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WHIPPED BY NATURE : AQUAFABA-AMARANTH MOUSSE

David Keresztes, Amalia-Elena Farcaș, Antonia-Mara Tazma, Mihaela Lăcătuș, Despina-Maria Bordean*

Faculty of Food Engineering, University of Life Sciences "King Michael I" from Timisoara, 119 Aradului Street, 300645 Timisoara, Romania

*Corresponding author: despinabordean@usvt.ro

Abstract:

This study presents the development of a plant-based mousse that integrates food wastes like aquafaba, combined with residual amaranth solids, upcycled into a crunchy base layer, thereby enhancing texture and contributing to a zero-waste design.

Introduction:

The aim of this study is to promote the usage of uncommon ingredients such as aquafaba which is the perfect substitute for eggs and a common plant, Amaranthus (pigweed), into the daily diet. Such ingredients offer significant health benefits; they are sustainable and also waste free.

- Amaranthus (pigweed) is a highly adaptable wild plant, valued for its exceptional nutritional profile. The plant is rich in essential vitamins (A, C, K), minerals such as Fe, Ca and Mg, fiber, omega-3 fatty acids and high-quality proteins. As the seeds provide a rich source of protein, they are naturally free of gluten and offer a balanced acid composition, making them a nutritious option for individuals with gluten intolerance and an excellent addition for enhancing dietary variety.
- Heat processing reduces its antinutrients (oxalates, saponins, phytates) enhancing nutrient absorption. Rich in nutrition and linked to health benefits, it supports food security, biodiversity, and climate-resilient agriculture.
- Aquafaba is a highly versatile plant-based ingredient valued for its unique functional properties. It serves as an egg substitute in various recipes, offering emulsifying, foaming, thickening, and binding abilities ideal for vegan and allergen-free diets. Rich in plant proteins, trace minerals, and soluble fiber, aquafaba contributes modest nutritional value while providing an accessible alternative to animal-based ingredients. Its low fat and cholesterol-free composition supports heart health and caters to individuals with dietary restrictions.
- As a byproduct of legume processing, aquafaba promotes sustainable food use by reducing waste and supporting circular food systems. Its growing popularity in plant-based cuisine reflects a shift toward eco-friendly, inclusive, and climate-conscious eating habits.
- Together, aquafaba and amaranth demonstrate how revaluing underutilized plant resources can lead to waste-free, nutrient-dense, and eco-efficient food systems. Their integration into vegan food development promotes circular economy principles, minimizes waste generation, and reduces reliance on resource-intensive ingredients, contributing to a more sustainable and resilient global food future

Conclusions:

- Amaranth offers complete protein and vital nutrients, while aquafaba is a cholesterol-free egg alternative. Together, they support balanced, plant-based diets ideal for vegan and allergen-free lifestyles.
- Together, amaranth and aquafaba drive a shift toward ethical, plant-based, low-waste diets—empowering communities and advancing sustainable food futures.
- The product concept embodies a novel example of circular food innovation, meeting not only the demands of society, but also showing a positive environmental impact, by minimizing the waste, increasing food security and sustainability by lowering the greenhouse gas footprint.

Materials and Methods:

Amaranth seeds were cooked in water to obtain **amaranth milk** (filtrate) and a **starchy-fibrous residue** (retentate). The milk was used as a functional aqueous phase, while the residue was dehydrated and baked to create a **crisp amaranth base**.

Aquafaba was obtained from canned chickpeas and whipped to form a stable foam. Dark chocolate was melted and combined with amaranth milk, after which whipped aquafaba was gently folded in to produce a **light chocolate mousse**. For the intermediate layer, almonds were **roasted and lightly caramelized**, then blended into a smooth cream and mixed with **sour cherries** to add acidity and fruit notes. The dessert was assembled in three layers:

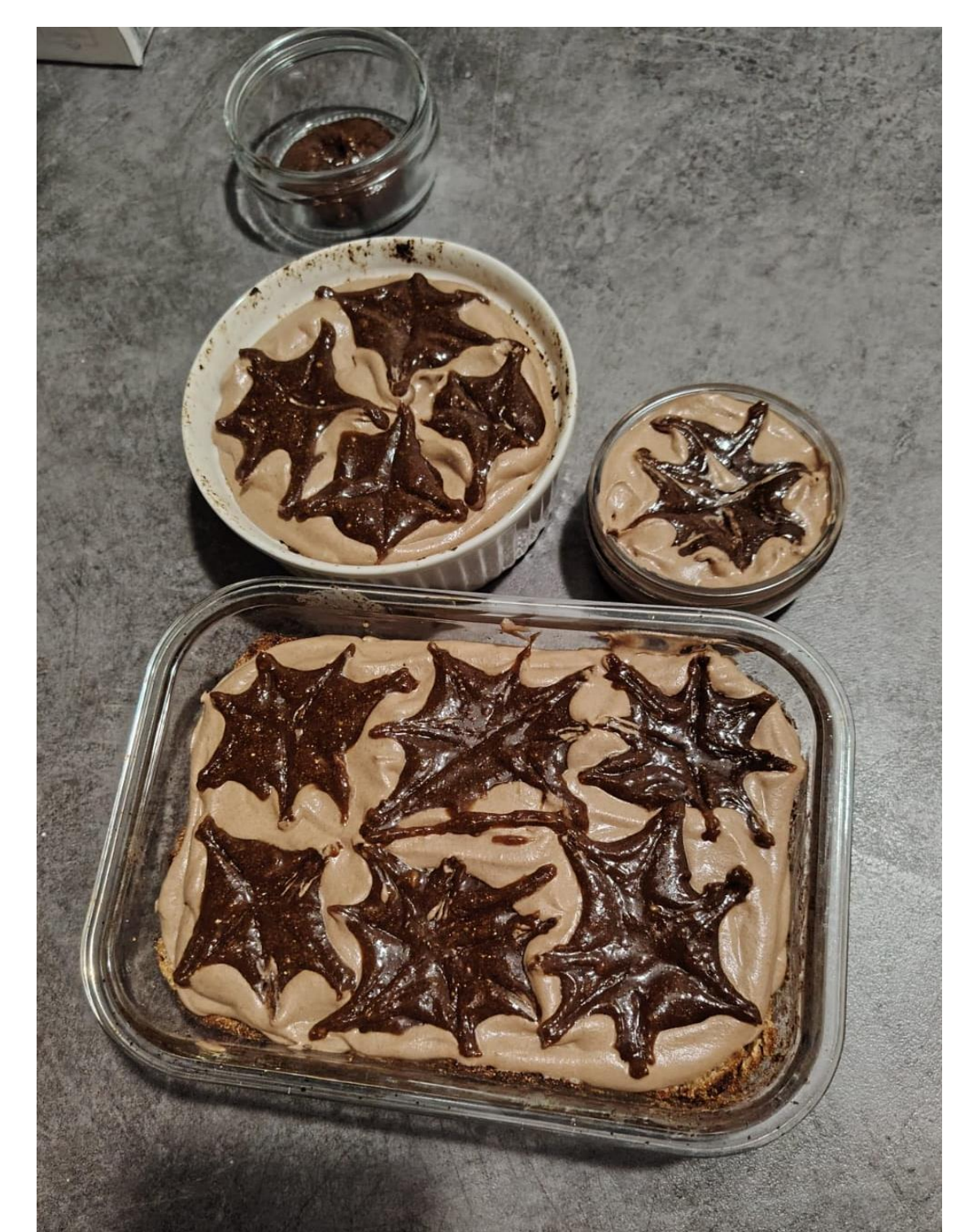
1. **Crisp amaranth base**
2. **Caramelized almond cream with sour cherries**
3. **Chocolate-aquafaba-amaranth mousse**

This process integrates multiple textures and uses amaranth as both a liquid (milk) and solid (base) component, resulting in a functional, multi-layered dessert.



Results and Discussions:

The created functional vegan model system, shows strong nutritional and technological synergy between its components. The formulation was optimized with amaranth milk and fruit ingredients to achieve desirable sensory, nutritional and stability characteristics while maintaining a fully sustainable profile. Figs (*Ficus carica* L.) impart a caramel-like flavor, replacing refined sugar, while frozen sour cherries (*Prunus cerasus* L.) contribute moisture retention, and enrich the mousse with polyphenols and antioxidant compounds. Together, these balanced components demonstrate how fruits, legume and pseudocereal by-products can be transformed into high-quality vegan desserts, providing plant-based proteins, essential fatty acids, fibers, antioxidants, and minerals, and highly achievement: the reduction of animal-derived ingredients dependence.



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