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GC-MS ANALYSIS OF TURMERIC DRIED MILLED RHIZOMES

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Abstract: Turmeric, also called “The Golden Spice”, is a rhizomatous herbaceous perennial plant belonging to the ginger family Zingiberaceae. Modern medicine has begun to recognize its importance in the last 25 years, as evidenced by the presence of numerous articles published in specialized literature. Curcumin, also known as diferuloylmethane, is the main curcuminoid found in the rhizomes of turmeric. The extraction process is a crucial step in the recovery of bioactive compounds from the plant matrix. This study focused on the extraction of turmeric, using the conventional Soxhlet technique. The advantage of the chosen technique is conferred by the recirculation of the extraction solvent, which leads to the processing of a larger amount of material with a lower solvent cost and an increased extraction yield. Thus, the extraction was carried out using different organic solvents such as: acetone, ethanol and methanol and the chemical content of each extract was investigated using gas chromatography coupled with mass spectrometry (GC-MS). The GC-MS data revealed a high degree of similarity in the chemical profile of the extracts. The extraction solvents did not affect the concentration of the major compounds such as AR-turmerone (32.64%), curlone (12.53%) and curcumin (5.55%), instead it had an impact on the minor constituents. Constituents such as 2-methoxy-4-vinylphenol, a member of the phenol class represented cca. 3.57% and α -zingiberene a phytochemical from the sesquiterpene class represented cca. 0.68%.

Keywords:

Curcumin, GC-MS, Soxhlet, bioactive compounds

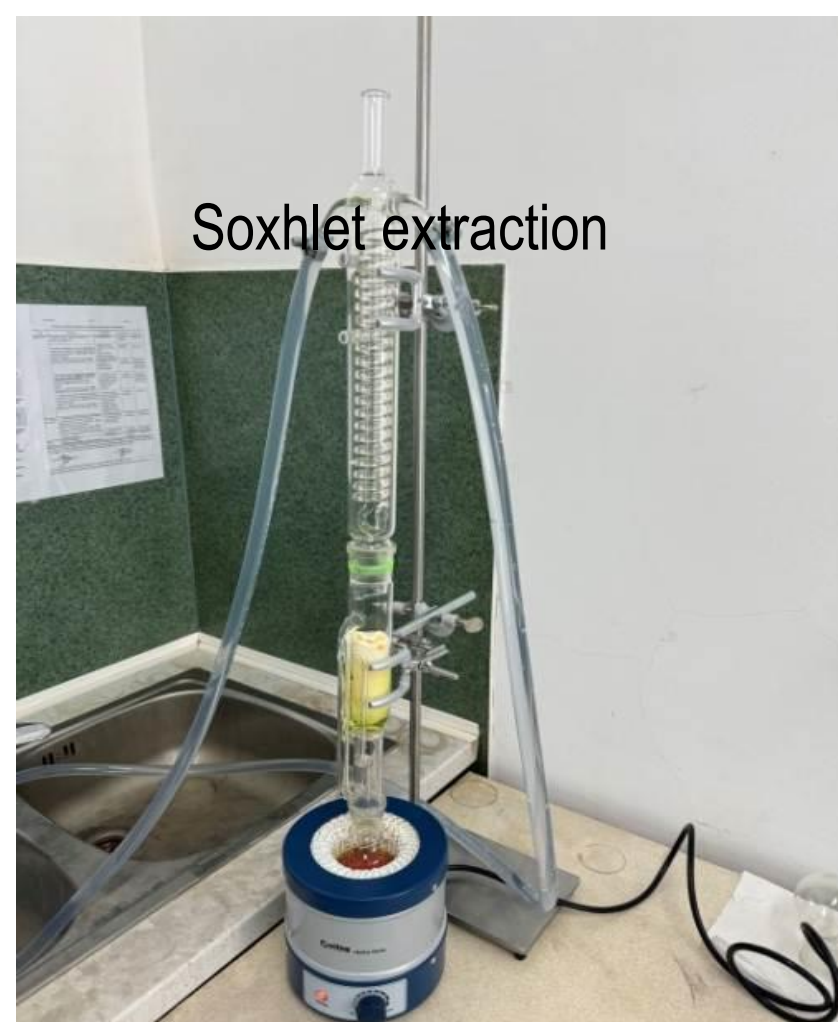
Introduction

Because secondary metabolites are chemical compounds produced in plants that are not directly involved in the normal growth, development or reproduction of an organism, but possess desired beneficial health effects, interest in their isolation and purification has increased considerably in the last 30 years. With the development of modern analytical techniques, including gas chromatography-mass spectrometry (GC-MS), the isolation, purification and structure determination of these compounds from plant extracts has exploded. This advanced technique facilitates the identification of a wide range of phytochemicals. In the present study, bioactive compounds were identified from the acetone extract of turmeric rhizomes by GC-MS analysis.

Material and method

Extraction procedure:

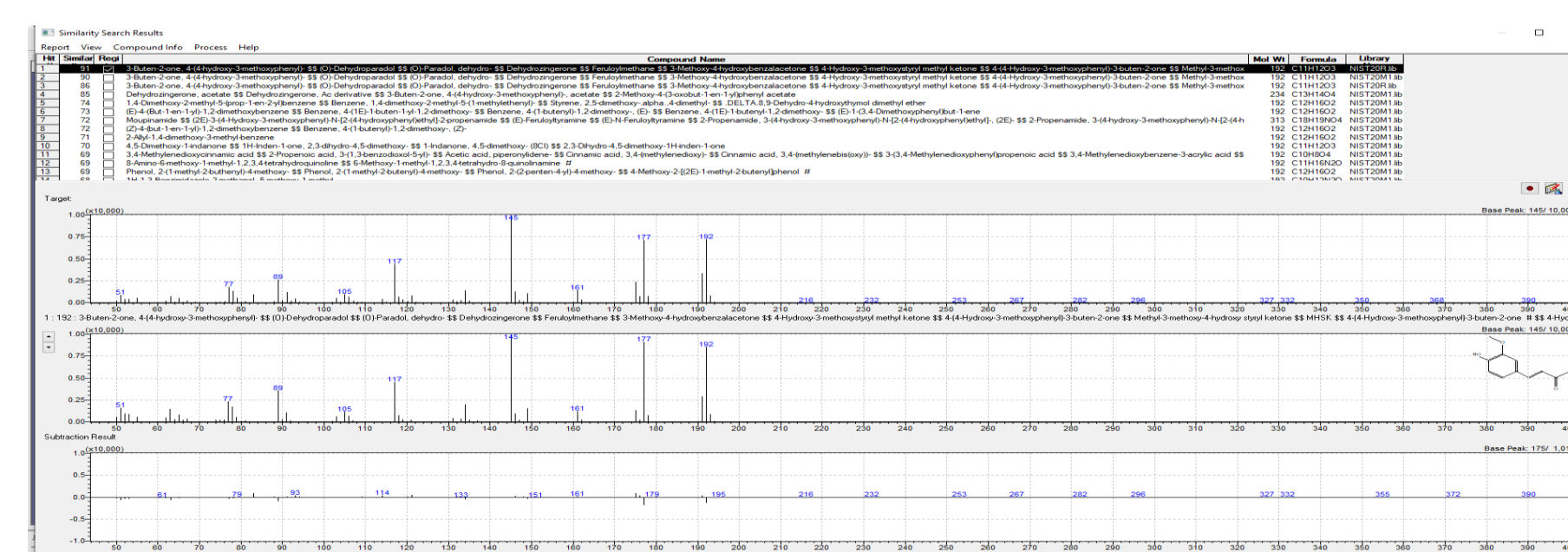
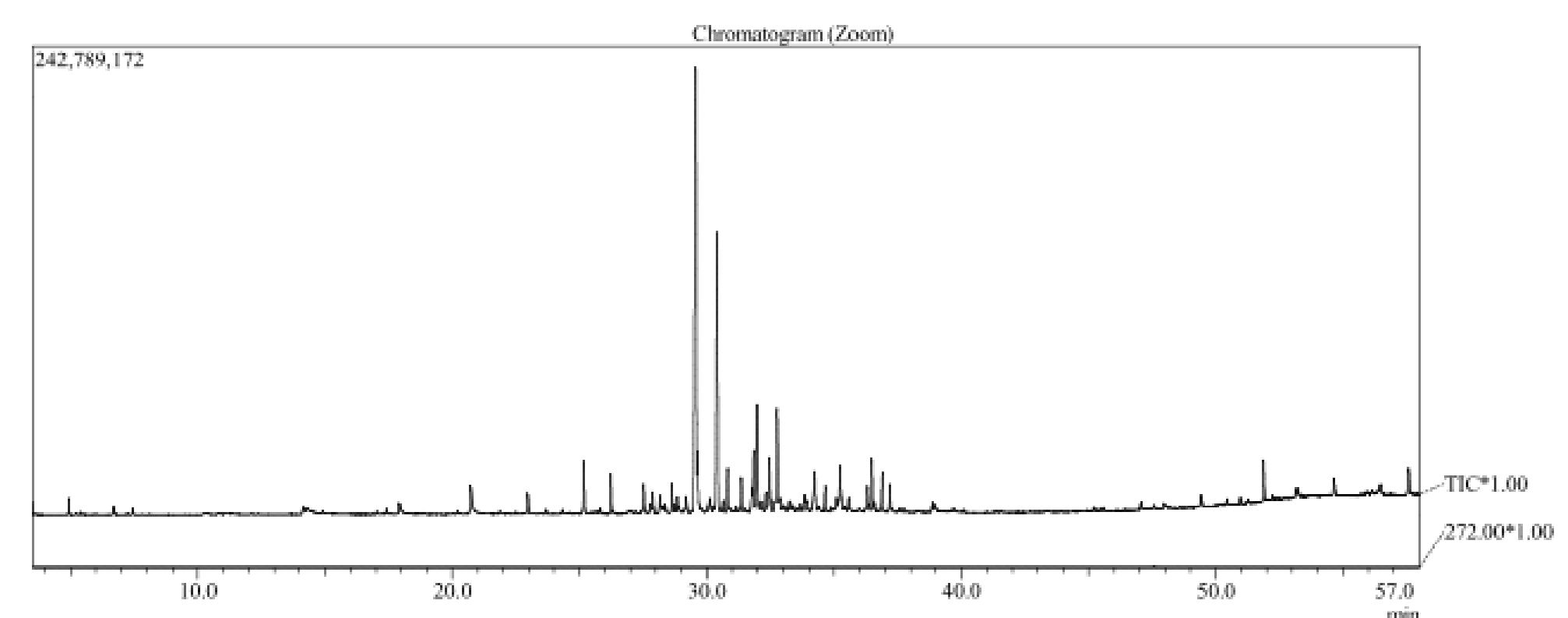
10 g of ground turmeric powder was weighed and incorporated into a thimble, introduced into the Soxhlet apparatus which was gradually filled with acetone as the extraction solvent. The entire process was carried out at 60 °C for a total of 16 extraction cycles.



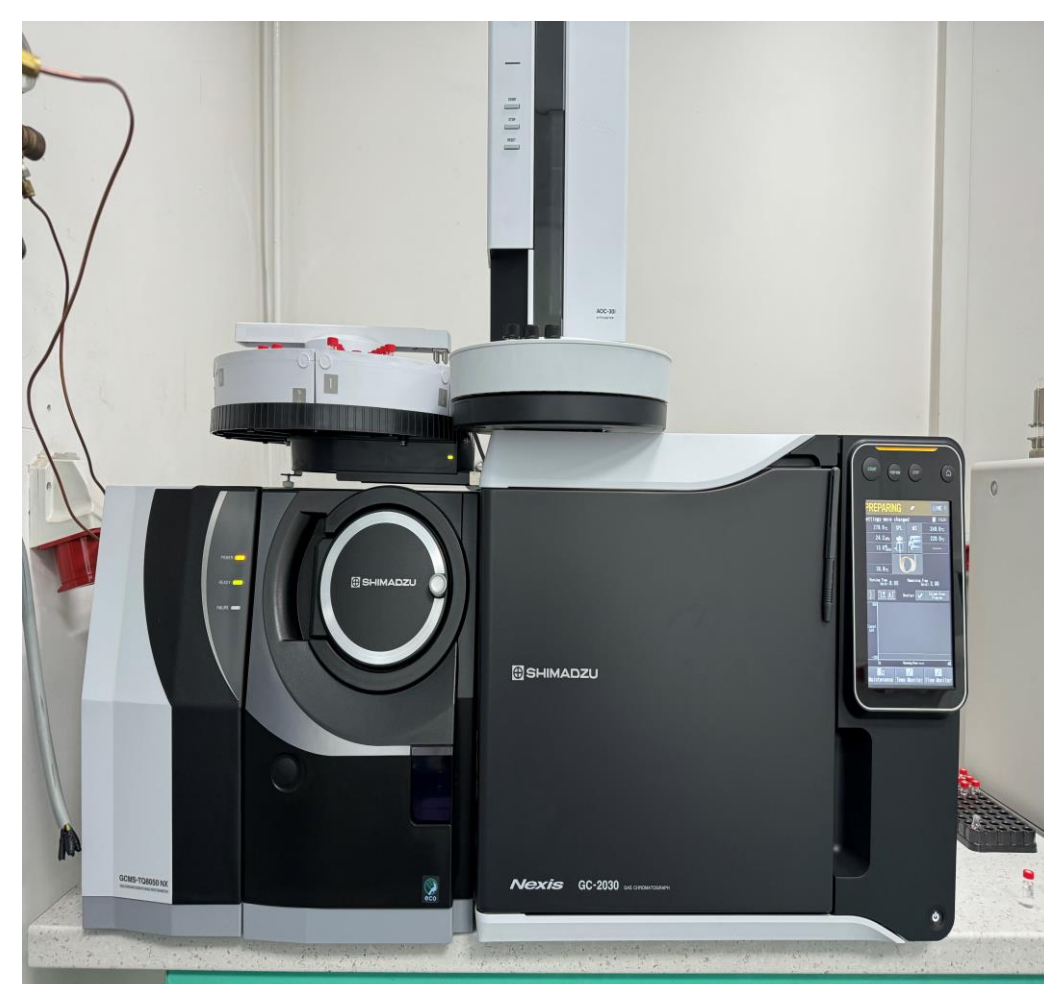
Results and discussions

Most relevant compounds identified in turmeric extract

Retention time(min)	Compound	% of total
14.113	α -guaiacol	2.77
17.890	4-vinylphenol	1.61
20.687	2-methoxy-4-vinylphenol	3.57
25.155	α -curcumene	1.62
25.472	α -zingiberene	0.68
25.807	β -bisabolene	0.17
27.505	2-methyl-6-(p-tolyl)hept-2-en-4-ol	1.06
28.123	1-(2-methoxy-1-methylethyl)-2-methylbenzene	1.05
28.607	(+/-)- dihydro- α R-turmerone	0.84
29.530	α R-turmerone	32.64
30.365	curlone	12.37
30.780	1-(4-hydroxybenzylidene)acetone	1.84
31.345	(6R,7R)-bisabolone	1.24
31.830	2-methyl-2-phenyl-tridecane	2.36
31.947	(E)-atlantone	3.48
32.432	1,7,7-trimethylbicyclo[2.2.1]hept-2-yl ester exo-2-propenoic acid	2.03
32.732	curcumin	5.55
33.379	(Z)- α -atlantone	0.21
33.577	(E)-atlantone	0.30
34.198	6-(5-hydroxy-4-methylenecyclohex-2-en-1-yl)-2-methylhept-2-en-4-one	1.59
35.216	Turmeranol A	1.05
51.849	N-(2,4-dihydroxyphenyl)-4-(1,1-dimethylethyl)-benzamide	1.78



Mass spectrum of curcumin identified by NIST database in turmeric rhizome extract



Conclusions

Nowadays, the population is increasingly concerned about their health, and they pay more and more attention to the function and safety of food supplements. As a result, interest in functional food supplements for maintaining health has increased worldwide. Botanical food supplements isolated from natural plants, such as turmeric, occupy an important part of the market and are constantly growing, and research on optimizing the isolation and purification process of these bioactive substances is in full swing. In the future, there is a need for large clinical studies to provide data on the efficacy and safety of these compounds with biological activity.