



GREEN EXTRACTION OF ANTHOCYANINS WITH NATURAL DEEP EUTECTIC SOLVENTS

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Natural Deep Eutectic Solvents (NADES) represent a green chemistry alternative to utilization of common hazardous organic solvents. They were introduced by Abbott et al. [1], and were found to have a wide range of compositions and favorable properties. NADES are typically obtained by mixing hydrogen-bond acceptors (HBA), with hydrogen bond donors (HBD), leading to a significant depression of the melting point. The availability of components, simple preparation, biodegradability, safety, reusability and low cost are the significant advantages that call for research on their analytical applications. Three methods are most commonly used for preparing NADES: a) heating and stirring: the mixture until a clear liquid is formed; b) evaporating solvent from components solution with a rotatory evaporator; c) freeze drying of aqueous solutions [1].

The common solvents for the extraction of anthocyanins are acidified mixtures of water with ethanol, methanol, or acetone [2]. The anthocyanins extracts are susceptible to degradation due to high temperature, and the solvent properties (e.g. high pH) and the whole process can often be time-consuming. Extraction of anthocyanins from red cabbage by four NADES was investigated. The results are presented in Table 1.

Table 1 Extraction of red cabbage with NADES and 0,1M HCl

No	NADES solution and conventional method	Ratio cabbage: NADES	g/100g anthocyanins per NADES	Relative extraction efficiency, %
1	Malic acid: β -alanine: water: 1:1:3	1:14	0.115	37
2	Malic acid: choline chloride: water: 1:1:2	1:10	0.128	41
3	Lactic acid: glucose: water: 5:1:3	1:7	0.320	102
4	2-propanediol: choline chloride: water: 1:1:1	1:12	0.258	82
5	Extraction with 0,1 M HCl		0.314	100

Thus, NADES No.3 has comparable extraction efficiencies with conventional method No.5 with 0.1 M water solution of HCl. This indicates a possibility of utilization the Green chemistry extraction processes as a promising new green-extraction technology with low cost efficiency and environment friendly technology for production of safe food additives.

References

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2. Ongkowijoyo P., Luna-Vital D.A., Gonzalez de Mejia E. Extraction techniques and analysis of anthocyanins from food sources by mass spectrometry: An update // Food Chem., 2018, Vol. 250, p. 113–126.