LOCALNUTLEG project is part of the PRIMA programme supported by the European Union's Horizon 2020 research and innovation programme

REPORT OF MACRO AND MICRO NUTRIENTS OF FINAL PUMPKIN FRUIT FORMULATION

DELIVERABLE 4.5

PulpIng

Developing of **Pu**mpkin Pu**lp** Formulation using a Sustainable **Integ**rated Strategy

Index

Document information

Deliverable Number	4.5
Deliverable name	Report of macro and micro nutrients of final pumpkin fruit formulation
Contributing WP	WP4: Pumpkin fruit pulp formulation
Contractual delivery date	M26, October 2022
Actual delivery date	M48, August 2024
Dissemination level	Public
Responsible partner	DECORGEL
Reviewers	All partners
Version	1

1 Summary

The PulpIng project aims to develop a high-quality pumpkin pulp product enriched with value-added compounds from pumpkin by-products. This initiative promotes sustainability and an integrative approach. The main objective of WP4 is to develop a pumpkin pulp formulation ready to use and incorporated with natural preservatives that ensure stability over the product shelf-life. The present report concerns WP4 deliverable D4.5 "Report of macro and micro nutrients of final pumpkin fruit formulation", where the nutritional and chemical characteristics of the final formulation obtained are presented.

2 Description

In Task 4.2, the optimized preservative extract obtained in the previous Task 2.2 was incorporated into the pumpkin pulp. The extract obtained from the Butternut squash peels in the optimal global condition of heat-assisted extraction was incorporated in the pumpkin pulp formulation in different concentrations, to replace the traditional preservative potassium sorbate. As concluded in Deliverable 4.3, it was possible to replace 50% of the potassium sorbate added in the original pumpkin pulp product formulation with the natural ingredient pumpkin peel extract. The final formulation obtained was evaluated for its nutritional value (moisture, ash, proteins, fats, carbohydrates and energy) and chemical composition of free sugars and fatty acids.

3 Results and discussion

The formulation was prepared using <90% mashed pumpkin pulp, and the additional components included corn starch (<10%), beta-carotene colorant, citric acid, sodium citrate, and preservative. As the preservative, the extract obtained from the Butternut squash peels under the optimal global condition by heat-assisted extraction, as described in Deliverable 2.4, was incorporated into the formulation at a concentration of 10g/kg, replacing 50% of the potassium sorbate content of the formulation traditional.

The ingredients were carefully mixed using a mixer and then pasteurized in a double-jacketed heating tank with an agitation paddle. The mixture was heated to 90°C, held for 3 minutes, and then cooled to 76°C for packaging in sterile airtight container. Each batch was stored in triplicate and under refrigeration at 5 ± 2°C, for subsequent analysis.

In **Table 1** are presented the macronutrients of the formulation. The pumpkin pulp formulation is rich in carbohydrates, followed by proteins and low in fat, with around 67 kcal per 100g.

Table 1. Macronutrients from pumpkin pulp formulation with natural preservative ingredient (in mg/100g fresh weight (fw) and kcal for energy).

Moisture	Ash	Protein	Fat	Carbohydrates	Energy value
82.5 ± 0.2	0.76 ± 0.04	1.23 ± 0.05	0.076 ± 0.006	15.4 ± 0.2	67.3 ± 0.8

In addition, the profiles of free sugars and fatty acids were also analysed, by chromatography, more specifically using a HPLC coupled to a refractive index detector and by gas–liquid chromatography with flame ionization detection (GC-FID), respectively. **Table 2** presents the quantification of the four free sugars identified for all formulations. A predominance of sucrose can be seen, followed by close values of fructose and glucose, and smaller amounts of trehalose.

Table 2. Free sugar composition of the pulp formulations (in mg/100g dry weight (dw)).

Fructose	Glucose	Sucrose	Trehalose	Total
1.24 ± 0.01	1.33 ± 0.02	5.8 ± 0.1	0.199 ± 0.009	8.5 ± 0.1

In terms of fatty acid composition in **Table 3**, there is a predominance of C16:0 (48.4 ± 0.2 %), followed by C18:0 and C18:1n9c, with almost 15% each.

Table 3. Fatty acids composition of the pulp formulations (in relative %).

C14:0	C16:0	C18:0	C18:1n9c	C18:2n6c	C18:3n3
8.9 ± 0.2	48.4 ± 0.2	14.78 ± 0.06	14.9 ± 0.2	10.54 ± 0.07	2.43 ± 0.04

These results are in line with the preliminary study (Deliverables 1.5), demonstrating the important nutritional contribution of this formulation.

4. Prospection

The successful maintenance of the macro and micronutrient profile, achieved through the partial replacement of potassium sorbate with natural pumpkin peel, demonstrates its effectiveness as a preservative in this formulation. The next step is to evaluate the acceptability of the formulation.