 & Braccini and Pérez, 2001) The ´´egg-box´´ model was based on the bonds formed between Calcium-ions and non-esterified galacturonic acid found in alginates and LM pectins. (Ngouémazong *et al*., 2012) The studies of Wellner *et al.* (1998) showed that the cross-linkages were found at polygalacturonate chains. The oxygen atoms from the carboxyl groups and in the hydroxyl group of the next residue. (Wellner *et al.*, 1998) The acidity level also played a big role in the gelation of pectins with calcium-ions. (Cardoso, Coimbra and Lopes da Silva, 2003) Neutral pH the gelling of pectins was explained by electrostatic interactions between charged carboxyl groups of pectins and these ions. (Schlemmer,1989) All of the studies showed similar gelling properties of LM pectins which meant that the scientific proof was backed by the spherification of the pectin solution.

The sensory test was done on the final product and fifteen (15) participants took part in the tasting. The taste, smell, texture and visual appearance was analysed with a scale of 1-5, 1 being the worst , 5 being the best. The test was done with students from class which meant that the results could have been bias. The first aspect that was looked at was the flavour. The new and special flavour combination of the Cocci, Eug and Rain produced by Iqemusu was imitating the flavour notes that could be found in a forest. This flavour was found disliked by most judges, due to the unusual flavour of this. In some cases, the taste was described as terrible. The flavour aspect of the dish can be easily changed, and it was only used for testing

of new combinations with the Iqemusu flavour compounds. The second aspect looked at in the sensory analysis of the final dish was the texture of the dish. The combination of the liquid centre of the sphere and the crunch of the oyster shell was liked by the judges. The feedback on the texture was mostly positive except of some cases were the truffle sand was found slightly too oily. Besides the oiliness of the sand, the texture was well accepted by the judging panel which meant that in the further development of the dish these elements can mostly stay the same. The improvement will be done on the truffle sand. The third sense used for the sensory analysis was the smelling. The judges were asked to smell the product and give feedback on it. The judges had mixed opinions on the smell of the product. Some of the judges liked the smell of the forest whereas other found it to smell mouldy or like moss which was disliked. The overall result on the smell was that the smell could be improved, and this will be worked on in the future. The last category analysed was the visual appearance of the product. The visual appearance of the product was liked by the judges. Some judges said that the final dish looked similar to a fried egg because of the orange oyster. The colour of the oyster should be changed to green, so it represents the colours of the forest more. The reason for the orange colour selection was to have an attractive colour to the tasters. Green usually was symbolized as spoiled or not edible which would have made the appearance less attractive.

Final Conclusion

The final dish was found nice in appearance but was disliked in taste. The smell and taste elements of the product will have to be reconsidered and maybe been changed if the dish would be reproduced. The flavour world was chosen to test the combinations of new flavours to create the flavour of a forest. This was achieved partly due to the feedback of the product tasting like moss but was also disliked because of this taste.

Conclusion

Overall the aim of pectin spherification was achieved with the final dish and with some changes the dish can be made more attractive for the judge's taste. The main aim of creating a pectin sphere by using calcium and a low sugar content was achieved. The prove of this process fulfilled the aim of the project as well because a low/ minimum amount of sugar was only used in the gelling of the pectin and the main element, the oyster was fully made with the focus on the pectins and the gelation of these compounds. Note-by-note allows the individual to use scientific knowledge and create a new dish based on these by being able to influence every element of the dish. Note-by-note could also be described as the Lego game of the food industry and cooking. The project showed me how important the work of each week is to get to a final finished product that still can be improved. The overall result of the final dish: The Forest oyster turned out presentable and the aim of pectin spherification was reached but the taste has to be improved for the next time.

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Logbook for Molecular Gastronomy

Week One: 15th November 2019

Aim

The aim of the first week was to analyse the different pectin´s for the gelling properties given in the first week.

Objectives

- Making pectin gels with just water
- Comparing different pectin concentrations with the effect of gel texture
- Comparing amidated pectin (440 ii) and pectin (440i)

Materials & Methods

Ingredients:

Picture of Product	Name of Ingredient	Producer	Quantity
	Water		200g
	Pectina Xoco Nappage X58	Sosa	3g
	Water		200g
	Pectine Jaune	Louis Francoise	3.4g
	Water		200g

	Pectina Jaune	Sosa	3g
	Water		200g
	Pectina Low Sugar	Sosa	2g

Equipment:

Picture of Product	Name of Product	Producer
	HBCS Hand Blender	Richard Morphy
	Stainless Steel Saucepan 900ml	Vogue
	General Purpose Bowl 0.5 Ltr	Vogue
	Light Whisk 12”	Vogue
	High Heat Spatula 10.2”	Vogue

	Bead Table Spoon	Olympia
	PACK 20B	La Minerva
	Small High Accuracy Weighing Scales	Trumweigh
	Spherification Spoon	Molecular-R
	BW Series Scales	Ohaus
	Heavy Duty Sieves	Vogue
	Small Plastic tray	Unknown

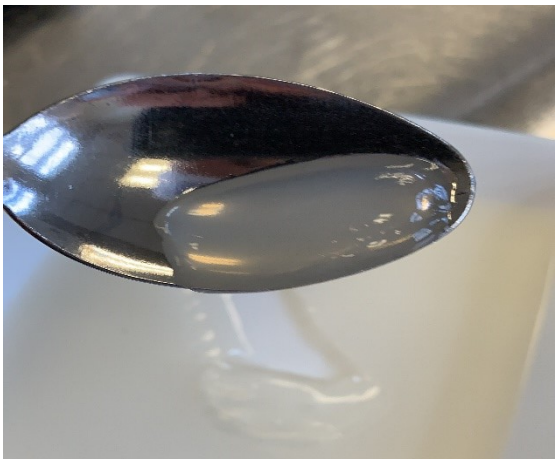
	Good Grips Chef's Precision Digital Instant Read Thermometer	Oxo
	viale spagna 12 stove	Berto´s Spa
	Refracto 30PX	Mettler Toledo
	Maxima Freezer	Froster
	Formaflex Silicone Half Sphere Mould 15 Cup	Pavoni
	Syringe	Terumo
	pH Paper	BYS2012

	Ring Mold 6 cm Diameter	Vogue
	Stainless Steel Round Tip Tweezer Tongs 300mm	Clifton Food Range

Method:

- Take the saucepan
- Place on BW Series scales
- Tare the scales
- Add 200g water
- Weigh 3g of Sosa Pectina Xoco Nappage with the trumweigh precision scales
- Add the 3g of nappage pectin to the saucepan with the water
- Take the hand blender
- Blend until pectin is dissolved
- Place saucepan on the berto´s spa stove
- Heat until boiling or measure with oxo thermometer until temperature reaches at least 85°C
- Pour onto small plastic tray
- Place and cool in the fridge
- Repeat for the other pectins

Results



Picture 7 Sosa Nappage Pectin

Figure 8 Louis Francoise Pectine Jaune Gel

The testing of the different pectins found in the first week of the kitchen was the main aim of the class. The two main pectins which were placed in focus were the yellow pectin by Louis François and the nappage pectin by Sosa. None of the pectins found in class were pure compounds and all of the pectins were premixed with undefined amount of sugars (mostly sucrose and dextrose).The yellow gel from Louis François formed a firm and solid gel which needed longer for setting. The sosa nappage pectin formed a soft easily spreadable gel. The nappage pectin was an amidated LM pectin. The yellow pectin was a HM pectin. The aim of the testing was to find out the concentrations of the pectins needed to form gels. Both cases the highest concentration was used. The nappage pectin had a highest recommended concentration of 1.5% which created the soft gel. The recommended highest concentration of the yellow pectin was 1.7% and it took longer to set. The yellow pectin also needed the addition of sugar (3x the amount of the pectin).

Recommendations for next week

The recommendations for the next week are to get the other Louis François pectins. The pectins found in class on the first week were not pure and would not suite the competition standards which the Louis François products would assure. The next week will be used to create the 65°Bris dextrose solution with the use of the Mettler Toledo Refracto 30PX. The aim of the refractometer experiment will be to find out the amount of dextrose needed to reach 65°Brix.

Week Two: 22nd November 2019

Aim

The aim of the second week was to analyse the different pectin´s for the gelling properties produced by Louis Francois and the making of the 65°Brix dextrose solution with the help of the refractometer.

Objectives

- Testing of the Louis Francois pectins (pectagel rose)
- Setting up of the Mettler Toledo Refracto 30PX
- Making dextrose solution by using different concentrations
- Testing the different concentrations of dextrose solutions with the refractometer
- Finding the amount of dextrose need for the 65°Brix dextrose solution

Materials & Methods

Ingredients:

65° Brix Dextrose Solution

Picture of Product	Name of Ingredient	Producer	Quantity
	Water	Volvic Water	355g
	Dextrose	Louis François	350g

Gelling properties of Louis François Pectins

Picture of Product	Name of Ingredient	Producer	Quantity
	Water	Volvic Water	200g
	Pectine Jaune	Louis François	3g
	Pectagel Rose	Louis François	3g

Equipment:

Picture of Product	Name of Product	Producer
	HBCS Hand Blender	Richard Morphy
	Stainless Steel Saucepan 900ml	Vogue
	General Purpose Bowl 0.5 Ltr	Vogue
	Light Whisk 12”	Vogue
	High Heat Spatula 10.2”	Vogue

	Bead Table Spoon	Olympia
	PACK 20B	La Minerva
	Small High Accuracy Weighing Scales	Trumweigh
	Spherification Spoon	Molecular-R
	BW Series Scales	Ohaus
	Heavy Duty Sieves	Vogue
	Small Plastic tray	Unknown

	Good Grips Chef's Precision Digital Instant Read Thermometer	Oxo
	viale spagna 12 stove	Berto´s Spa
	Refracto 30PX	Mettler Toledo
	Maxima Freezer	Froster
	Formaflex Silicone Half Sphere Mould 15 Cup	Pavoni
	Syringe	Terumo
	pH Paper	BYS2012

Method:

65° Brix Dextrose Solution

This method was used with every concentration noted in the results section

- Turn on Trumweigh precision scales
- Place the weighing tray on scales
- Tare the scales
- Weigh 167g of Louis François Dextrose
- Add to saucepan
- Place clean weighing tray/boat on the scales
- Weigh 84.88g of Volvic water
- Add water to the dextrose in the saucepan
- Take a vogue whisk
- Mix water and dextrose
- Place on Berto´s Viale Spagna 12 stove over medium heat
- Whisk until dextrose is fully dissolved
- Prepare the Mettler Toledo Refracto 30PX
- Set to Brix%
- Take a dropper
- Add 3 drops of the dextrose solution on the refractive scanner
- Press measure until the refractometer gives the result
- The Refracto 30PX shows 65.3 °Brix
- Solution done

Gelling properties of Louis François Pectins

- Take the saucepan
- Place on BW Series scales
- Tare the scales
- Add 200g water
- Weigh 3g of Louis François Pectine Jaune with the trumweigh precision scales
- Add the 3g of yellow pectin to the saucepan with the water
- Take the hand blender
- Blend until pectin is dissolved

- Place saucepan on the berto´s spa stove
- Heat until boiling or measure with oxo thermometer until temperature reaches at least 85°C
- Pour onto small plastic tray
- Place and cool in the fridge
- Gel done
- Repeat method for Louis François Pectagel Rose

Results

65° Brix Dextrose Solution

Water quantity	Dextrose Quantity	°Brix Measurement
100g	65g	48.1°Brix
85g	90.5g	52.4 °Brix
84.88g	132g	56.2 °Brix
84.88g	167g	65.3 °Brix

Table 5 °Brix for different dextrose concentrations

The main aim of the second weeks class was to determine the dextrose concentration needed to make a °Brix dextrose solution. Three concentrations were chosen to identify the concentration needed: 65g dextrose in 100g water, 90.5g & 132g in 84.88g water. None of the three concentrations were high enough to reach the 65°Brix concentration. The 132g dextrose solution was used to find the final concentration. The final concentration which resulted in the 65°brix dextrose solution was at 167g of dextrose in the 84.88g of water. The refractometer was set to °Brix and temperature depended. This was visible when the solutions cooled the concentration of the solutions slightly increased. The final concentration was measured at a temperature of 22.5°C. The refracto meter used was made by Mettler Toledo and had the product name of Refracto 30PX.

Gelling properties of Louis François Pectins

Figure 9 Louis Francoise Pectine Jaune Gel

The second aim of the class was to test the texture and gelation properties of the Louis François pectins. The focus was mainly on looking for an amidated LM pectin which in the case of the Louis François pectins, the pectagel rose fulfilled. The yellow pectin was also repeated to see if the gelling property has stayed the same compared to the first week. The yellow gel from Louis François

formed a firm and solid gel which needed longer for setting, which was due to the type of pectin, High Methoxyl Pectin. The recommended highest concentration of the yellow pectin was 1.7% and it took longer to set. The yellow pectin also needed the addition of sugar (3x the amount of the pectin). The pectagel rose was an amidated LM pectin which set quicker compared to the yellow pectin. The property was typically found in LM pectins.

Recommendations for next week

The recommendation for the next week class was to produce a new batch of the 65°brix dextrose solution and the use of the pectine jaune and pectagel rose for the spherification of the pectin solutions. The reason for the fresh production of the 65°Brix dextrose solution is due to oversaturation of the solution the dextrose recrystalizes and forms a solid block of dextrose. The new batch would ensure a more accurate result. The testing of the pectin spherification will be the main focus for the next class.

Week Three: 29th November 2019

Aim

The aim of the third week was to make a trail on the spherification of the pectin solutions.

Objectives

- Testing of the pectin spherification
- New batch of 65°Brix dextrose solution
- Production of spherification solution
- Production of dripping (base) solution
- Production of citric acid solution

Materials & Methods

Ingredients

Base Solution

Picture of Ingredient	Name of Ingredient	Producer	Quantity
	Pectine Jaune	Louis Francoise	6g
	Calcium Lactate	Texturas	3g
	Citric acid water	Selfmade	10g

	Dextrose solution (65° Brix)	Selfmade	46g
	Water	Volvic	142g

Spherification Solution

Picture of Ingredient	Name of Ingredient	Producer	Quantity
	Pectagel Rose	Louis Francoise	3g
	Water	Volvic	197g

65°Brix Dextrose Solution

Picture of Ingredient	Name of Ingredient	Producer	Quantity
	Dextrose	Louis Francoise	167g
	Water	Volvic	84.88g

Citric acid Solution

Picture of Ingredient	Name of Ingredient	Producer	Quantity
	Citric Acid	Louis Francoise	2.5g
	Water	Volvic	200g

Equipment

Picture of Product	Name of Product	Producer
	HBCS Hand Blender	Richard Morphy
	Stainless Steel Saucepan 900ml	Vogue
	General Purpose Bowl 0.5 Ltr	Vogue
	Light Whisk 12"	Vogue

	High Heat Spatula 10.2"	Vogue
	Bead Table Spoon	Olympia
	PACK 20B	La Minerva
	Small High Accuracy Weighing Scales	Trumweigh
	Spherification Spoon	Molecular-R
	BW Series Scales	Ohaus
	Heavy Duty Sieves	Vogue
	Small Plastic tray	Unknown

	Good Grips Chef's Precision Digital Instant Read Thermometer	Oxo
	viale spagna 12 stove	Berto´s Spa
	Refracto 30PX	Mettler Toledo
	Maxima Freezer	Froster
	Formaflex Silicone Half Sphere Mould 15 Cup	Pavoni
	Syringe	Terumo
	pH Paper	BYS2012

Method of preparation

65°Brix Dextrose Solution

- Turn on Trumweigh precision scales
- Place the weighing tray on scales
- Tare the scales
- Weigh 167g of Louis François Dextrose
- Add to saucepan
- Place clean weighing tray/boat on the scales
- Weigh 84.88g of Volvic water
- Add water to the dextrose in the saucepan
- Take a vogue whisk
- Mix water and dextrose
- Place on Berto´s Viale Spagna 12 stove over medium heat
- Whisk until dextrose is fully dissolved
- Prepare the Mettler Toledo Refracto 30PX
- Set to Brix%
- Take a dropper
- Add 3 drops of the dextrose solution on the refractive scanner
- Press measure until the refractometer gives the result
- The Refracto 30PX shows 65.3 °Brix
- Solution done

Cirtic Acid Solution

- Turn on Trumweigh precision scales
- Place the weighing tray on scales
- Tare the scales
- Weigh 2.5g of Louis François Citric Acid
- Add to a bowl
- Turn on BW series scales
- Place a new bowl on the scale
- Tare the scales
- Weigh 200 g Volvic water
- Add the weighed water to the bowl with the citric acid
- Mix well with Vogue whisk until fully dissolved
- Take BYS2012 pH indicator paper
- Remove one strip
- Dip the strip into the citric acid solution
- The strip turns orange (pH range 3-4)
- Citric acid solution done

Spherification Solution

- Turn on Trumweigh precision scales
- Place the weighing tray on scales
- Tare the scales
- Weigh 3 g of Louis François Pectagel Rose
- Add to a saucepan
- Turn on BW series scales
- Place a new bowl on the scale
- Tare the scales
- Weigh 197g Volvic water
- Add the weighed water to the saucepan with the Louis François Pectagel Rose
- Take the Richard Morphy hand blender
- Blend the mixture until the pectin mostly dissolved
- Place on Berto´s Viale Spagna 12 stove over medium heat
- Whisk until dextrose is fully dissolved
- Place the Oxo thermometer into the saucepan (end of the probe has to be in the middle of the liquid, do not touch bottom of the pan)
- Heat until the temperature reaches at least 75°C or until boiling
- Remove the saucepan from heat
- Leave to cool until
- Place mixture into a small bowl (300ml bowl)
- Place into the La Minerva Vacuum machine
- Set the sealing time to 3
- Set vacuum time to 25 seconds
- Place bowl in the vacuum machine
- Do three rounds of vacuum pumping (Caution: if solution over boils press sealing time and the vacuum will stop and prevent overflowing)
- Spherification solution done

Dripping (Base) Solution

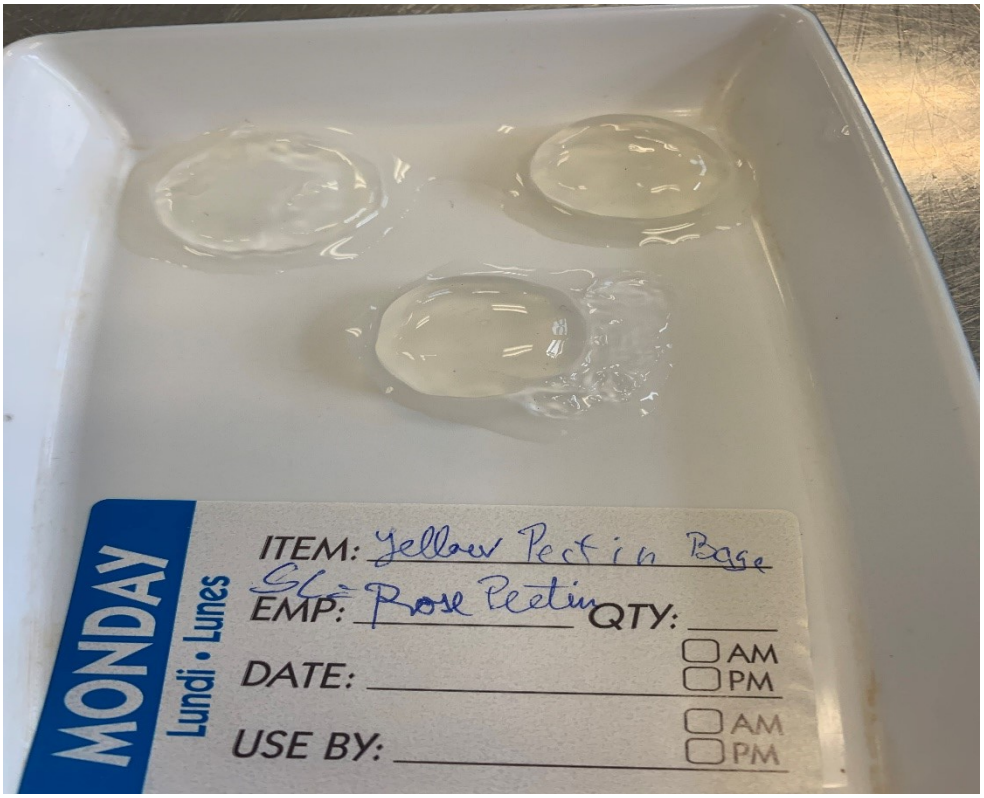
- Turn on Trumweigh precision scales
- Place the weighing tray on scales
- Tare the scales
- Weigh 6g of Louis François Pectine Jaune
- Add to a saucepan
- Place clean weighing tray/boat on the scales
- Weigh 3g of Texturas Gluco (calcium lactate)
- Add to saucepan
- Place clean weighing tray/boat on the scales
- Weigh 10g of Citric Acid solution
- Place clean weighing tray/boat on the scales
- Weigh 46g of 65°Brix solution
- Turn on BW series scales
- Place a small bowl (300ml) on the scale
- Tare scales
- Weigh 142g of Volvic Water
- Add water to saucepan
- Take the Richard Morphy hand blender
- Blend the mixture until the pectin mostly dissolved
- Place on Berto´s Viale Spagna 12 stove over medium heat
- Whisk until dextrose is fully dissolved
- Place the Oxo thermometer into the saucepan (end of the probe has to be in the middle of the liquid, do not touch bottom of the pan)
- Heat until the temperature reaches at least 75°C or until boiling
- Remove the saucepan from heat
- Leave to cool until
- Place mixture into a small bowl (300ml bowl)
- Place into the La Minerva Vacuum machine
- Set the sealing time to 3
- Set vacuum time to 25 seconds
- Place bowl in the vacuum machine
- Do three rounds of vacuum pumping (Caution: if solution over boils press sealing time and the vacuum will stop and prevent overflowing)
- Dripping (Base) solution done

Pectin Spherification

- Turn on BW series scales
- Place a small bowl (300ml) on the scale
- Tare scales
- Weigh 100g of the spherification solution
- Add 3 drops of Iquemusu Cocci
- Add 3 drops of Iquemusu Eug
- Add 3 drops of Iquemusu Rain
- Add 3 drops of Mallard Ferrière Jaune Citron
- Mix with a vogue whisk
- If air bubbles are created repeat the vacuum process from spherification solution
- Take the pavoni silicone mold
- Add 6ml of the dripping (base) solution with the terumo syringe into the semi sphere molds
- Once all the 15 molds are filled place the silicone mold into the Froster Maxima Freezer at -22°C
- Freeze for 1 hour or until fully frozen
- Remove the frozen semispheres from mold
- Place quickly into the frozen dripping (base) semipheres into the spherification solution
- Leave the spheres in the spherification solution for at least 5 minutes or until completely melted and fully spherified
- Take a clean small bowl(300ml)
- Add volvic water (enough to cover spheres)
- Remove the spheres from the spherification solution
- Place into the fresh-water bowl
- Pectin spherification done

Results

Picture 1 65°Brix Dextrose Solution week 3



Picture 2 Pectin Spherification week 3

The aim of the third was to make the spherification with the pectin solutions. The spherification solution was made with the pectagel rose and the dripping solution was made with the yellow pectin. The dripping solution contained all the flavours and calcium lactate. The dripping solution was frozen in the semisphere mold and than dropped into the spherification solution. The gelling worked well but the increase of the calcium lactate content could improve the spherification.

Recommendations for next week

The recommendation for the final week will be to increase the calcium lactate concentration to 4.4g to improve the gel formation of the sphere membranes. The decision of the flavour combination was made this week and the combination of Iqemusu Cocci, Eug and Rain suited the ``Forest´´ theme the best. The colour was also decided to be yellow to create a contrast in colours usually identified in forests.