



## **Playing with Pectin and a Minimum Content of Sugar**

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# TABLE OF CONTENTS

List of figures.....	4
List of tables.....	5
Chapter 1 Introduction .....	6
1. Background.....	7
1.1. 'Note by note' cooking .....	7
1.2. Pectin.....	8
1.3. Gelling of pectins .....	9
Chapter 2 Aim.....	10
2. Aim: .....	11
Chapter 3 Materials & Method .....	12
3. Materials and Method: .....	13
3.1. Materials used: .....	13
3.2. Ingredients used: .....	15
3.3. Method of preparation: .....	17
Chapter 4 Results .....	18
4. Results:.....	19
Chapter 5 Discussion .....	21
5. Discussion:.....	22
Chapter 6 Conclusion.....	23
6. Conclusion: .....	24
Chapter 7 Log book .....	25
7. Log book:.....	26
7.1. Week 1 .....	26
7.2. Week 2 .....	28
7.3. Week 3 .....	30
Chapter 8 References .....	32

8. References:.....	33
Chapter 9 appendices .....	34
9. Appendices.....	35

## LIST OF FIGURES

	Page
Figure 1. Hervé This- “The Father of Molecular Gastronomy”.	7
Figure 2. Gelling of pectin flow diagram.	9
Figure 3. Piña Colada cocktail.	17
Figure 4. Pineapple shaped jellies.	17
Figure 5. Piña Colada cocktail and the pineapple shaped jellies.	19
Figure 6. Sensory analysis results chart.	19
Figure 7. Lemon (yellow) and peach (red) flavoured jellies.	26
Figure 8. Spearmint jellies (green), blackcurrant jellies (blue).	28
Figure 9. The Piña Colada cocktail	30

## LIST OF TABLES

	Page
Table 1. Materials used.	13
Table 2. Ingredients used.	15
Table 3. Attributes and intensity scale.	22
Table 4. Ingredients used.	26
Table 5. Ingredients used.	28
Table 6. Ingredients used.	30

CHAPTER 1  
INTRODUCTION



Figure 1. Hervé This- “The Father of Molecular Gastronomy”.

## 1. Background

Molecular gastronomy is the scientific discipline concerned with the physical and chemical transformations that occur during cooking. The name is sometimes mistakenly given to the application of scientific knowledge to the creation of new dishes and culinary techniques (Myhrvold, This, 2019).

The scientific discipline which was introduced under the name *molecular and physical gastronomy* and later shortened to *molecular gastronomy*—was established in 1988 by Hervé This, a physical chemist, and Nicholas Kurti, a former professor of physics at the University of Oxford, who were interested in the science behind the phenomena that occur during culinary processes. Although food science had existed for some centuries, its focus had historically been on the chemical composition of ingredients and on the industrial production and nutritional properties of food. Molecular gastronomy, on the other hand, focuses on the mechanisms of transformation that occur during culinary processes at the level of domestic and restaurant cooking, an area that had historically tended to rely heavily on tradition and anecdotal information.

### 1.1. ‘Note by note’ cooking

Molecular gastronomy was co-created by a French scientist named Hervé This. This wants the world to cook with chemical compounds, a process that he believes can help improve global food security.

His approach investigates the deconstruction of ingredients such as vegetables and meat into individual chemical constituents like amino acids and lipids. Not-by-note cooking is based on chemistry processes such as extraction, reverse osmosis and mixing.

After distinguishing the fundamental chemical composition of the dish, This then incorporates those raw compounds to rebuild the essence of traditional dishes. The finalised product is typically made up of foams, gels and oils with added bulk from coagulation that occurs during cooking.

Using chemical compound will firstly prevent food spoilage that occurs during the transportation of crops and animal product; it can feed more people; aid farmers stay profitable and also save energy by reducing the use of fridges, as stated by This.

The concept of note-by-note cooking is not only to recreate existing dishes, but to invent novel edible items.

Note-by-note cooking, according to This, is entirely different to molecular gastronomy as it relies solely on chemicals while still using classic and molecular cooking techniques (Chandran, 2018).

## **1.2. Pectin**

Pectins are a loosely defined group of water soluble polysaccharides containing a significant amount of galacturonic acid and few L-arabinose, d-galactose and l-rhamnose.

It is a high molecular weight water soluble carbohydrate which is present in virtually all plants where it contributes to the cell structure. Some fruits, like quince, and apples, and the rinds, seeds, and membranes of citrus are naturally very high in pectin. Pectin is a natural and commercially produced essential ingredient in preserves, like jellies and jams. Without pectin, jellies and jams won't gel. It is sold as a dry powder and in liquid form and can be costly. There are two main types of pectin: high methoxyl and low methoxyl. Amongst these two types of pectin, there are many different varieties, and each behaves in different ways. Dry pectin comes in several forms, including regular, fast set and slow set, no or low sugar, modified, and instant or freezer jam pectin. The liquid form only comes in one form and is similar to the regular dry pectin but is pre-dissolved to prevent clumping (Timberlake, 2019).



### 1.3. Gelling of pectins

Pectin has the ability to form a thick gel like solution, therefore, it is used in the preparation of jellies, jams and marmalades. This property is beneficial in the confectionery, pharmaceutical, and textile industries. The polysaccharides present in pectins are extractable with hot water or aqueous solutions of dilute acids. The main sources of commercial pectin are the peels of citrus fruit (Stachelin, 1998).

Gel formation relies on the structure of pectins along with other factors including; pectin and sugar concentrations, the presence of crosslinking agents, temperature, and pH. The structure of pectins is related to the degrees of methylation and acetylation, the degree of amidation, molecular weight, and the heterogeneity of polymer chains (BeMiller, 1986).

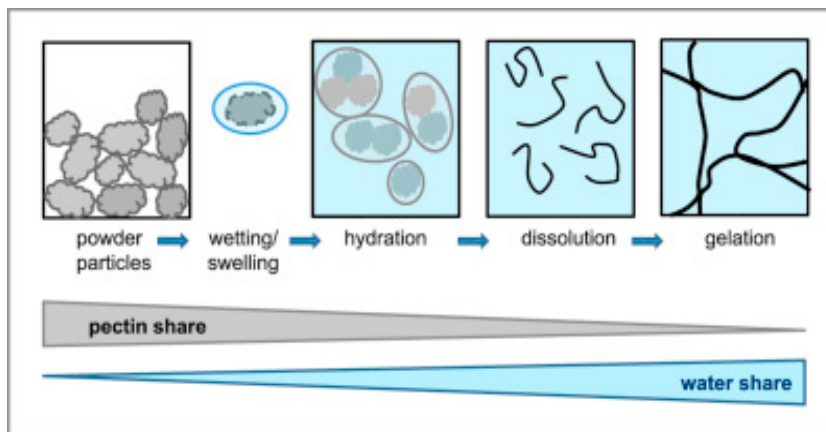


Figure 2. Gelling of pectin flow diagram .

CHAPTER 2  
AIM

## **2. Aim:**

The aim of this study was to develop a dish with unusual consistencies and/or flavours using pectin as well as reducing the sugar content for gelling. Therefore I developed a Piña Colada Cocktail. This drink also contains pineapple shaped jellies which are placed on top of the drink as garnish.







# CHAPTER 3






## MATERIALS & METHOD

### 3. Materials and Method:

#### 3.1. Materials used:


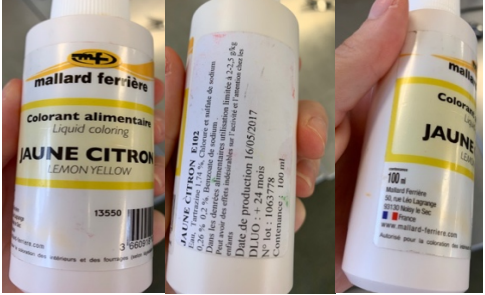



Table 1. Materials used.


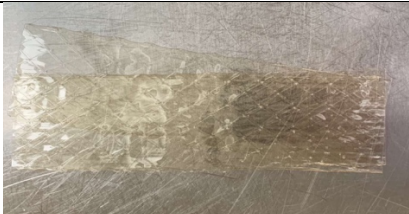
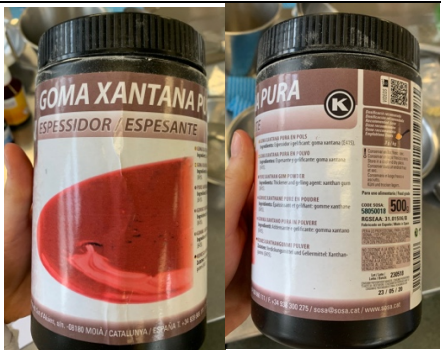

Spoons	
Stainless steel graduated jug	
Saucepan	
Hand held mixer	
Whisk	
Pineapple mould	

<p>Stainless steel bowls</p>	
<p>OHAUS BW series- weighing scales</p>	
<p>Berto's SPA- Hob</p>	
<p>BD Plastipak- syringe</p>	
<p>Martini cocktail glass</p>	

### 3.2. Ingredients used:

Table 2. Ingredients used.

<p>Sosa- low sugar pectin</p>	
<p>Mallard ferrière- yellow food colouring</p>	
<p>Colour Food Professional- orange food colouring</p>	
<p>Colour Food Professional- green food colouring</p>	
<p>Bulk Powders- stevia powder</p>	

<p>Tap water</p>	
<p>Gelatine sheets</p>	
<p>Sosa- Xanthan gum</p>	
<p>Msk- Piña Colada flavouring</p>	
<p>Granulated sugar</p>	



### 3.3. Method of preparation:

Preparation of the cocktail:

1. One hundred millilitres of water was poured into three separate stainless steel bowls.
2. Different measurements of Xanthan gum were measured including, 1g, 1.5g, and 2 g and divided into each of the stainless steel bowls containing 100 ml of water each.
3. Two grams of low sugar pectin along with 3 drops of piña colada flavour were added to each bowl.
4. The mixtures in each of the three bowls were thoroughly mixed using a handheld mixer.
5. The liquid with the highest concentration of Xanthan gum went on the bottom of the cocktail glass, after that each layer had reduced concentrations.



Figure 3. Piña Colada cocktail.

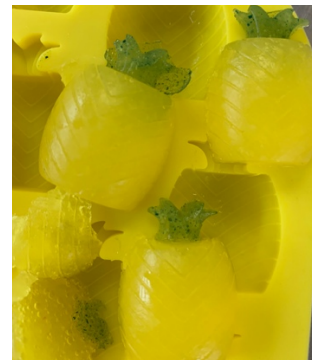


Figure 4. Pineapple shaped jellies.

Preparation of the jellies:

1. One hundred grams of water was weighed and poured into a stainless steel saucepan.
2. Two sheets (4g) of gelatine were added along with 1 g of sugar, 0.075g of stevia and 4g of low sugar pectin.
3. The mixture was fully dissolved on a low heat, whilst constantly being stirred with a whisk to prevent the mixture from sticking to the bottom of the saucepan and burning.
4. The mixture was divided into two different stainless steel bowls. Two drops of green food colouring were added to one bowl and two drops of yellow food colouring were added to the second bowl.
5. A syringe was used to inject the green mixture into the top of the pineapple mould. This was also carried out to inject the yellow mixture to the other half of the mould.
6. The mould was then placed into the freezer for 10 minutes.
7. After 10 minutes the jellies were ready to be taken out of the pineapple mould.

## CHAPTER 4

### RESULTS

#### 4. Results



Figure 5. Piña Colada cocktail and the pineapple shaped jellies.

The final dish can be seen above in figure 5. This is a Piña Colada cocktail, garnished with pineapple shaped jellies and a paper parasol.

The different coloured layers of the cocktail were accomplished by using xanthan gum and different food colourings.

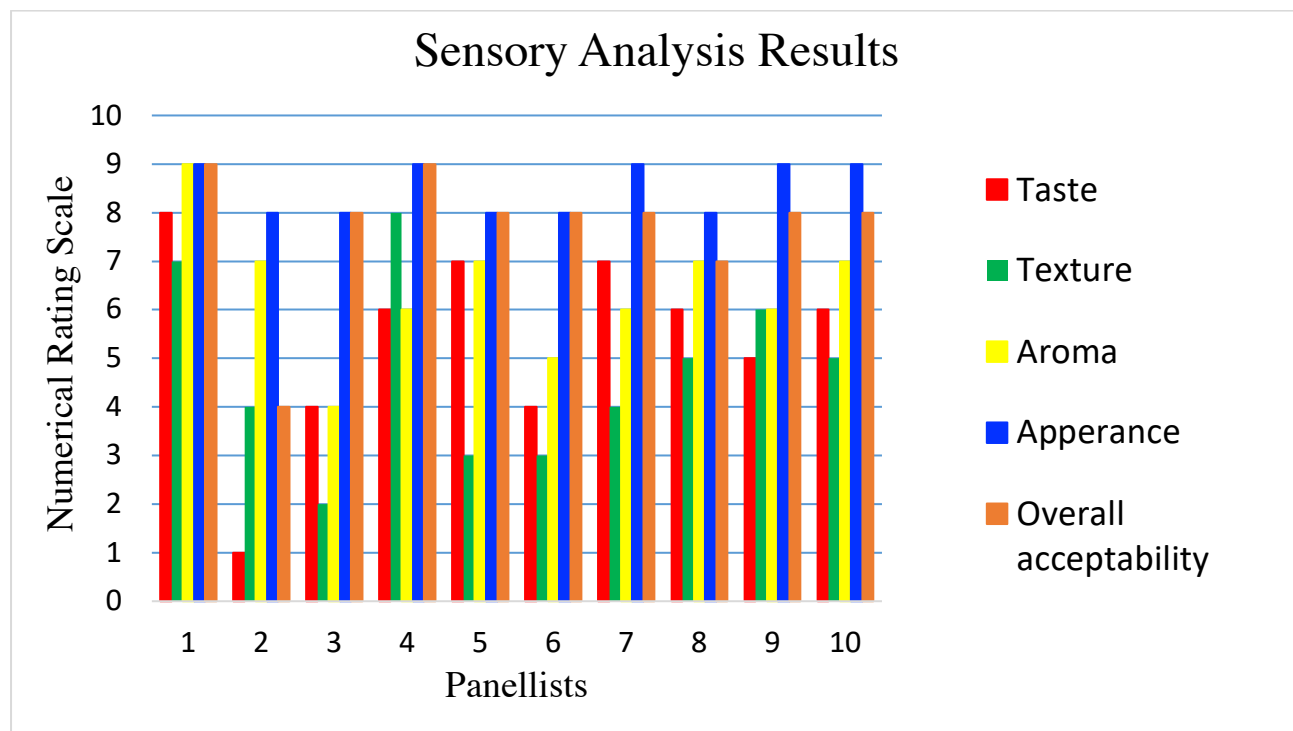


Figure 6. Sensory analysis results chart.

From the data displayed in the chart in figure 6 it is clear that the results are widely varied. The y-axis displays the numerical rating scale and the x-axis displays the panellists. The properties are colour coded; taste is represented in red, texture in green, aroma in yellow, appearance in blue and overall acceptability in orange.

## CHAPTER 5 DISCUSSION

## 5. Discussion:

Four weeks was not a lot of time to prepare a dish. This short amount of time prevented the dish from being developed further. Therefore the flavour of the cocktail and jellies are not fully developed. The jellies need to be sweeter. This can be modified by adding more stevia or adding a flavouring.

The texture of the Piña Colada cocktail was not pleasant, it left a fatty sensation in the mouth of some panellists. As displayed in figure 6 of the results section, it is evident that texture (represented in green) scored low. The jellies had a crumbly texture, they didn't gel correctly like a normal jelly would.

Sensory analysis was carried on week 4 (06/12/19) using a scaling test. The panellist simply placed an 'X' on the scales on the sensory evaluation sheet. A 0-9 hedonic scale was used to rate the attributes.

Table 3. Attributes and intensity scale.

<b>Attributes</b>	<b>Scale</b> <b>0-9</b>
Aroma	No aroma- intense aroma
Taste	Stale flavour- fresh flavour
Texture	Hard texture- dry texture
Appearance	Not acceptable- extremely acceptable
Overall acceptability	Dislike extremely- like extremely

The sensory attributes tested included; taste, texture, aroma, appearance and overall acceptability. The sensory panel consisted of 10 semi-trained panellists.

The highest rated property was appearance, this is perhaps due to the vibrant colours in the dish.

## CHAPTER 6 CONCLUSION

## **6. Conclusion:**

A dish with low amounts of sugar and variable amounts of pectin was produced. The flavour of the cocktail and jellies need to be improved as the desired sweetness intensity was not reached. If this drink was to be enjoyed by consumers, the texture/mouthfeel of the cocktail itself would need to be modified.

Upon reviewing the results and pictures it is clear that the dish was aesthetically pleasing but lacked flavoured.



CHAPTER 7  
LOG BOOK

## 7. Log book:

### 7.1. Week 1

**Date:** 15/11/19



**Aim:** Figure 7. Lemon (yellow) and peach (red) flavoured jellies

The aim for week 1 was to produce a jelly with vibrant colours and experiment with the texture.

Table 4. Ingredients used.

<b>Trial 1</b>	<b>Trial 2</b>
1g Agar	0.5g Agar
5g Pectin	4g Pectin
1g Sugar	1g Sugar
94g Water	94g Water
2 drops of yellow food colouring	2 drops of red food colouring
2 drops of lemon food flavouring	2 drops of peach food flavouring

#### **Materials used:**

- Whisk
- Stainless steel saucepan
- OHAUS BW series- weighing scales
- Spoon
- Small stainless steel bowls
- Shallow plastic container
- Sharp knife

**Method of preparation:**

1. Both trials were carried out using the same method.
2. Weighed out all ingredients and place them into a saucepan.
3. Placed the saucepan on the hob on a low heat.
4. The mixture was whisked regularly to prevent the mixture from sticking to the base of the saucepan.
5. The mixtures were each poured into shallow plastic containers and cut into the desired shape.

## 7.2. Week 2

**Date:** 22/11/19

**Aim:**

The aim for this week is to produce a jelly using a different mould and different flavourings.



Figure 8. Spearmint jellies (green), blackcurrant jellies (blue).

Table 5. Ingredients used:

<b>Trial 1</b>	<b>Trial 2</b>
5g Sosa- Low sugar pectin	4g Sosa- Low sugar pectin
1 sheet gelatine	1 sheet gelatine
94g tap water	94g tap water
1g granulated sugar	1g granulated sugar
2 drops of Colour Food Company- green food colouring	2 drops of Mallard Ferière blue food colouring
3drops of peppermint food flavouring	3 drops of black currant food flavouring

**Materials used:**

- Whisk
- Stainless steel saucepan
- Spoon
- Stainless steel bowls
- OHAUS BW series- weighing scales
- Silicon mould

**Method of preparation:**

1. Both trials were carried using the same method.
2. All the ingredients were weighed out using a OHAUS BW weighing scales and placed into a stainless steel saucepan.
3. The saucepan was placed on a low heat and whisked frequently to prevent the contents from sticking to the base of the saucepan.
4. Both mixtures were poured into shallow silicon moulds and left to set in the fridge for 20 minutes.
5. Once the jellies had set they were taken out of the silicon moulds and placed on a plate.

### 7.3. Week 3

**Date:** 29/11/19

**Aims:**

The aim for this week is to try and produce a dish.



Figure 9. The Piña Colada cocktail.

Table 6. Ingredients used.

<b>Cocktail:</b>	<b>Jellies:</b>
Xanthan Gum	Low sugar pectin
Tap water	Gelatine
Low sugar pectin	Tap water
Pina colada flavouring	Granulated sugar
Orange food colouring	Green food colouring
	Yellow food colouring
	Stevia

**Materials used:**

- Whisk
- Saucepan
- Bowls
- Weighing scales
- Spoons
- Pineapple mould
- Hob

## **Method of preparation:**

### Preparation of the cocktail:

1. One hundred millilitres of water was poured into three separate stainless steel bowls.
2. Different measurements of Xanthan gum were measured including, 1g, 1.5g, and 2 g and divided into each of the stainless steel bowls containing 100 ml of water each.
3. Two grams of low sugar pectin along with 3 drops of piña colada flavour were added to each bowl.
4. The mixtures in each of the three bowls were thoroughly mixed using a handheld mixer.
5. The liquid with the highest concentration of Xanthan gum went on the bottom of the cocktail glass, after that each layer had reduced concentrations.

### Preparation of the jellies:

1. One hundred grams of water was weighed and poured into a stainless steel saucepan.
2. Two sheets (4g) of gelatine were added along with 1 g of sugar, 0.075g of stevia and 4g of low sugar pectin.
3. The mixture was fully dissolved on a low heat, whilst constantly being stirred with a whisk to prevent the mixture from sticking to the bottom of the saucepan and burning.
4. The mixture was divided into two different stainless steel bowls. Two drops of green food colouring were added to one bowl and two drops of yellow food colouring were added to the second bowl.
5. A syringe was used to inject the green mixture into the top of the pineapple mould. This was also carried out to inject the yellow mixture to the other half of the mould.
6. The mould was then placed into the freezer for 10 minutes.
7. After 10 minutes the jellies were ready to be taken out of the pineapple mould.

## CHAPTER 8 REFERENCES



## 8. References:

Chandran N. 2018, The future of food may be cooking with chemical compounds

Stahelin, A. L. 1998. Encyclopedia. *Pectin*

Timberlake S. ,201. The spruce eats. *What is pectin*

BeMiller J.N. An introduction to pectins: Structure and properties. In: Fishman M.L., Jen J.J., editors. Chemistry and Function of Pectins. American Chemical Society; Washington, DC, USA: 1986. pp. 2–21.

CHAPTER 9  
APPENDICES

## 9. Appendices

Sensory evaluation sheet:

Name: _____	Date: _____
Sensory Evaluation Sheet -Scaling Test:	
<b><u>Piña Colada Cocktail</u></b>	
Please rate the organoleptic qualities on a scale of 0 to 9 by placing an 'X' on the scale presented below: (0=Dislike, 9=Like extremely)	
Taste:	
0	9
----- -----	
Texture:	
0	9
----- -----	
Aroma:	
0	9
----- -----	
Appearance:	
0	9
----- -----	
Overall acceptability:	
0	9
----- -----	