OPTIMIZATION OF ENCAPSULATION BIOLOGICALLY ACTIVE MOLECULES OBTAINED FROM MIXED *Halopteris scoparia* AND *Pistacia lentiscus* EXTRACTS

LJEKARNA ZADAR

Tanja Jović[a], Zrinka Čošić[b], Ivona Elez Garofulić[b], Patricija Čulina[b], Sandra Pedisić[b], Zdenka Pelaić[b], Verica Dragović-Uzelac[b] and Zoran Zorić[b]*

faculty of food technology and biotechnology
University of Zagreb

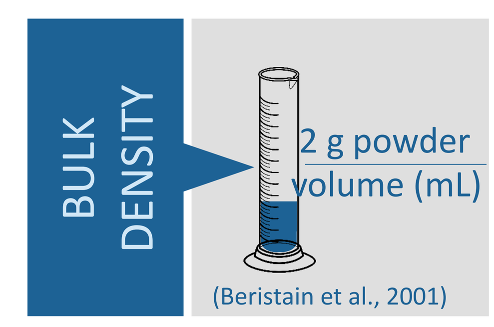
[a]Pharmacy Zadar, Jurja Barakovića 2, 23000 Zadar, Croatia
[b]Faculty of Food Technology & Biotechnology, University of Zagreb, Pierottijeva 6, 10 000 Zagreb, Croatia
E-mail: zzoric@pbf.hr

INTRODUCTION

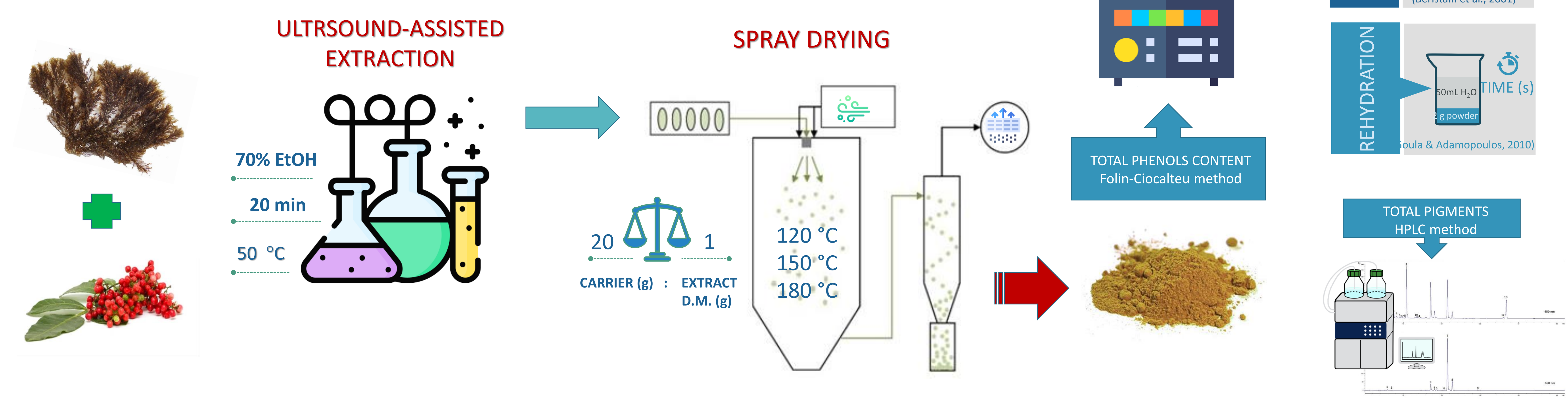
Being the rich source of biologically active molecules (BAM), extracts from algae and plants are an excellent potential for the production of functional foods with added value. Despite the fact that today there are many researches on different plant species, their application in the production of functional products is not sufficient. Studies have shown that the brown alga *Halopteris scoparia* is a source of various BAM such as amino acids, polysaccharides, vitamins, sterols, minerals, dietary fibers, fatty acids and pigments (Alagawany, 2019.; Mišurcová et al., 2014), which have enormous functional and nutraceutical potential, while on the other hand, the analysis of mastic tree (*Pistacia lentiscus* L.) leaves, stems, fruits and roots revealed significantly higher concentration of the main groups of secondary metabolites (flavonoids, phenolic acids and tannins), indicating that the plant has great biological potential (Dragović et al., 2020). Due to the different composition of BAM, these two remarkable natural sources show a great synergistic effect in the production of functional products by mixing their extracts. Given the particular sensitivity to degradation of BAM by temperature, pH, enzymes, and oxygen, encapsulation has proven to be an effective way to protect these compounds, especially in the production of functional foods.

AIM

- ✓ Optimization of spray-drying conditions of mixed extracts from the algae *H. scoparia* and *P. lentiscus* using two different carriers [maltodextrin (MD) DE 13-17 and gum arabic (GA)];
- ✓ Determination of physical properties of the powder obtained at spray-drying temperature of 120, 150 and 180 °C and wall-to-core ratio of 1:20;
- ✓ Evaluation a retention of the phenolics and pigments content in spray dried samples



MATERIALS & METHODS



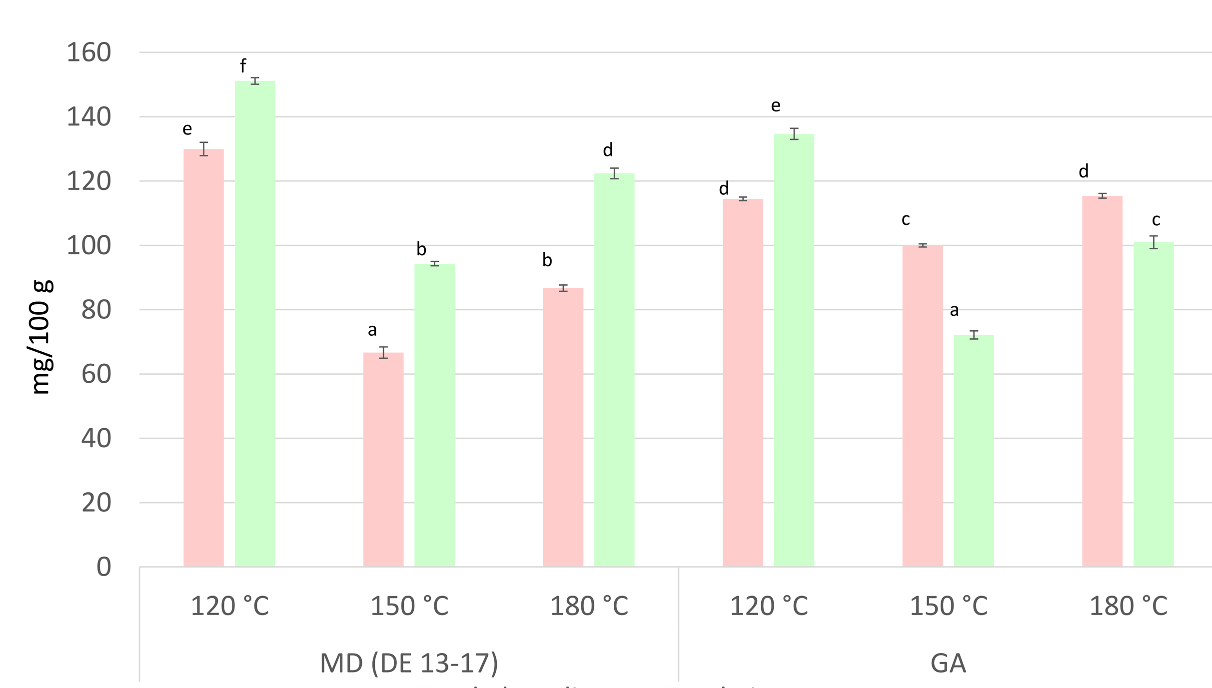
RESULTS AND DISCUSSION

Carrier	Temperature (°C)	Yield (%)	Solubility (%)	Moisture (%)	Bulk density (mg/mL)
MD (13-17 DE)	120	47.80 ± 0.25	85.56 ± 0.86	4.45 ± 0.02	0.40 ± 0.00
	150	50.12 ± 0.20	84.04 ± 0.20	4.03 ± 0.01	0.37 ± 0 01
	180	48.34 ± 0.47	83.37 ± 0.61	4.03 ± 0.04	0.33 ± 0.01
GA	120	54.88 ± 0.92	75.83 ± 0.67	6.24 ± 0.02	0.31 ± 0.01
	150	52.06 ± 0.37	65.28 ± 0.93	4.86 ± 0.01	0.83 ± 0.01
	170	53.22 ± 0.45	79.46 ± 0.59	3.63 ± 0.01	0.39 ± 0.01

In bulk density, particles mass is divided by the total volume which includes particles volume and space between them. Heavier powder will fill the space between the particles more easily so it will occupy less volume and have a higher bulk density. Bioactive compounds are prone to oxidation, so if the area between the particles is larger, higher oxygen concentration is available what reduces the bioactive properties of the produced powders (Tonon et al., 2010). Along with reduced packaging and shipping costs, higher bulk density is considered as desirable property (Shishir and Chen, 2017).

Rehydration is measured as the time it takes for the dried powder to be visually completely rehydrated. A functional food powder should be wett quickly and thoroughly rather than float on the surface.

Optimal temperature for the production of powders with MD was 150 °C, while for powders with GA as carrier it was 120 °C. Inlet air temperatures below 150 °C can cause a formation of the moisture on the drying chamber walls. Better retention of phenolics as well as pigments was at higher drying temperature (180 °) than at 150 °C which can be explained by better encapsulation of these compounds in both carriers.



This work was supported by the project "Bioactive molecules of medical plant as natural antioxidants, microbicides and preservatives" (KK.01.1.1.04.0093), co-financed by the Croatian Government and the European Union through the European Regional Development Fund - Operational Programme Competitiveness and Cohesion 2014 – 2020 (KK.01.1.1.04.).

CONCLUSIONS

- ✓ The powders prepared with MD had lower product yield but other physical properties and retention of BAM were better;
- ✓ The obtained results showed a strong synergistic effect of phenols from Mediterranean plants and algal pigments in all powders obtained by spray drying, which can be an excellent basis for further research and production of new value-added functional foods.

REFERENCES

Alagawany, M., Elnesr, S. S., Farag, M. R., Abd El-Hack, M. E., Khafaga, A. F., Taha, A. E., Tiwari, R., Yatoo, M. I., Bhatt, P., Marappan, G., & Dhama, K. (2019). Use of Licorice (Glycyrrhiza glabra) Herb as a Feed Additive in Poultry: Current Knowledge and Prospects. Animals : an open access journal from MDPI, 9(8), 536.

Dragović, S., Dragović-Uzelac, V., Pedisić, S., Čošić, Z., Friščić, M., Elez Garofulić, I., & Zorić, Z. (2020). The Mastic Tree (Pistacia lentiscus L.) Leaves as Source of BACs: Effect of Growing Location, Phenological Stage and Extraction Solvent on Phenolic Content. Food technology and biotechnology, 58(3), 303–314.

Mišurcová, L., Buňka, F., Vávra Ambrožová, J., Machů, L., Samek, D., & Kráčmar, S. (2014). Amino acid composition of algal products and its contribution to RDI. Food chemistry, 151, 120–125.

Shishir, M.R.I., Chen, W. (2017) Trends of spray drying: A critical review on drying of fruit and vegetable juices. Trends Food Sci Technol. 65, 49-67

Tonon, R.V., Brabet, C., Hubinger, M.D. (2010) Anthocyanin stability and antioxidant activity of spray-dried acai (Euterpe oleracea Mart.) juice produced with different carrier agents. Food Res Int. 43, 907-914.

European Union
REPUBLIC OF CROATIA Ministry of Science and Education
REPUBLIC OF CROATIA Ministry of Regional Development and EU Funds
Operational programme COMPETITIVENESS AND COHESION
EUROPEAN STRUCTURAL AND INVESTMENT FUNDS
Plant Biomolecules