



CHEMICAL COMPOSITION AND BIOLOGICAL POTENTIAL OF GARLIC BY-PRODUCTS

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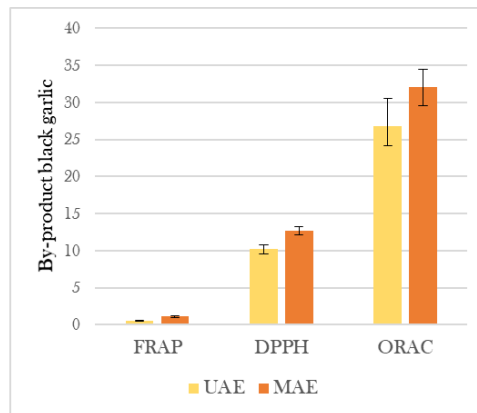
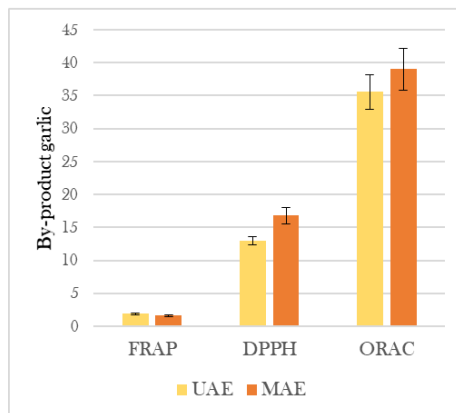
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Introduction & Methodology

Garlic, a vegetable from the *Allium* genus, has been valued for its medicinal properties since ancient times. The processing of garlic produces valuable by-products rich in phenolic compounds known for their exceptional biological properties, including antioxidant and antimicrobial activities. In addition to white garlic, its fermented version, black garlic, is increasingly appreciated for its beneficial properties and high nutritional value. The aim of this study was to analyze the chemical composition and evaluate the biological activities (antioxidant and antimicrobial) of white and black garlic by-products, prepared by microwave (MAE) and ultrasonic (UAE) extraction. The phenolic profile of the samples was determined using high performance liquid chromatography (HPLC). The antioxidant activity was evaluated using the ferric reducing antioxidant power (FRAP) assay and the 2,2-diphenyl-1-picrylhydrazyl free radical scavenging (DPPH) assay. The antimicrobial activity against foodborne pathogens: *Staphylococcus aureus*, *Listeria monocytogenes*, *Escherichia coli* and *Salmonella enteritidis* was evaluated using the minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) methods.



mg/L	By-product garlic UAE	By-product garlic MAE	By-product black garlic UAE	By-product black garlic MAE
protocatechuic acid	0,16 ± 0,01	0,08 ± 0,00	0,10 ± 0,00	0,11 ± 0,00
epicatechin	4,89 ± 0,29	3,57 ± 0,03	1,63 ± 0,00	2,24 ± 0,28
rutin	6,47 ± 0,26	6,37 ± 0,18	1,67 ± 1,02	1,00 ± 0,88
quercetin-3-glucoside	2,67 ± 0,15	2,63 ± 0,24	0,82 ± 0,12	0,74 ± 0,57
myricetin	4,60 ± 0,95	2,34 ± 0,20	0,66 ± 0,24	0,63 ± 0,14
quercetin	2,53 ± 0,08	1,60 ± 0,06	1,11 ± 0,37	1,30 ± 0,31
kamferol	0,73 ± 0,04	1,04 ± 0,06	1,09 ± 0,00	0,93 ± 0,37

Sample	<i>S. aureus</i>		<i>L. monocytogenes</i>		<i>Salmonella enteritidis</i>		<i>E. coli</i>	
	MIC	MBC	MIC	MBC	MIC	MBC	MIC	MBC
By-product garlic UAE	>10	/	10	10	10	>10	>10	/
By-product black garlic UAE	10	>10	5	5	10	>10	>10	/
By-product garlic MAE	>10	/	2,5	2,5	5	10	>10	/
By-product black garlic MAE	10	10	2,5	2,5	5	10	>10	/

Results and Conclusion

The results showed a high content of the polyphenols rutin (6.5 mg/L) and catechin (4.9 mg/L) and also the best antioxidant activity in the extract of white garlic by-products prepared by microwave and ultrasonic extraction. In terms of antimicrobial activity, the by-products obtained by microwave extraction showed better activity than the extracts obtained by ultrasound. The antimicrobial and bactericidal activity of the white and black garlic by-products against *L. monocytogenes* at a concentration of 2.5 mg/mL stands out. The results underline the potential of garlic by-products as a valuable source of bioactive compounds for functional foods, nutraceuticals and natural preservatives.