NOTE BY NOTE RECIPES

for

Narwhal in the Earth

Submitted by,

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Materials & Methods

3.1 Ingredients

INGREDIENT AND PRODUCT SPECIFICATIONS

Ingredient	Name	Brand
	Isomalt	Special Ingredients Ltd.
	Activated Charcoal	虎斑竹専門店 竹虎
	Erythritol	Pure Via®
	Gelatine Leaf	Noel's

	Cola Flavouring	SOSA Ingredients SLU
	Blue Colouring Powder	Mallard Ferrière
	Citric Acid	Louis Francois
	Passion Fruit Aroma	SOSA Ingredients SLU
	Green Colouring Powder	Mallard Ferrière

3.2 Equipment

The equipment used in this project was mainly standard kitchen tools, together with some specialised tools for sugar work. A pot was used to heat the sugar mixture, and a whisk was used for mixing. A silicone spatula and silicone mat were used to handle hot sugar safely and prevent sticking. A thermometer was used to monitor the temperature of the sugar during heating, which is important for achieving the correct texture for pulling. Scissors were used to cut and shape the sugar when needed. For sugar pulling, heat-resistant gloves were used to protect the hands and allow manipulation of the sugar. A sugar art lamp (Matfer Bourgeat, France) was used to keep the sugar warm and workable during shaping. A sugar pump with a rubber tip was used to create the hollow structure of the sugar container.

Ingredients	Weight (gram)
A. Black Narwhal	
Isomalt	150
Water	20
Activated Charcoal	2
B. Cola Ocean Jelly	
Water	300
Erythritol	15
Gelatine Leaf	7.5
Isomalt	20
Cola Flavouring	0.5
Blue Colouring	2
C. Passion Fruit Forest Jelly	
Water	300
Citric Acid	1
Gelatine Leaf	7.5
Passion Fruit Aroma	0.5
Green Colouring	2

Table 1. List of Ingredients

3.3 Methods

For black narwhal, activated charcoal was first dissolved in water to form a uniform mixture. This solution was then added to the isomalt in a pot. The mixture was heated until fully melted and reached the appropriate working temperature. The melted sugar was poured onto a silicone mat and allowed to cool slightly. Once it reached a workable temperature, the sugar was pulled and folded to improve texture and shine. The sugar was then shaped into a hollow form using a sugar pump, and adjusted by hand to resemble a narwhal shape. A sugar lamp was used to keep the material warm during shaping. The final structure was left to cool and harden at room temperature **(see Figure 1)**.

For cola ocean jelly, water, isomalt, and erythritol were mixed and gently heated until fully dissolved. Gelatine leaf, previously soaked in cold water, was added to the warm solution and mixed until completely melted. Cola flavouring and blue colouring were then added and mixed evenly. The mixture was poured into a container and cooled rapidly using an ice water bath to speed up the setting process. Once set, the jelly was cut or shaped as needed for plating.

For mango forest jelly, Water was mixed with citric acid and gently heated. Gelatine leaf, pre-soaked in cold water, was added and stirred until fully dissolved. Mango flavouring and green colouring were then added and mixed well. The mixture was poured into a container and cooled quickly using an ice water bath to reduce setting time. After gelation, the jelly was cut into the shape as needed for plating.

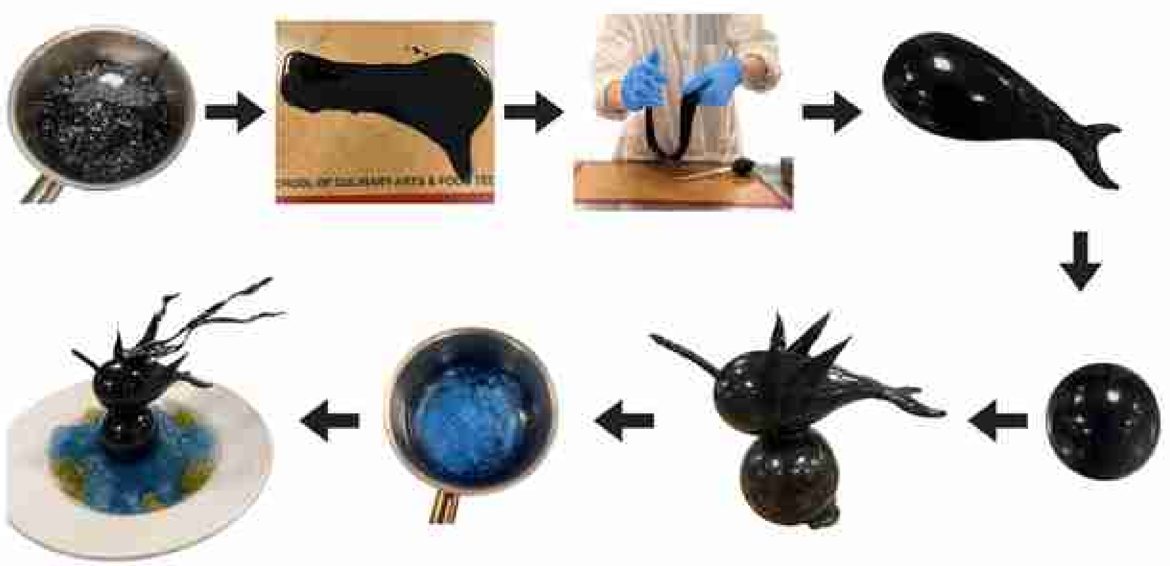

Figure 1. Process Flow Diagram for the Preparation of the Dish

Sensory analysis

A sensory evaluation was carried out to assess the quality of the final product. The panel consisted of 15 participants ($n = 15$), all of whom were classmates and untrained panelists.

Flavour was positively rated (7.78 ± 1.30), showing that the combination of cola and tropical fruit flavours was generally well received. However, the higher standard deviation suggests that there was some variation in individual preference.

Nutritional Analysis

The nutritional composition of the final product was calculated using Nutritics software. The product achieved a Nutri-Score of A and an HFSS rating of -1, indicating that it can be considered a healthier option compared to many conventional desserts. Detailed nutritional information is provided in **Appendix C**. Per 100 g, the product provides 562 kJ (133 kcal) of energy, with 0 g fat (0 g saturated fat), 40 g carbohydrate (0 g sugars), 1.7 g protein, and 0.02 g salt. Based on a serving size of 150 g, this corresponds to approximately 843 kJ (200 kcal). Despite the relatively high carbohydrate content, the absence of sugars is notable, as sweetness is mainly provided by sugar alcohols such as isomalt (E953) and erythritol.

The low-calorie concept of this product is mainly achieved by replacing traditional sugar with alternative sweeteners. The use of sugar alcohols such as erythritol and isomalt plays a key role in achieving the reduced-calorie profile of the product. Compared to sucrose, which provides approximately 4 kcal/g, most polyols provide significantly lower energy, typically around 1.5–2.4 kcal/g, representing nearly a 40–50% reduction in caloric value (Gogoi, 2025). Isomalt, for example, provides approximately 2 kcal/g, which is about half the energy of regular sugar (Sentko and Willibald-Ettle, 2012). This reduction is mainly due to its disaccharide bond incomplete digestion and partial fermentation in the large intestine, resulting in lower energy availability to the body (McNutt and Sentko, 2003). Erythritol shows an even greater advantage, with an energy value close to 0–0.2 kcal/g, which is only around 5% of the caloric value of sucrose (Varzakas, Labropoulos and Anestis, 2012). Their lower digestibility and reduced caloric contribution make them suitable alternatives for developing products with improved nutritional profiles.

The ingredient composition is shown as follows: Water (76%), Isomalt (E953) (18.4%), Erythritol (2.9%), Gelatine (1.9%), Blue Colouring (0.39%) [Indigo Carmine, Sodium Chloride and Sulfate], Activated Charcoal Powder (0.19%), Green Colouring (0.11%) [Tartrazine (E102), Brilliant Blue FCF (E133), Sodium Sulfate Chloride], Cola Flavouring (0.1%) [Natural flavour, Propylene Glycol (E1520), Glucose-Fructose Syrup, Coumarin, Safrol], Citric Acid (E330) (0.05%), Passion Fruit (0.03%) [Invert Sugar Syrup, Natural flavour, Glycerin (E422), Aroma].

Product Cost

The cost of the final product was calculated based on ingredient usage per unit, using a proportional formulation approach. The detailed calculation is presented in **Figure 4**. First, each ingredient in the formulation was converted into a percentage of the total black narwhal weight. For example, isomalt accounted for 150g in the total formulation, which represents approximately 87.21% of the overall recipe. This percentage was then applied to the unit dough weight (25g per black narwhal) to estimate the actual quantity used per piece. In this case, the amount of isomalt per unit was calculated as 87.21% × 25g = 21.8g. The ingredient cost was then calculated based on its unit price. For example, the cost of isomalt was €21 per 2000g, equivalent to approximately €0.011 per gram. Therefore, the cost contribution of strong flour per croissant was 21.8g × €0.011 = €0.229. This same method was applied to all ingredients in the formulation. By summing up the cost of all ingredients, the total raw material cost per unit was estimated at €0.984 per product.

The relatively low cost of the product can be explained by several factors. First, the formulation mainly relies on water and a limited number of functional compounds, rather than complex or multiple raw ingredients. This reduces both ingredient diversity and overall cost. In contrast, traditional food processing often generates waste through trimming, peeling, or unused portions (Galanakis, 2020). In addition, many of the compounds used, such as isomalt and erythritol, have a relatively long shelf life and high stability. This reduces the risk of spoilage and waste, which can further lower production costs over time.

Black Narwhal				Weight/ piece	Black Narwhal					
Ingredients	g	Row Labels	Total - g	25 g	Ingredients	Qty	UoM	Cost	Cost/gram	Cost/ Usage
Isomalt	150	Isomalt	87.21%	21.802g	Isomalt	2000	gram	21	0.011	0.229
Water	20	Water	11.63%	2.907g	Water	-	-	-	-	-
Activated Charcoal	2	Activated Charcoal	1.16%	0.291g	Activated Charcoal	300	gram	11.8	0.039	0.011
		Subtotal	100.00%							

Cola Ocean Jelly				Weight/ piece	Pistachio Filling					
Ingredients	g	Row Labels	Total - g	100 g	Ingredients	Qty	UoM	Cost	Cost/gram	Cost/ Usage
Water	300	Water	86.96%	86.957g	Water	-	-	-	-	-
Erythritol	15	Isomalt	5.80%	5.797g	Isomalt	2000	gram	21	0.011	0.061
Gelatine Leaf	7.5	Erythritol	4.35%	4.348g	Erythritol	250	gram	6.49	0.026	0.113
Isomalt	20	Gelatine Leaf	2.17%	2.174g	Gelatine Leaf	50	gram	4.21	0.084	0.183
Cola Flavouring	0.5	Blue Colouring	0.58%	0.58 g	Blue Colouring	100	gram	42.2	0.422	0.245
Blue Colouring	2	Cola Flavouring	0.14%	0.145g	Cola Flavouring	5	gram	2	0.400	0.058
		Subtotal	100.00%							

Raspberry Filling				Weight/ piece	Raspberry Filling					
Ingredients	g	Row Labels	Total - g	25 g	Ingredients	Qty	UoM	Cost	Cost/gram	Cost/ Usage
Water	300	Water	96.46%	24.116g	Water	-	-	-	-	-
Citric Acid	1	Gelatine Leaf	2.41%	0.603g	Gelatine Leaf	50	gram	4.21	0.084	0.051
Gelatine Leaf	7.5	Green Colouring	0.64%	0.161g	Green Colouring	20	gram	0.2	0.010	0.002
Passion Fruit Aroma	0.5	Citric Acid	0.32%	0.08 g	Citric Acid	4	gram	0.08	0.020	0.002
Green Colouring	2	Passion Fruit Aroma	0.16%	0.04 g	Passion Fruit Aroma	50	gram	37.12	0.742	0.030
		Subtotal	100.00%							
									SUM	0.984

Figure 4. Ingredient cost calculation of Note by Note

Conclusion and Recommendations

The final product achieved positive sensory evaluation results, particularly in appearance and overall acceptability. Nutritional analysis also demonstrated that the product could be positioned as a lower-calorie alternative dessert, mainly due to the replacement of sucrose with isomalt and erythritol. Furthermore, sustainability analysis suggested that the product had a moderate environmental impact, supporting the potential of Note by Note cuisine as a future-oriented food approach.

However, several limitations still remain. The flavour complexity of Note by Note dishes is still difficult to achieve when only a limited number of compounds are used. In addition, pulled sugar structures remain highly sensitive to moisture and temperature changes, which can affect storage stability and handling.

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