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Potential of onion byproducts as a sustainable source of dietary fiber and antioxidant compounds for its application as a functional ingredient

Jessica Báez [1,2], Gian Marra [1], Victoria Olt [1,2], Adriana Maite Fernández-Fernández [1] and Alejandra Medrano [1,*]

1 Laboratorio de Bioactividad y Nanotecnología de Alimentos, Departamento de Ciencia y Tecnología de Alimentos, Facultad de Química, Universidad de la República, General Flores 2124, Montevideo 11800, Uruguay; 2 Graduate Program in Chemistry, Facultad de Química, Universidad de la República, General Flores 2124, Montevideo 11800, Uruguay. * Correspondence: amedrano@fq.edu.uy

Introduction

The food industry shows interest in the development of new high added value products with a strong nutritional impact. Onion byproducts are a rich source of dietary fiber and bioactive compounds, which represent a sustainable alternative to the use of traditional ingredients in the formulation of food products for the application of circular economy concept. The objective of this work was to improve the management of waste from agrifood production, both from the economic and environmental point of view, focusing on the search for alternatives for the recovery of byproducts generated in the processing and production of onion.

Materials and Methods

Brown onion byproducts

60°C
24 h

Milling dried byproducts with domestic mill

Onion skin

Onion pulp with 9% of onion skin

- ✓ Proximal analysis [1]
- ✓ Bioactivity assays:
  - ➢ Total Polyphenol Content (TPC) [2]
  - ➢ ABTS [2]
  - ➢ ORAC-FL [3]
  - ➢ HORAC [3]
  - ➢ α-glucosidase inhibition capacity [2]

Results

Table 1. Proximal analysis and mineral composition of onion skin (OS) and onion pulp combined with 9% of OS (OP).

	OS	OP
DM (%)	91.2 ± 0.2b	14.1 ± 0.3a
Proteins (%)	2.38 ± 0.01	-
Lipids (%)	0.53 ± 0.01	-
Dietary fiber (%)	69.9 ± 2.9b	43.9 ± 0.8a
Ashes (%)	9.4 ± 0.6b	5.3 ± 0.2a
Minerals (mg/g)		
Ca	24.5 ± 0.5b	9.7 ± 1.5a
Fe	0.048 ± 0.004b	0.018 ± 0.003a

Values are means ± SD, n=3. Means within a row with different letters are significantly different at p<0.05 by t-test. Al the results are expressed in dry matter (DM) basis.

Both byproducts presented high nutritional quality (**Table 1**) so they could be employed in the formulations of food products with high nutritional value

High total dietary fiber content

OS showed the highest TPC, antioxidant capacity (ABTS and HORAC), and α-glucosidase inhibition capacity (lowest IC_{50}) ($p<0.05$) (**Table 2**)

Table 2. Total Polyphenol Content (TPC), antioxidant activity and α-glucosidase inhibition capacity of onion skin (OS) and onion pulp combined with 9% of OS (OP).

Bioactive properties	OS	OP
TPC (mg GAE/g DM)	112.9 ± 7.4b	19.3 ± 3.8a
Antioxidant capacity		
ABTS (µmol TE/g DM)	699.0 ± 94.2b	162.5 ±14.4a
ORAC-FL (µmol TE/g DM)	1782.0 ± 92.0a	2989.4 ± 70.9b
HORAC (mg chlorogenic acid/g DM)	46.1 ± 2.2b	5.7 ± 0.1a
Antidiabetic capacity (IC_{50}, µg/mL DM)		
α-glucosidase inhibition capacity	447.2 ± 40.5a	625.1 ± 58.0b

Values are means ± SD (n=3). Means within a row with different letters are significantly different at p<0.05 by t-test. DM: dry matter.

Conclusions

Based on the health-promoting effects shown by both onion byproducts, it can be concluded that they have great potential to be used as functional ingredients. In addition, their use as ingredients will subsequently include a positive impact on the environment through the application of the circular economy concept.

References

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