



ANTIOXIDANT CAPACITY AND TOTAL POLYPHENOLIC CONTENT OF SUNFLOWER SEED HULLS - A PLENTIFUL BIOWASTE FROM THE FOOD INDUSTRY



Flora Tsvetanova*, Stanislava Boyadzhieva, Greta Naydenova

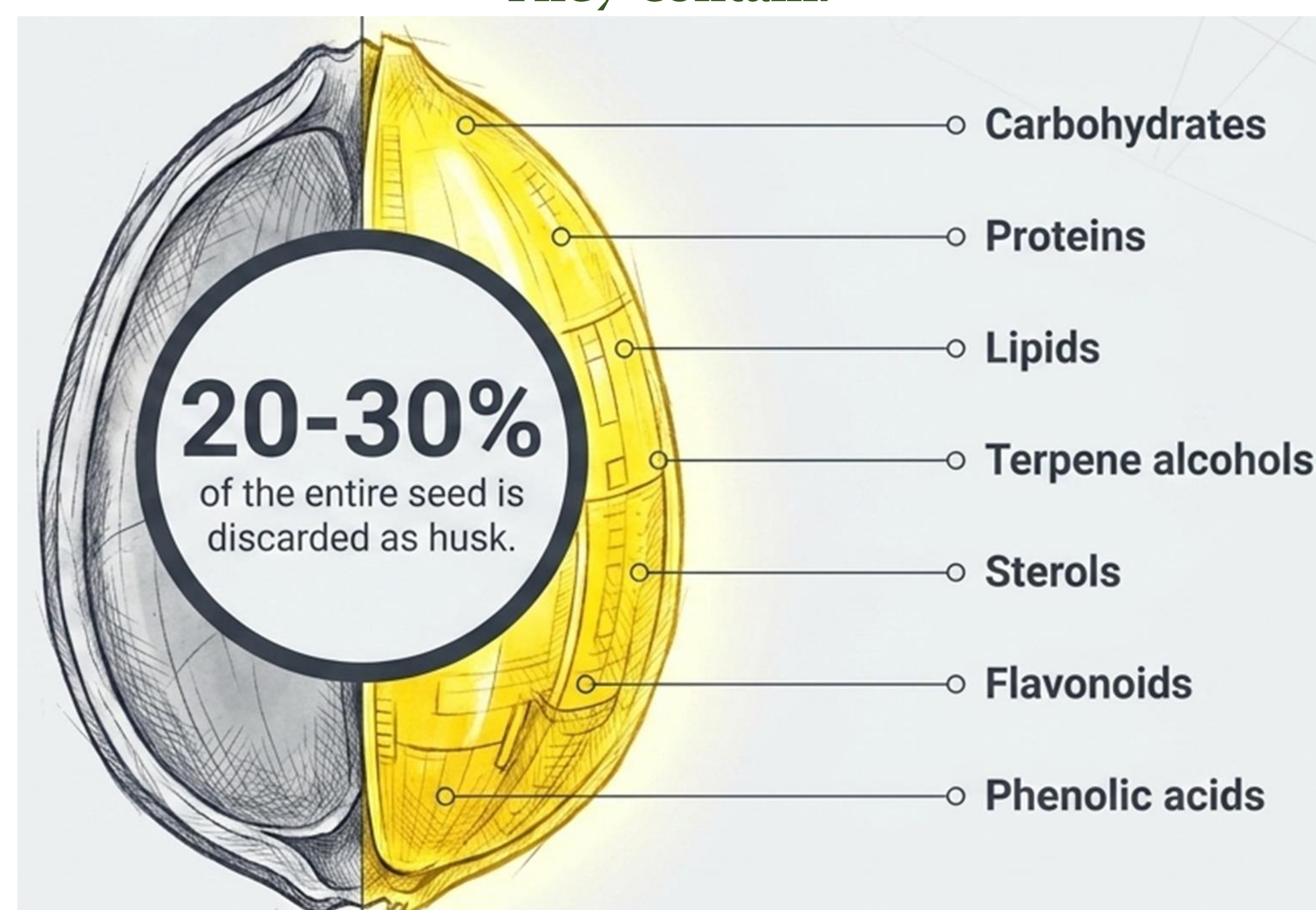
Institute of Chemical Engineering - BAS

*florablue@abv.bg

14 May 2026
Sofia, Bulgaria

Due to the growing interest in the use of natural products and in accordance with the European Zero Waste Directive, scientists are increasingly focusing their attention on studying and valorizing the abundant waste biomass from the food industry. Such examples include sunflower hulls - a waste product of sunflower oil production.

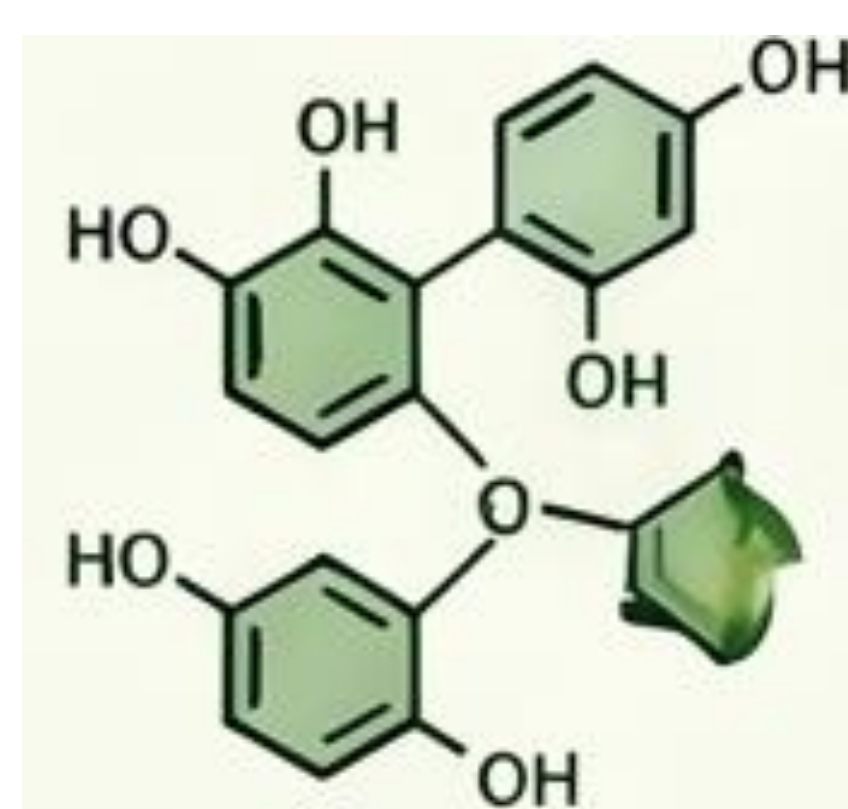
They contain:



Phenolic compounds exhibit a wide range of bioactivities, such as **antioxidant**, **antiallergic**, **anti-inflammatory**, **antimicrobial**, **antithrombotic**, and others.

High phenolic concentration

Hulls contain about 0.7-5.4% phenolic compounds, making this waste product a potential source of valuable bioactive components.



This work focuses on determining the antioxidant capacity of extracts obtained by Soxhlet extraction of sunflower hulls. Green solvents (ethanol and water) were selected for the extraction of phenolic compounds, which, in addition to being safe for human health, do not harm the environment.

The total amount of polyphenols was determined using the Folin-Ciocalteu method, and the antioxidant activity of the extracts obtained was determined using the DPPH method.



COMPARATIVE EXTRACTION RESULTS (Ethanol vs. Water)

Solvent	Yield (%)	TPC (mg GAE/gde)	IC50 (g/l)
Ethanol (EtOH)	4.21	21.60	2.38
Water (H2O)	6.83	38.63	0.72

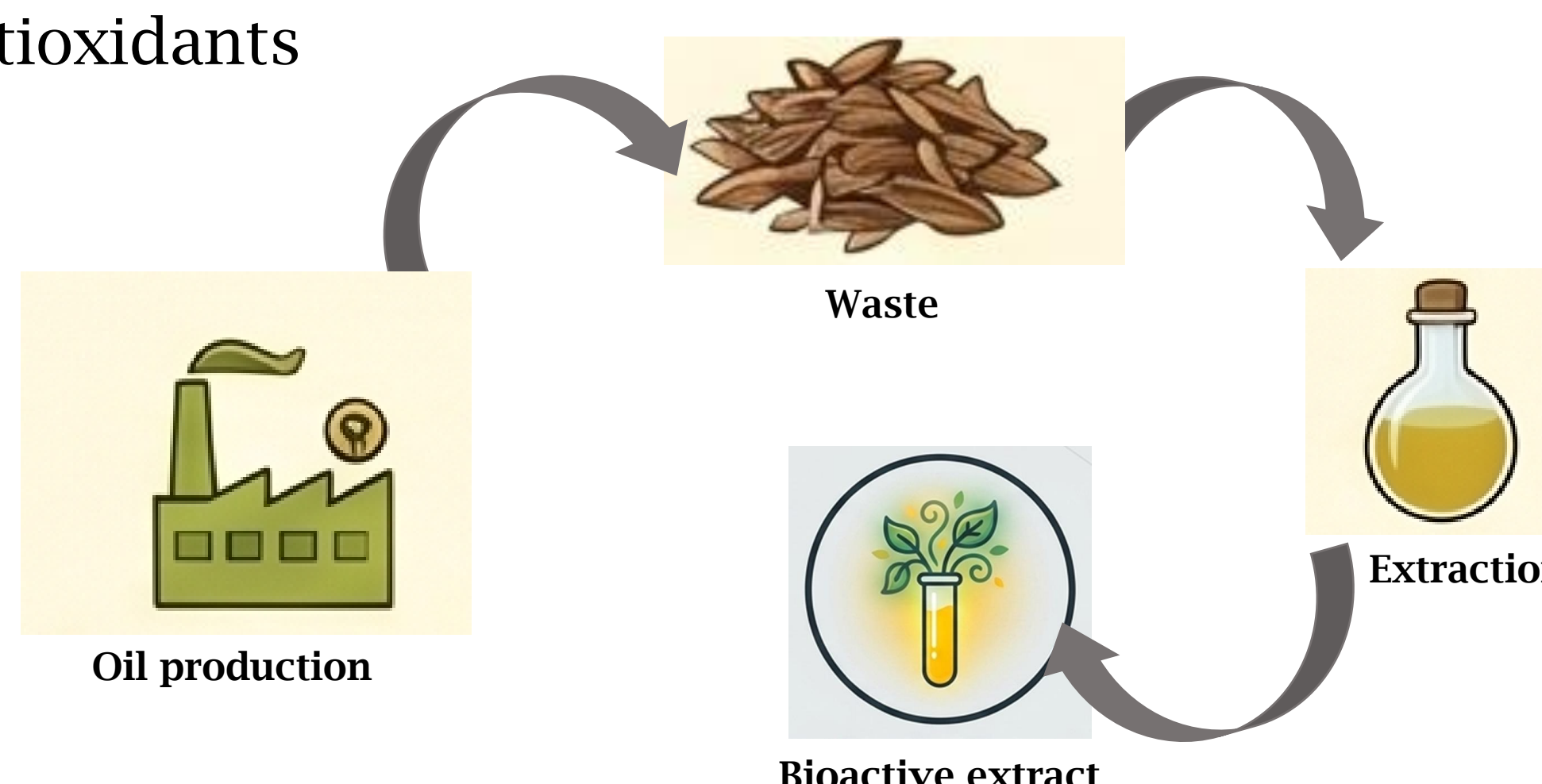
	Folin-Ciocalteu Method	DPPH Radical Method
What it measures	Total volume of polyphenols in the extract.	Antioxidant activity of the extract.
Scientific Goal	Quantitative analysis (Determining the precise concentration of bioactive substances).	Functional analysis (Proving their actual ability to neutralise free radicals).



The two methods work in synergy to prove not just presence, but real-world effectiveness of the extracted antioxidants

Circular Bio-economy:

Valorizing this bio-waste aligns with the European Zero Waste directive, turning industrial waste into a health-promoting resource.



Natural alternatives to synthetics:

Phenolic compounds from hulls can replace synthetic stabilizers and antioxidants in food and supplements.

In the context of maintaining human health, phenolic compounds are of particular importance.

Sunflower hulls are a valuable and inexpensive source of natural antioxidants necessary for the maintenance of human health. Furthermore, phenolic compounds can be used in foods and food supplements as stabilizers and antioxidants, rather than synthetically produced ones. The utilization of this waste product closes the circular bio-economy loop.

The authors gratefully acknowledge the Bulgarian National Science Fund for its financial support via the contract for project for young scientists КП-06-M87/3.