

BIOACTIVE AND SENSORY EVALUATION OF CHOCOLATE PRALINES ENRICHED WITH POLYPHENOLIC COMPOUNDS EXTRACTED FROM GROUND IVY AND MOUNTAIN GERMANDER



Danijela Šeremet^{1*}, Ana Mandura¹, Evan Cazalens², Marion Natucci Pasquino², Aleksandra Vojvodić Cebin¹ & Draženka Komes¹

¹University of Zagreb, Faculty of Food Technology and Biotechnology, Pierottijeva 6, 10000 Zagreb, Croatia

²Université Bourgogne Franche-Comté, AgroSup Dijon, 21000 Dijon, France



* ✉ danijela.seremet@pbf.unizg.hr ☎ +385 1 4605 185

INTRODUCTION



Fig.1. *Teucrium montanum* L.

Due to abundant number of different chocolate products on market, the need has arisen for development of attractive chocolate products with functional properties. Therefore, in the present study, a total of five innovative formulations of chocolate pralines were developed containing coffee, chicory, carob, cocoa powder and peanut protein powder as the main ingredients of their fillings, additionally enriched with phenolic extracts from medicinal plants – ground ivy (*Glechoma hederacea* L.) and mountain germander (*Teucrium montanum* L.). Formulated pralines were subjected to sensory analysis and bioactive characterization.



Fig.2 *Glechoma hederacea* L.

METHODS



Fig.3. Preparation of chocolate pralines

FORMULATION OF CHOCOLATE PRALINES

Chocolate pralines were prepared in laboratory conditions. Chocolate liquor with 38% cocoa solids was used. Cocoa liquor was tempered using the T5 tempering machine (Pomati Group. Codogno LO. Italia). The chocolate shells were formed in silicone molds, an equal amount of filling in each individual mold was added and the final layer of chocolate liquor was poured to form the bottom of praline. The pralines were left in a refrigerator at 4 °C for 1 hr and taken out from the mold and stored at ambient temperature.

CHARACTERIZATION OF EXTRACTS AND PRALINES

Total phenolic content (TPC) and antioxidant capacity were conducted using spectrophotometric methods, while content of individual phenolic compounds and methylxanthines using HPLC-DAD methodology [1,2]

RESULTS

Table 1. Content of individual phenolic compounds and methylxanthines in formulated pralines

	Chlorogenic acid (µg/g)	Caffeine (µg/g)	Caffeic acid (µg/g)	Theobromine (µg/g)	Criptochologenic acid (µg/g)	Echinacoside (µg/g)	Verbascoside (µg/g)	Rosmarinic acid (µg/g)	Rutin (µg/g)
ground ivy									
Carob	4.43	235.45	16.770	2538.23	2.06	n.d.	n.d.	22.10	6.23
Chicory	10.92	243.03	0.96	2353.30	5.24	n.d.	n.d.	29.48	6.68
Cocoa powder	5.95	327.03	20.85	3233.05	3.24	n.d.	n.d.	32.02	8.34
Coffee	333.53	2154.26	35.27	1823.63	324.21	n.d.	n.d.	53.23	42.96
Peanut powder	9.26	259.90	49.09	2844.29	4.16	n.d.	n.d.	48.32	9.65
mountain germainder									
Carob	n.d.	214.26	n.d.	232.19	n.d.	171.07	122.53	n.d.	n.d.
Chicory	n.d.	181.89	n.d.	2022.27	n.d.	57.34	38.85	n.d.	n.d.
Cocoa powder	n.d.	220.23	n.d.	276.64	n.d.	114.81	43.75	n.d.	n.d.
Coffee	n.d.	863.87	n.d.	2208.06	n.d.	113.18	41.92	n.d.	n.d.
Peanut powder	n.d.	167.72	n.d.	1882.36	n.d.	277.54	208.69	n.d.	n.d.
infusion extracts									
Ground Ivy	31.85	15.90	8.40	n.d.	19.52	n.d.	n.d.	2656.35	11.27
Montain germander	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
plain pralines									
Plain pralines	n.d.	145.64	4.65	2545.06	29.50	n.d.	n.d.	n.d.	n.d.

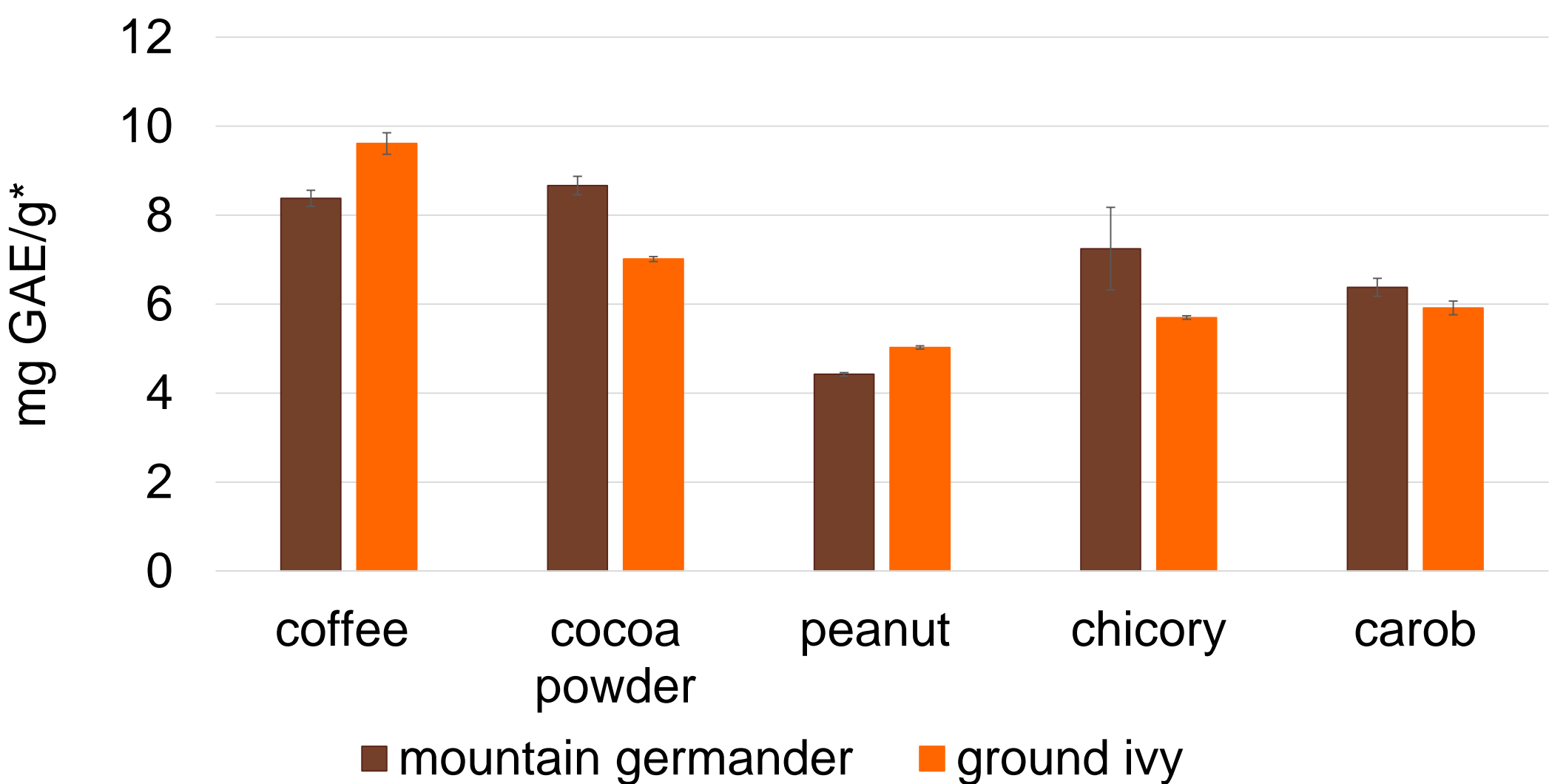


Fig.4. TPC of formulated pralines

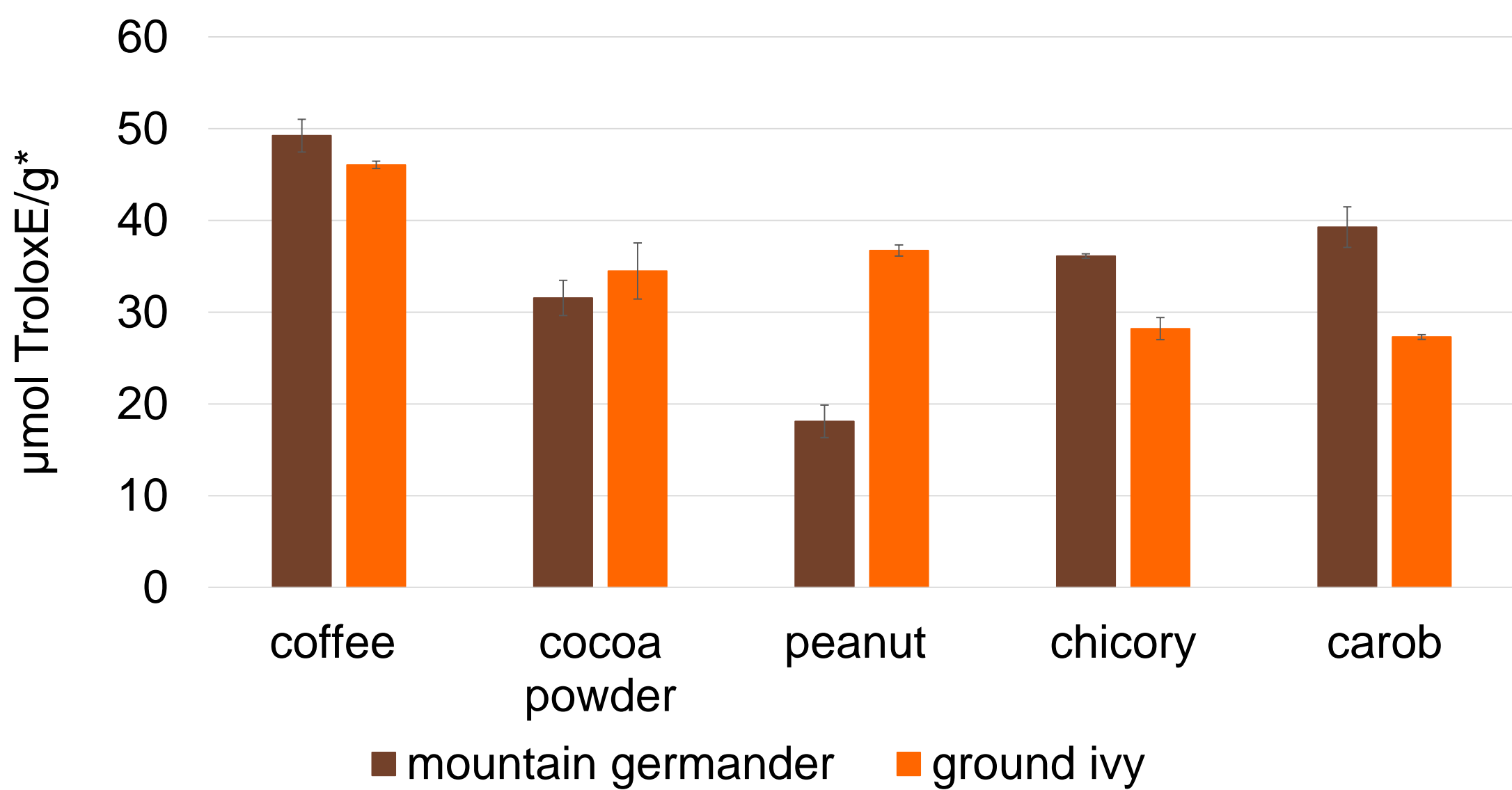


Fig.5. Antioxidant capacity (DPPH assay) of formulated pralines

CONCLUSIONS:

- TPC of plain chocolate pralines was 4.66 mg GAE/g, while for filled ones it was higher, even two-fold for coffee pralines made with ground ivy (10.42 mg GAE/g), and even more for the same made with mountain germander (16.93 mg GAE/g).
- Results revealed that dominant phenolic compounds of both ground ivy – rutin, chlorogenic, cryptochlorogenic, caffeic and rosmarinic acid, and mountain germander - echinacoside and verbascoside, were successfully incorporated into chocolate pralines.
- The pralines enriched with ground ivy were sensory evaluated with higher grades in terms of overall acceptability that those with mountain germander for which the greatest flaw was recognized by an extremely bitter taste.

REFERENCES:

- [1] Singleton, V.L., & Rossi, J.A. (1965). Colorimetry of total phenolics with phosphotungstic acid reagents. American Journal of Enology and Viticulture, 16, 144–158.
[2] Brand-Williams W., Cuvelier M. E., & Berset C. (1995). Use of a free radical method to evaluate antioxidant activity. LWT – Food Science and Technology, 28, 25-30.

Acknowledgment

This research was acquired as part of the project named: “Formulating encapsulated systems of bioactive ingredients from traditional plants: Mountain Germander and Ground Ivy for the development of innovative functional food products” (IP-2019-04-5879 / FUNCBIOCAP), funded by the Croatian Science Foundation.