International Journal of Molecular and Physical Gastronomy

Edible Ideas: Recipes

The unplugged apple pie: note by note cooking to save energy

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Abstract

Energy consumption in modern food production is recognized as a major environmental concern. Traditional cooking methods often require significant energy, contributing to the overall carbon footprint of our diets. In response, Note by Note cooking, an innovative culinary technique introduced in 1994, helps to reduce energy use in food preparation by focusing on pure compounds. Inspired by the comforting memories of home-made apple pie, a dessert that is both nostalgic and widely appreciated across countries, "The Unplugged Apple Pie" is presented. The challenge was to keep the familiarity while adhering to the principles of Note by Note cooking. This meant no oven, no long cooking times, and a preference for a short list of ingredients. The results show the potential of the approach for more sustainable cooking techniques and recipes.

Keywords

recipe, energy, Note by Note cooking, International Contest for Note by Note Cooking, 2024

Introduction

According to the Food and Agriculture Organization (FAO), global food systems contribute to approximately one-third of total energy consumption, with cooking representing a substantial portion of that figure (FAO, 2022). The reliance on fossil fuels for cooking not only increases environmental degradation but also leads to serious health risks, particularly for the 2.3 billion people globally who lack access to clean cooking facilities, often relying on polluting fuels and technologies (World Health Organization, 2021). Efforts to improve energy efficiency in food preparation can lead to reduced carbon footprints and lower health risks, ultimately promoting a healthier, more sustainable food system (FAO, 2011)

Note by Note cooking offers a new approach to reducing energy consumption in the kitchen. By utilizing pure chemical compounds instead of traditional food tissues, it allows for precise control over the cooking process, facilitating the transition to cleaner energy sources (This, 2013). This method aligns with global efforts to achieve more sustainable

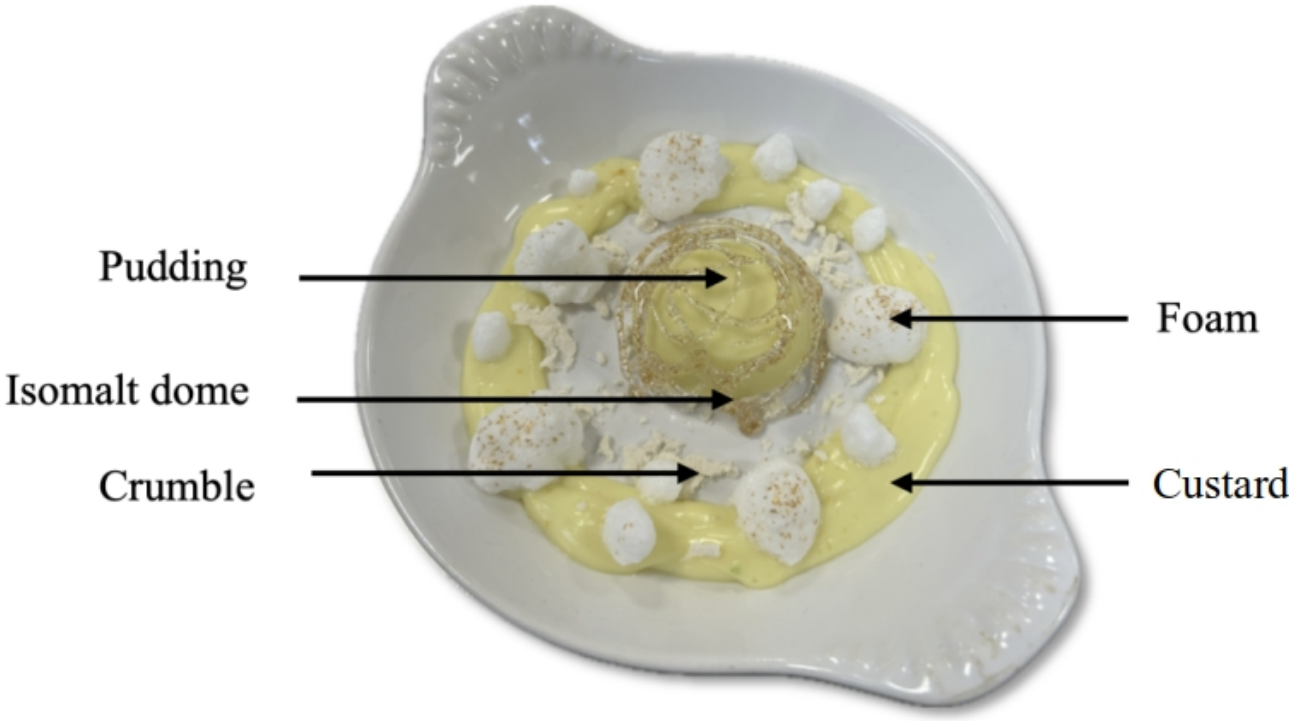

Figure 1.“The Unplugged Apple Pie” elements.

energy solutions by rethinking how to prepare and consume food.

Inspired by the comforting memories of a home-made apple pie, "The Unplugged Apple Pie" was created as a dessert that remains familiar in terms of flavours and consistencies, while adhering to the principles of Note by Note cooking and avoiding the traditional energy-intensive preparation. This approach required the reduction of the energy footprint by avoiding the use of an oven, minimizing cooking times, and employing a short list of ingredients that leverages the interactions between molecules to achieve the desired flavours and textures, ultimately decreasing the overall amount of ingredients used. These constraints raised some unique challenges for achieving the pie's signature characteristics, particularly the crunchiness of the crust and the caramelization, with nothing but a bain-marie and a saucepan.

Each component of "The Unplugged Apple Pie" (Figure 1) was designed to illustrate how Note by Note cooking can achieve energy efficiency while delivering the familiar flavours and textures of a traditional apple pie, presenting a sustainable approach to culinary practices. This dish has been developed in the context of the International Contest for Note by Note Cooking 2024, which celebrates the innovative approaches in contemporary culinary practices. The competition serves as a platform for chefs, food scientists and members of the general public to explore the intersection of gastronomy and sustainability, pushing the boundaries of traditional cooking methods.

Materials and methods

Equipment required:

Non-Energy Consuming Materials: two types of silicone moulds, six bowls, one saucepan, one spatula, one whisk, one water container, one piping bag.

Energy-Consuming Materials: one stand mixer (Maxima, Power 350 W), one immersion blender (Robot Coupe MP240 VV Mini Stick Blender, Power 290 W), one microscale, one fridge (Electrolux 1430 Litre Double Door Fridge, Power 0.27 kW), one gas cooker (Electrolux with 2 Burners, Power 5.5 kW each).

1. Note by note "custard" and "pudding"

The "custard" and "pudding" were created to demonstrate the transformative power of temperature, showing how from a single base, various textures and forms can be achieved.

Ingredients:
For the note by note "milk":
• 10 g lactose powder (MSK Ingredients)
• 3.5 g whey powder (Bulk Ingredients)
• 5.5 g casein powder (Bulk Ingredients)
• 176 g tap water
• 8 g rapeseed oil (Sandua Ingredients)
Then:
• 9 g corn starch (Gem Ingredients)
• 0.5 g kappa carrageenan (MSK Ingredients)
• 3 g sucrose (table sugar)
• 0.3 g yellow colour (Lemon yellow food colouring, Mallard Ferrière)
• 0.2 g apple pie water soluble flavouring (MSK Ingredients).

Preparation method:
For the 200 g of note by note "milk":
1. In a bowl, combine the lactose, casein and whey powders.
2. Add water and mix well to hydrate the "milk" solids.
3. Add rapeseed oil, then blend using a hand blender for 1 minute.
Then :
4. Stir corn starch and kappa carrageenan into 50 g of the note by note "milk".
5. Add sucrose and yellow food colouring to the remaining "milk" and bring it to boil.
6. Remove from heat and stir in the corn starch and kappa carrageenan mixture into the hot "milk".
7. Heat again, stirring constantly for 3 minutes, then remove from heat and mix in the apple pie flavouring.
8. For the "custard": If the "custard" is not consumed immediately, it will thicken and solidify at room temperature. To ensure a smooth texture before serving, it is recommended to use an immersion blender just before serving to create a fluid gel. For the "pudding": Pour the mixture into moulds and refrigerate at a minimum of 4 °C for half an hour.

2. Note by note crumble

The crumble component was crucial for recreating the sandy texture and mouthfeel typically achieved through baking. The method developed allowed creating a range of textures without relying on heat.

Ingredients:
• 8 g cocoa butter (DGF Royal Ingredients)
• 10 g olive oil (extra virgin)
• 0.3 g yellow food colouring (Lemon yellow Liquid colouring, Mallard Ferrière)
• 3 g sucrose (table sugar)
• 1 g vanilla aroma (Sosa. Ingredients)
• 0.5 g malic acid (MSK Ingredients)
• 20 g tapioca maltodextrin (Maltosec, Sosa Ingredients)

Preparation method:
1. Melt the cocoa butter and olive oil over a bain-marie.
2. Add the colours, flavourings, sugar, and malic acid to the fats and blend using a hand blender.
3. Allow the mixture to cool for 10 minutes at room temperature in a steel bowl.
4. Add the maltodextrin and break the mixture into small pieces resembling soil.

To enhance the crunchiness of the crumble further, incorporating naturally crunchy ingredients like granulated sugar and pieces of the isomalt dome, as described in point 3, can be an effective solution.

3. Note by note golden dome

By using isomalt, a thin dome can be created; it can be broken into smaller, crispy pieces, adding a satisfying contrast to the dish's softer components.

Ingredients:
• 96 g isomalt (Sosa Ingredients)
• 2 g gold food colouring (Metallic Effect Powder Colour, Sosa Ingredients)
• 2 g caramel flavouring (Sosa Ingredients).

Preparation method:
1. Heat isomalt over medium heat until it completely melts and reaches a temperature of 160-170 °C.
2. Add the gold powder and the caramel flavouring.
3. Place the demi-sphere mould upside down, with the outer part facing you. Using a spoon, slowly pour and coat the melted isomalt onto the mould in a spiral or zigzag pattern. Aim to create thin lines rather than filling the entire dome. This technique will ensure that the isomalt remains easy to break.
4. Wait for it to cool and set. You should obtain domes with a diameter of approximately 6-8 cm.

4. Note by note foam

The foam was created to add a light, airy texture that contrasts with the denser elements of the dish. The gelatin provide structure, and the xanthan gum add stability, enhancing the lightness of the dish (Wang *et al.*, 2016).

Ingredients:
• 300 g tap water,
• 10 g gelatin leaves (Newforge Ingredients),
• 5 g xanthan gum (Sosa Ingredients),
• 1 g white food colouring (calcium carbonate),
• 0.3 g caramel flavour (Sosa Ingredients).

Preparation method:
1. Heat the gelatin for 2 min at 60 ° - 70 °C in 150 g of water.
2. Dissolve xanthan in 150 g of water using a hand blender, then incorporate the hydrated gelatin.
3. Add the caramel flavouring and the white food colouring.
4. Refrigerate the preparation for 20 minutes.
5. Pour the cooled mixture into the stand mixer and whisk at full speed for 5 - 10 minutes to create foam.
6. Use a piping bag to shape the foam and refrigerate until serving.

5. Plating Instructions

Start by placing the “pudding” in the centre of the plate. Then add a generous spoonful of the “custard” in a circular motion around the outer edge of the plate. Next, add a portion of the crumble on top of the “custard”, sprinkling it gently to maintain a textured appearance. Ensure that some of the crumble remains visible to add contrast to the creamy base. Carefully position the prepared dome on top of the “pudding”, making sure it is centred. Finally, place the foam around the dome on the “custard”.

Results and Discussion

"The Unplugged Apple Pie" effectively demonstrates the importance of synergies among various culinary components and techniques while addressing energy efficiency. The dish integrates five distinct elements each contributing to the minimization of energy consumption and innovative texture creation.
The “pudding” and “custard” were developed to outline how temperature changes can transform a single base ingredient into various textures. This approach emphasizes the energy-saving potential of avoiding multiple cooking processes (Egharevba, 2020).
The crumble demonstrates how the combination of maltodextrin and fats creates a

texture like traditional pie crusts without the need for baking. While it provides a sandy mouthfeel, it does not achieve the desired crunchiness typically found in baked crusts. To enhance the overall texture, it's essential to incorporate naturally crunchy ingredients, which will add that satisfying crunch and contrast to the sandy base. This technique avoids the energy-intensive process of baking while still achieving the desired texture through the synergy of maltodextrin moisture-binding properties and fat's textural contribution (Hadnađev *et al.,* 2011). Similarly, isomalt structural properties are used to create a crunch without relying on traditional caramelization processes. This choice reduces energy use while providing the necessary texture and visual appeal.

Finally the foam stabilized by the synergy between xanthan gum and gelatin, shows how combining different stabilizers can enhance the texture and stability of foams. The synergistic effect of these two ingredients allows for a stable and airy foam, demonstrating the efficiency of using combined ingredients to achieve superior results with minimal energy (Gornall and Terentjev, 2008).

By focusing on these synergies, "The Unplugged Apple Pie" not only saves energy but also explores new dimensions of texture and flavour, offering a creative approach to sustainable cooking practices.

Conclusion

In conclusion, "The Unplugged Apple Pie" shows how innovative culinary techniques can preserve traditional flavours and textures while significantly reducing energy consumption. By exploring the transformative power of temperature to create both the pudding and custard and using ingredients like maltodextrin and isomalt to replicate the textures of baked components without an oven, the dish successfully minimizes the need for high-energy processes. The Note-by-Note approach used for making this dish not only demonstrates the potential for energy-efficient cooking techniques but also illustrates the broader possibilities for culinary innovation and sustainability, paving the way for future advancements in both taste and environmental impact.

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Edited by:
Paulina Mata

Reviewers:
1. Anonymous
2. Anonymous

Received:
14 September 2024

Accepted :
28 October 2024

Published:
6 November 2024.

Section:
This article was published in the “Edible Ideas: Recipes” section of the *International Journal of Molecular and Physical Gastronomy.*

Citation:
Delattre C. 2024. The unplugged apple pie, *International Journal of Molecular and Physical Gastronomy,* 10(1), 10, 1-6. doi: 10.17180/ijmpg-2024-art010