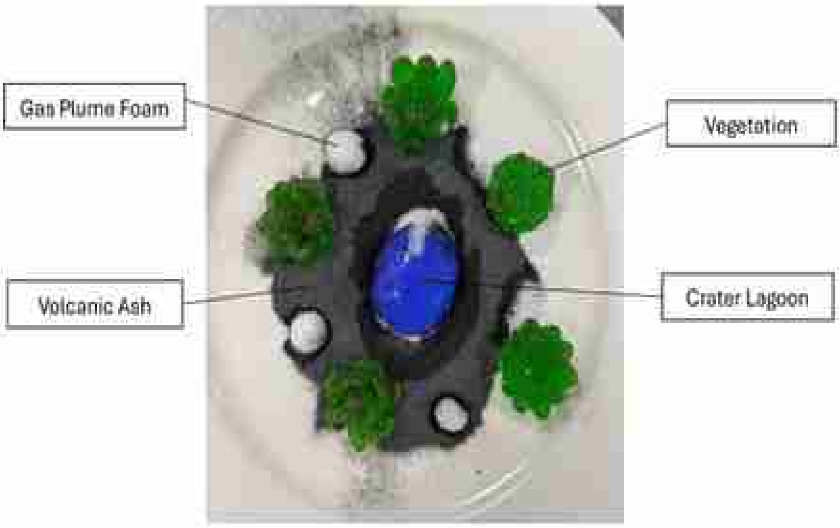
Irazú Volcano Crater Dish By Veronica ARIAS

Figure 1. Irazú Volcano National Park

the final assembly of the dish, where all components were combined to recreate the visual and sensory characteristics of the Irazú volcanic landscape. All additives used in this dish, namely sodium alginate (E401), calcium gluconolactate (E578), activated charcoal (E153), isomalt (E953), sucrose esters (E473) and the blue colorant, are authorized and used within the permitted levels established under EU Regulation (EC) No 1333/2008.



Irazú Volcano dish.

Materials and Method

Volcanic Ash

Ingredients

Ingredient	Quantity	Description
Glucose powder	20 g	Gem. Glucose, 453 g.
Activated charcoal	1.5 g	Bamboo charcoal powder (Ref: 132), 50 g. Origin: Japan. Imported by: Umami.

Equipment

- Scale
- Bowl
- Spoon

Method

1. Mix the glucose powder with the activated charcoal in a bowl.

Crater Lagoon

Ingredients

Ingredient	Quantity*	Description
Water	500 g for alginate bath 100 g for calcium solution	Tap water.
Sodium alginate	3 g	Sosa. Alginato de sodio en polvo (E401), 500 g.
Calcium gluconate	4 g	Sosa. Lactato de calcio (E327), gluconato de calcio (E578), 500 g.
Blue colorant	3 g	Mallard Ferrière. Blue coloring foodstuff lipid-dispersible, 100 g.
Watermelon aroma	3 drops	Sosa. Sandia Aroma, 50 g.

** This formulation yields approximately 8 spheres of 15 mL.*

Equipment

- Scale
- Bowls
- Hand blender
- Measuring spoon (15 mL)
- Perforated spoon

Method

1. For the sodium alginate bath, mix water and sodium alginate with a hand blender.

2. For the calcium solution, mix water, calcium gluconate, blue colorant, and aroma with a

hand blender.

3. Vacuum both solutions to remove air bubbles. Let them rest for 10 mins.

4. Using a measuring spoon, gently introduce a spoonful of the calcium solution into the

alginate bath and hold for 2 mins.

5. Gently release the sphere into the alginate bath and leave for 5 minutes to complete gel

formation.

6. Transfer the sphere to a clean water bath to rinse off excess alginate and stabilize the

surface before plating.

Vegetation

Ingredients

Ingredient	Quantity	Description
Isomalt	100 g	Isomalt E953. DGF Service, 5 kg.
Water	10 g	Tap water.
Green gel colorant	2 drops	Mallard Ferrière, Il Punto Italiana, Cake Decoration. Concentrated gel, colorant hydrosoluble, Apple Green, 100 g.

Equipment

- Pot
- Silicon spatula
- Silicon mat
- Silicone mould

Method

1. Heat isomalt with water to 160 °C until fully melted.
2. Let it cool to 140 °C, then add colorant and aroma.
3. Pour it into the silicone mold placed on a silicone mat.
4. Let cool completely until hardened and unmold.

Gas Plume Foam

Ingredients

Ingredient	Quantity	Description
Sucrose ester	2 g	Special Ingredients. Sucrose Ester, Emulsifier & Stabilizer, 100 g.
Water	100 g	Tap water.
Pineapple aroma	3 drops	Sosa. Piña Aroma Natural, 50 g.

Equipment

- Plastic bowl
- Microwave
- Deep container
- Hand blender
- Spoon

Method

1. Mix all the ingredients in a plastic bowl.
2. Heat the solution in the microwave for 1:30 mins.
3. Pour it in a deep container and blend for 30 seconds.
4. Let the foam stabilize for 10-15 seconds.
5. Collect the foam with a spoon and plate it.

Nutritional Analysis

The nutritional analysis of the dish was performed using Nutritics software. The total energy per portion was calculated as 282 kcal, and the contribution of each component was determined based on the percentage breakdown provided by the software. The main contributor to the total energy was glucose powder from the volcanic ash (52%, 147 kcal), followed by isomalt from the vegetation component (43%, 121 kcal), and sugar ester from the gas plume foam (5%, 14 kcal) (Table 1). Water provides 0 kcal, and similarly, aroma compounds and colorants do not contribute significantly due to their negligible quantities. Activated charcoal also does not impact on the total energy value, as it is not digested or absorbed in the human body and therefore does not contribute to caloric intake (EFSA, 2012). In a previous formulation, sugar was included in the recipe. However, it was removed in the final version to reduce the overall caloric content of the dish and to moderate sweetness. Overall, the results show that the caloric content of the dish is primarily driven by carbohydrate compounds, with glucose powder and isomalt being the dominant contributors. When compared to traditional desserts, which often exceed 400 kcal per portion, this formulation demonstrates a reduction in overall energy content.

Table 1. Energy Contribution of Each Component per Portion (Nutritics Analysis)

Component	Ingredient	% contribution	kcal
Volcanic Ash	Glucose powder	52%	147
	Activated charcoal	0%	0
Crater Lagoon	Water	0%	0
	Sodium alginate	0%	0
	Calcium gluconolactate	0%	0
	Blue colorant	0%	0
	Watermelon aroma	0%	0
Vegetation	Isomalt	43%	121
	Water	0%	0
	Green gel colorant	0%	0
Gas Plume Foam	Sucrose ester	5%	14
	Water	0%	0
	Pineapple aroma	0%	0
Total		**100%**	**282**

Costs

The cost analysis of the dish indicates a total production cost of approximately €2.33 per

portion, demonstrating that the formulation aligns with the objective of maintaining a low-cost

design. The main contributors to the total cost were isomalt in the vegetation component

(€1.05) and glucose powder in the volcanic ash (€0.86), which together account for most of the

expense. Other components, such as sodium alginate, calcium gluconolactate, colorants, and

sucrose esters, contributed minimally due to their low usage quantities. The cost contribution

of aroma compounds was negligible due to the very small quantities used. The results show that, despite using specialized ingredients associated with molecular gastronomy, the overall

cost can be effectively controlled through careful selection and optimization of quantities.

However, the relatively high contribution of isomalt suggests that further cost reduction could

be achieved by exploring alternative structuring agents. Overall, the formulation demonstrates

that note-by-note cooking can be applied in a cost-efficient manner while maintaining the

desired sensory and conceptual outcomes (Table 2).

Table 2. Ingredient Cost Distribution for the Irazú Volcano Crater Dish.

Component	Ingredient	Cost per g	g in dish	Dish cost
Volcanic Ash	Glucose powder	0,04	20,00	0,86
	Activated charcoal	0,06	1,50	0,09
Crater Lagoon	Sodium alginate	0,12	0,38	0,04
	Calcium gluconolactate	0,07	0,50	0,03
	Blue colorant	0,08	0,38	0,03
	Watermelon aroma	0,70	0,00	0,00
Vegetation	Isomalt	0,01	100,00	1,05
	Green gel colorant	0,07	0,00	0,00
Gas Plume Foam	Sucrose ester	0,12	2,00	0,23
	Pineapple aroma	0,70	0,00	0,00
Total		1,96	124,75	2,33

Conclusion

The objectives of this project were successfully achieved through the development of a note

by-note dish inspired by the Irazú Volcano crater landscape of Costa Rica. By using pure

chemical compounds as the main building blocks, the project demonstrated how molecular

gastronomy principles can be applied to construct a complete culinary experience while

controlling texture, flavor, color, and structure at the molecular level.

A balanced sensory experience was obtained through the combination of contrasting

elements, including the powdered volcanic ash, liquid-core crater lagoon, crisp isomalt

vegetation, and aerated gas plume foam. Tropical fruit aromas such as watermelon and

pineapple contributed to the conceptual connection with Costa Rica and were positively

perceived during sensory evaluation. In particular, the visual appearance of the dish received

the highest sensory scores, confirming the successful recreation of the volcanic landscape.

The formulation and preparation process were also optimized to support the objectives of

reducing production time, caloric content, and cost. Simplification of formulations, elimination

of unnecessary ingredients, and the use of rapidly setting systems such as isomalt and hand

blended foam contributed to efficient preparation. The final dish presented a relatively

moderate caloric value of 282 kcal per portion and a production cost of approximately €2.33,

demonstrating that note-by-note cuisine can be developed in a cost-efficient and lower-calorie

manner without compromising creativity or sensory quality.

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