

INFLUENCE OF EXTRACTION METHOD AND PARTICLE SIZE ON PHENOLIC CONTENT AND BIOLOGICAL POTENTIAL OF AGRI-FOOD BY-PRODUCTS

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INTRODUCTION

Food processing generates large amounts of by-products and waste, especially in fruit and vegetable production, of which about 25–30% is mainly peel. Although there are many reports on the extraction of valuable bioactive components from these by-products, there are also many parameters, advantages and disadvantages of the extraction methods that should be considered, evaluated and optimized. The particle size of the sample is one of the parameters in solid–liquid extraction that significantly affects the bioactive components of natural products.

MATERIALS AND METHODS

In this work, the influence of particle size of onion and pomegranate peels on phenolic composition and biological potential (antioxidant and antimicrobial activity) was investigated. The by-product samples were fractionated in three sample groups characterized by different particle sizes, namely >500 µm, 250-500 µm and <250 µm. Two extraction methods were then tested, ultrasound-assisted extraction (UAE) with 50% ethanol and accelerated solvent extraction (ASE) with water. Total phenols (TP) were determined spectrophotometrically, while antioxidant activity was evaluated using the DPPH (2,2-diphenyl-1-picrylhydrazyl radical scavenging ability) assay. Antimicrobial activity was determined using the minimum inhibitory concentration (MIC) method against common food-borne pathogens (*Staphylococcus aureus*, *Enterococcus faecalis*, *Listeria monocytogenes*, *Salmonella enterica*, *Escherichia coli*).

RESULTS

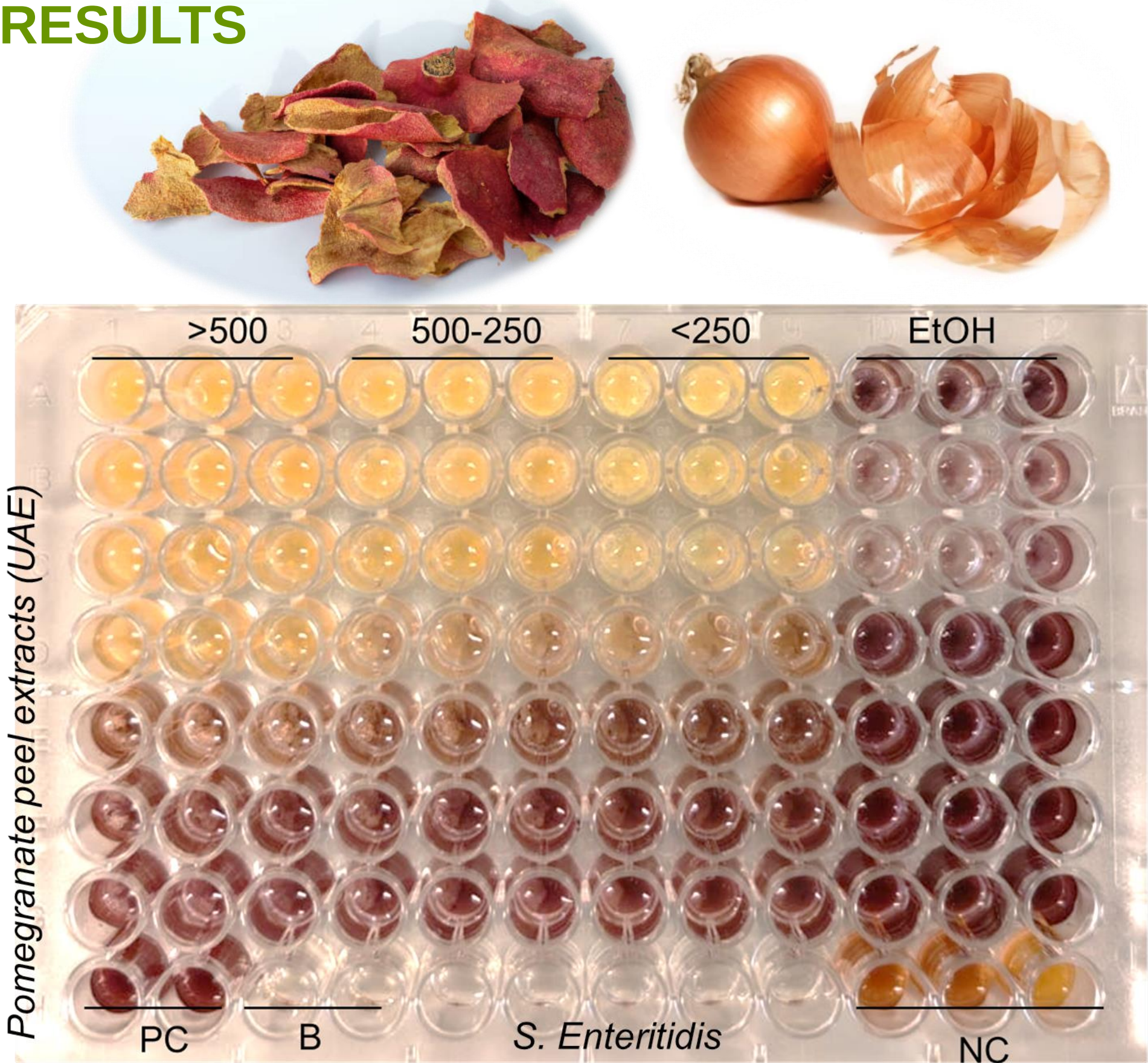


Table 2. Antimicrobial activity, expressed as the MIC value (mg GAE/g) of extracts

		S.	L.	E.	E.	S.
Pomegranate		aureus	monocytogenes	faecalis	coli	Enteritidis
UAE	>500	<0.61	2.43	1.43	38.93	4.87
	500-250	<0.52	2.07	1.08	33.19	8.3
	<250	<0.61	4.84	2.05	38.73	19.36
ASE	>500	0.89	7.16	3.58	>28.64	28.64
	500-250	0.86	6.91	6.91	>27.63	27.63
	<250	1.26	10.12	10.12	>20.24	20.24
Onion						
		Fraction				
UAE	>500	2.85	5.71	9.73	22.84	11.42
	500-250	2.16	4.32	8.3	17.26	17.26
	<250	4.1	1.03	19.36	16.41	16.41
ASE	>500	1.89	0.94	1.89	>3.77	>3.77
	500-250	1.96	3.92	3.92	>3.92	>3.92
	<250	5.26	2.63	2.63	>5.26	>5.26

Table 1. Total phenolic (TPC) content and antioxidant activity of extracts

Pomegranate	Fraction	TPC (mg GAE/g)	TE (mM)
UAE	>500	155.7 ± 4.9	4.0 ± 0.03
	500-250	132.8 ± 3.0	4.0 ± 0.02
	<250	155.0 ± 0.5	4.0 ± 0.01
ASE	>500	114.5 ± 0.6	4.0 ± 0.06
	500-250	110.5 ± 2.0	3.9 ± 0.10
	<250	81.0 ± 0.6	3.8 ± 0.07
Onion	Fraction		
UAE	>500	91.4 ± 3.1	4.0 ± 0.06
	500-250	69.1 ± 1.5	4.0 ± 0.01
	<250	65.7 ± 0.9	4.0 ± 0.09
ASE	>500	15.1 ± 0.3	3.4 ± 0.07
	500-250	15.7 ± 0.3	3.4 ± 0.07
	<250	21.0 ± 0.2	3.5 ± 0.13

RESULTS AND CONCLUSIONS

The results showed TP in the range of 15-156 mg GAE/g dry samples and good antioxidant and antimicrobial activity in all extracts, especially in those prepared with UAE. The TP content of the pomegranate peel extracts was significantly higher than that of the onion peel extracts. The influence of particle size was observed between the extracts obtained using ASE. The results show that the analyzed by-products have great potential for further application in food, but additional analysis in food models should be performed to confirmed biological activity of studied extracts.