

CHEMICAL AND BIOACTIVE CHARACTERIZATION OF *IMPATIENS BALSAMINA* L. PINK FLOWERS AND THEIR APPLICATION IN A PORTUGUESE PASTRY PRODUCT

Eleomar O. Pires Jr^{1,2}, Cristina Caleja^{1*}, José Pinela¹, Maria I. Dias¹, Ricardo C. Calhelha¹, Carolina C. Garcia², Ana Ćirić³, Marina Soković³, Isabel C.F.R. Ferreira¹, Lillian Barros¹

¹ Centro de Investigação de Montanha (CIMO), Instituto Politécnico de Bragança, Campus de Santa Apolónia, 5300-253 Bragança, Portugal. ² Departamento Acadêmico de Alimentos (DAALM), Universidade Tecnológica Federal do Paraná, Campus Medianeira, 85884-000, Brasil. ³ Institute for Biological Research "Siniša Stanković"- National Institute of Republic of Serbia, University of Belgrade. *ccaleja@ipb.pt

Abstract

The rose petals of the species *Impatiens balsamina* L. were investigated. In this way the nutritional composition, phenolic profile and its bioactive composition were evaluated. Next, the extract obtained was applied to a product of the Portuguese pastry "bombocas". Proving to be a possible promising natural colour for the food industry.

Keywords: *Impatiens*, Bioactivities, Natural ingredients.

Introduction

Edible flowers have been exploited and applied in cosmetics, pharmaceuticals and especially gastronomy, in line with the growing demand for safer and healthier foods [2]. The genus *Impatiens* is popularly known for two attractive flowers, and preliminary studies have demonstrated the bioactive potential of these plants [3]. Thus, the present work focused on the nutritional properties of *Impatiens balsamina* flowers, followed by phenolic characterization and the study of bioactivity. Finally, the extract was tested as a natural dye for the "bombocas" filling (Fig. 1).

Materials

Pink flowers of the *I. balsamina* were collected in a public park and identified in the herbarium FLOR (Brazil). The petals were carefully removed, frozen, lyophilized and crushed. The samples were stored in a cool, dry place and protected from light.

Methods

The nutritional value (ash, protein, fat, and carbohydrate content, and energy value, by AOAC methodology) and the phenolic compounds profile (by High-Performance Liquid Chromatography coupled with a diode array detector and mass spectrometry by electrospray ionization - HPLC-DAD-ESI/MS) of *I. balsamina* L. pink petals were determined. Moreover, the antioxidant, antimicrobial, cytotoxic, and anti-inflammatory evaluation (by the oxidative hemolysis inhibition assay - OxHLIA, microdilution method with ATCC strains, the sulforhodamine B method in four human tumour cell lines, and analysis in macrophage cells of rats (RAW 264.7), to inhibit the production of NO, respectively) in the hydroethanolic extracts was also accessed. Finally, the enriched-coloured extract was applied as a colorant in a cake filling called "bombocas", and its colorant capacity was compared with an artificial additive (E163).

Results

In the pink petals, proteins stood out as the main macronutrient, and only fructose and glucose were found in sugars profile. As for the phenolic composition, eighteen compounds were tentatively identified, five non-anthocyanin compounds (caffeic and coumaric acids, and eryodictiol-*O*-hexoside) and ten anthocyanin compounds (mainly acylated *O*-glycosylated malvidin, pelargonidin, and peonidin derivatives).










In addition, the hydroethanolic extracts demonstrated anti-inflammatory and cytotoxicity for all cell lines studied, presenting also a remarkable antifungal activity (Table 1).

Table 1. Bioactivities of petal extract.

Petals Extract	
Tumour cell lines (GI₅₀ values; µg/mL)	
HeLa	90.4 ± 5.5
HepG2	134.9 ± 9.2
MCF7	154.9 ± 14.5
NCI-H460	167.2 ± 12.5
Non-tumour cell lines (GI₅₀ values; µg/mL)	
PLP2	>400
Anti-inflammatory (GI₅₀ values; µg/mL)	
RAW264.7	163.5 ± 6.8
Antioxidant activity (Ic₅₀ values; µg/mL)	
Oxidative hemolysis inhibition assay(OxHLIA)	29 ± 2

Finally, the coloured extract applied in the formulations conferred a more natural colour to the "bombocas" (Table 2), as also functional properties such as antioxidant activity.

Table 2. Shelf life of the bombocas.

Formulations	DAYS AFTER PREPARATION		
	First Day	Third Day	Seventh Day
Control (BC) (No added colorants)	 BC-T0	 BC-T3	 BC-T7
Strawberry (BS) (With E163 colorant)	 BS-T0	 BS-T3	 BS-T7
<i>Impatiens</i> (BI) (With <i>I. balsamina</i> extract)	 BI-T0	 BI-T3	 BI-T7

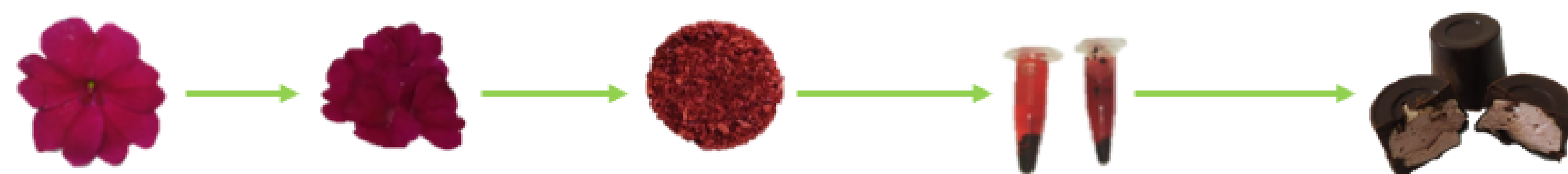


Fig. 1 Elaboration stages of the colourant extract of *Impatiens balsamina* flowers.

Conclusion

The hydroethanolic extract of the pink flowers of the species *I. balsamina*, showed auspicious characteristics as a source of bioactive compounds, particularly anthocyanins. Furthermore, its incorporation as an alternative colouring agent in pastry formulations has been able to contribute to a more natural aspect of the product. Indicating that these flowers, can be exploited in the future by the food industry as a natural colouring agent. However, for this to be possible, an in-depth study of the best extraction methods is required, as well as optimum conditions for the yield and stabilization of its phenolic compounds, in particular anthocyanins.

References

- [1] J. Azmir, I. Zaidul, I. Rahman, M. Sharif, M. Mohamed, A. Sahena, F. Omar 117 (2013), 426-436.
- [2] L. Trinh, Y. Choi, H. Bae, 125 (2018), 261-268.
- [3] K. Szewczyk. Biochemical Systematics and Ecology, 80 (2018) 94-121.

Acknowledgements

The authors are grateful to the Foundation for Science and Technology (FCT, Portugal) for financial support through national funds FCT/MCTES to CIMO (UIDB/00690/2020); national funding by FCT, P.I., through the institutional and individual scientific employment program-contract for L. Barros, R. Calhelha, M.I. Dias and J. Pinela's (CEECIND/01011/2018) contracts, respectively; research contract of C. Caleja (Project AllNatt, POCI- 01-0145-FEDER-030463); and to FEDER-Interreg España-Portugal program for financial support through the project TRANSCoLAB 0612_TRANS_CO_LAB_2_P, BIOMA (POCI_01_0247_FEDER_046112) and Green Health (Norte-01-0145-FEDER-000042). This work has been supported by the Ministry of Education, Science and Technological Development of Republic of Serbia (451-03-68/2020-14/200007).