INFLUENCE OF DIFFERENT COATINGS ON THE ENCAPSULATION EFFICIENCY OF TOTAL PHENOLIC COMPOUNDS FROM CABERNET SAUVIGNON GRAPE POMACE EXTRACT

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AIM

The aim of this study was to investigate the influence of different coatings on the encapsulation efficiency (*EE*) of total phenolic compounds (TPC) from red grape pomace (GP) extract of the variety Cabernet Sauvignon.

EXTRACT PREPARATION

- **extraction conditions**
  - solvent: 50 % aqueous ethanol
  - liquid-solid ratio: 40 mL/g
  - shaking-water bath (T = 80 °C, t = 120 min, n = 200 rpm)
- **extract concentration**
  - rotary evaporation (T = 50 °C, p = 48 mbar)
- **extract preparation for encapsulation**
  - dissolution of the GP extract with 30 % aqueous ethanol
- **determination of the total phenolic compound (TPC)**
  - Folin-Ciocelteau assay[1]

GRAPE POMACE

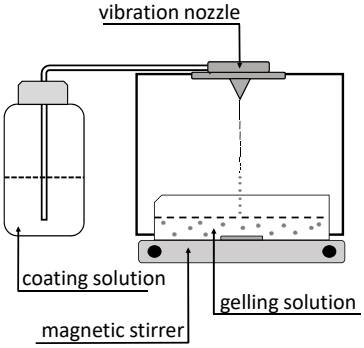
Cabernet Sauvignon *(Erdut winery, Croatia); dry matter content 92.91 %; 1 mm particle size*

ENCAPSULATION

- **ionic gelation (Büchi B-390)**
  - nozzle size: 300 µm, except for SA + GT (450 µm)
  - frequency: 140 Hz
  - electrode: 750 V
  - pressure: 206 mbar, except for SA + GT (508 mbar)
  - gelation type / coating material:

GELATION TYPE	COATING MATERIAL(S)	GELLING SOLUTION	EXTERNAL LAYER MATERIAL
simple	3 % SA	0.25 M $CaCl_2$	-
complex	3 % SA + 0.15 % GT	0.25 M $CaCl_2$	-
	3 % SA + 1.2 % MD		
	3 % SA + 1.6 % GA		
multilayered	3 % SA	0.25 M $CaCl_2$ + 0.5 % CS	-
		0.25 M $CaCl_2$ + 1 % CS	
		0.25 M $CaCl_2$ + 1.5 % CS	
immersion	3 % SA	0.25 M $CaCl_2$	0.5 % CS

- **rinsing**
  - after encapsulation, the microcapsules were filtered through filter paper and washed twice with distilled water



Scheme of ionic gelation

Microcapsule of GP extract *(3 % SA + 0.15 % GT)*

ENCAPSULATION EFFICIENCY (*EE*)

- ***EE* was calculated** by the formula :

$$EE = \frac{m_1 - m_2}{m_1} \; x \; 100 \; (\%)$$

where:

m_{TPC} = mass of TPC determined in GP extract before encapsulation (g)

m_{TPC} = mass of TPC determined in gelling solution after encapsulation (g)

- **data are expressed** as mean value ± SD (***Figures 1-3***)

RESULTS

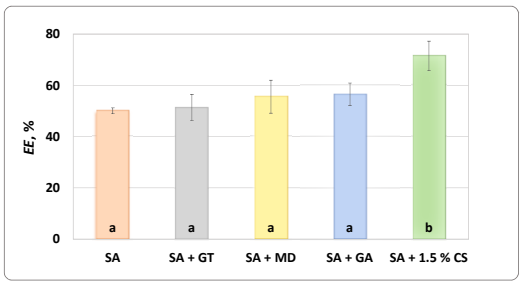


Figure 1 The influence of different coatings on the encapsulation efficiency (*EE*, %) of phenolic compounds from grape pomace extract.

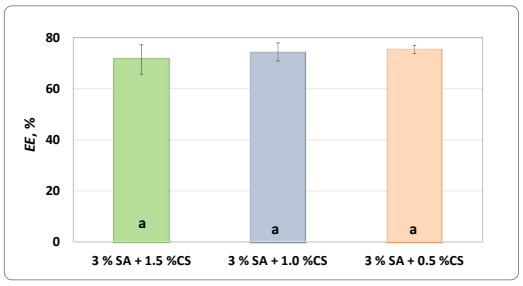


Figure 2 The influence of three different concentrations of chitosan (CS) on the encapsulation efficiency (*EE*, %) of phenolic compounds from grape pomace extract.

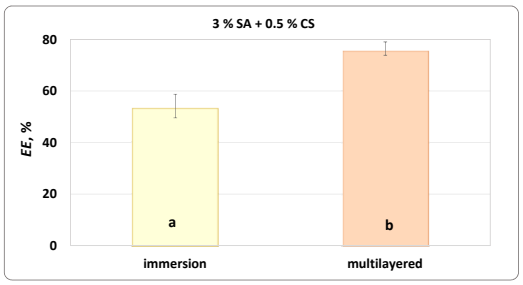


Figure 3 The influence of the gelation type with 0.5 % chitosan (CS) on the encapsulation efficiency (*EE*, %) of phenolic compounds from grape pomace extract (multilayer = CS mixed with $CaCl_2$, immersion = CS was used after the microcapsules were cured in $CaCl_2$).

CONCLUSION

- The TPC of grape pomace extract was 186.96 mg_{GAE}/g_{ext}.
- The *EE* was higher than 50 % for all the coatings used (***Figures 1-3***).
- The *EE* obtained with 3 % SA in combination with 1.5 % CS was statistically significantly different (Duncan test, $p < 0.05$) from the other tested coatings (***Figure 1***).
- The concentration of CS used in multilayer gelation did not have a statistically significant effect on *EE* (Duncan test, $p < 0.05$). The best *EE* (75.47 %) was obtained when 3 % SA was used as the coating material and 0.25 M $CaCl_2$ + 0.5 % CS as the gelling solution (***Figure 2***).
- The type of gelation had a statistically significant (Student t-test, $p < 0.05$) effect on *EE* of phenolic compounds from grape pomace extract (***Figure 3***).
- Multilayered gelation resulted in the best *EE* compared to the other gelation types (***Figure 1, 3***).

References:

1. Waterhouse, A. L. (2001). Determination of total phenolics. In *Current Protocols in Food Analytical Chemistry* (edited by R.E. Wrolstad). I1.1.1-I1.1.8. New York: John Wiley & Sons Inc.

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