

UPCYCLING MELON BY-PRODUCTS: DEVELOPMENT OF A NUTRIENT-RICH AND SUSTAINABLE PASTA

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Food waste is a growing concern worldwide, directly impacting the economy, society and the environment. One key aspect of this issue is the limited time to utilize the resources before they become waste.

Therefore, optimizing food waste management becomes a crucial issue for ensuring food availability and sustainability.

The valorization of fruit by-products offers an opportunity to develop new foods with added nutritional benefits while promoting a more efficient and time-conscious use of natural resources [1].



This study aimed to develop a pasta with melon peel and seed flours (by-products) incorporation and evaluate their nutritional potential.

In 2022, melon by-products were recovered from melon production and distribution companies. The melon peels were dehydrated, and the seeds were dried in an oven. Afterwards, by-products were ground to obtain melon peel flour and melon seeds flour, which were then roasted.

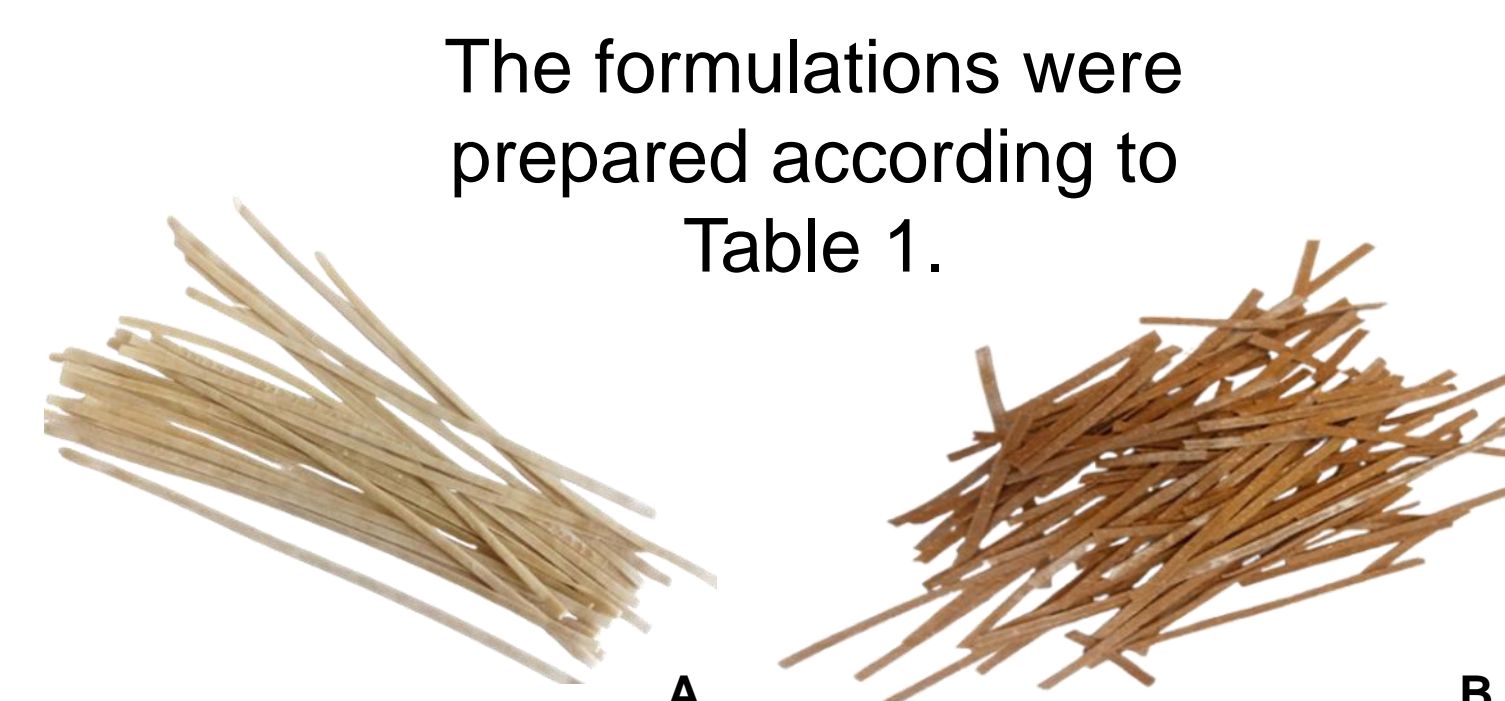


Figure 1. Innovative food products: A) Pasta control; B) Pasta with melon by-products flour.

The formulations were prepared according to Table 1.

Table 1 – Pasta (tagliatelle) formulations.

| Ingredients (%) | Pasta (tagliatelle) | |
|-----------------------------|---------------------|------|
| | Control | PMBF |
| Wheat flour | 68.3 | 58.0 |
| Melon peel flour (roasted) | - | 6.9 |
| Melon seeds flour (roasted) | - | 3.4 |
| Water | 30.7 | 30.7 |
| Salt | 1.0 | 1.0 |

PMBF - Pasta (tagliatelle) with melon by-products flour.

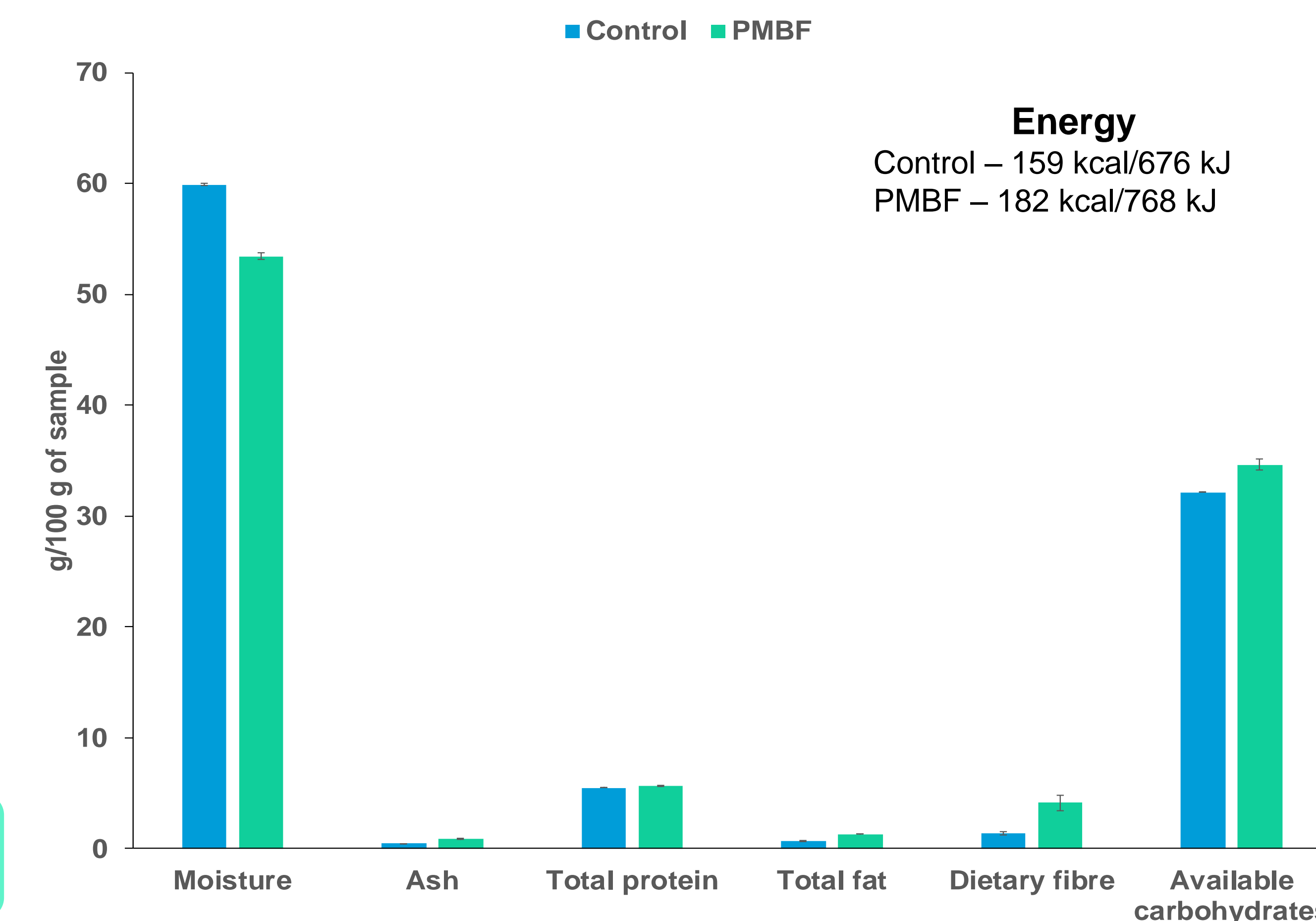


Figure 2. Nutritional composition (g/100 g of sample) of the control and the pasta with melon peel and seeds flour (PMBF).

- ✓ The incorporation of melon by-products flour allowed the development of a nutrient-rich pasta (tagliatelle) containing 4 g/100 g of dietary fibre, making it a source of fibre according to Regulation (EC) No 1924/2006 (Figure 2) [7].
- ✓ Moreover, these flours increased the levels of total phenolic compounds (1786 mg of gallic acid equivalents/100 g), thereby enhancing the product's antioxidant capacity (Table 2).

Table 2 – Antioxidant capacity and total phenolic content of the control and the pasta with melon peel and seeds flour (PMBF) (GAE – Gallic acid equivalents).

| Parameters | Control | PMBF |
|---|------------|------------|
| DPPH (mg Trolox eq./100 g of sample) | 3.43 ± 0.2 | 12.5 ± 0.9 |
| FRAP (mg Trolox eq./100 g of sample) | 38 ± 3 | 276 ± 21 |
| Total phenolic compounds (mg GAE/100 g of sample) | 714 ± 46 | 1786 ± 54 |

Methodology

Moisture • Gravimetric method, using a dry air oven [2].

Ash • Process of incineration at 525 °C [2].

Total protein • Kjeldahl method [2,3].

Total fat • Acid hydrolysis followed by extraction with petroleum ether using a Soxhlet apparatus [2].

Dietary fibre • Enzymatic-gravimetric method [2].

Available carbohydrates and energy value • Obtained by calculation [3,4].

Extract preparation

3 g of sample + 30 mL of ethanol (80%, v/v)
↓
Vortex (10 min)
↓
Filtration (Whatman n.º1)

DPPH• [5]

1 mL of extract + 1 mL of DPPH• ethanolic solution (0.004%, w/v)
↓
Reaction time (1 h)
↓
 $\lambda = 517 \text{ nm}$

FRAP [5]

0.15 mL of extract + 2.85 mL of solution (acetate buffer + FeCl₆H₂O (20 mM) + TPTZ (10 mM) in HCl (40 mM))
↓
Reaction time (30 min)
↓
 $\lambda = 593 \text{ nm}$

Total Phenolics [6]

0.1 mL of extract + 0.1 mL of Folin-Ciocalteu reagent (2 M) + 1.5 ultrapure water
↓
Reaction time (6 min)
↓
+0.3 mL Na₂CO₃ (20%, w/v)
↓
Water bath (30 °C, 1h)
↓
 $\lambda = 765 \text{ nm}$

Conclusions

This work highlights the potential of melon by-products, demonstrating that their integration into food formulations not only enhances relevant nutritional properties to health over time but also contributes to reduce food waste and environmental impact. Additionally, the incorporation of dietary fibre in innovative food products may contribute to better glycemic control and satiety throughout the day, aligning with the role of nutrition in dietary patterns.

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