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NODES – Bando a Cascata per le imprese LINEA A

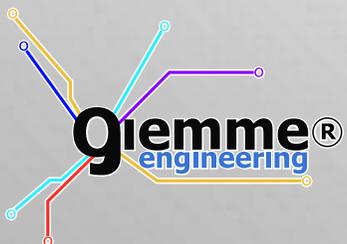
SPOKE N 7 – Agroindustria secondaria

Approvato con Decreto del Direttore Generale 745/2023 del 31/03/2023

# ESAC PROJECT

## Plant Waste Extraction with Water Without Organic Solvents

Project Partners



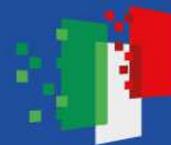
Scientific partner



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## ESAC PROJECT

Plant Waste Extraction with Water Without Organic Solvents

Agri-food industry by-products as raw  
ingredients



Hazelnut skin



Cocoa bean peels



Chestnut skin



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## ESAC PROJECT

Plant Waste Extraction with Water Without Organic Solvents

Selective extraction with **only water as solvent**



**No organic solvents** involved,  
harmful for people and for the  
planet



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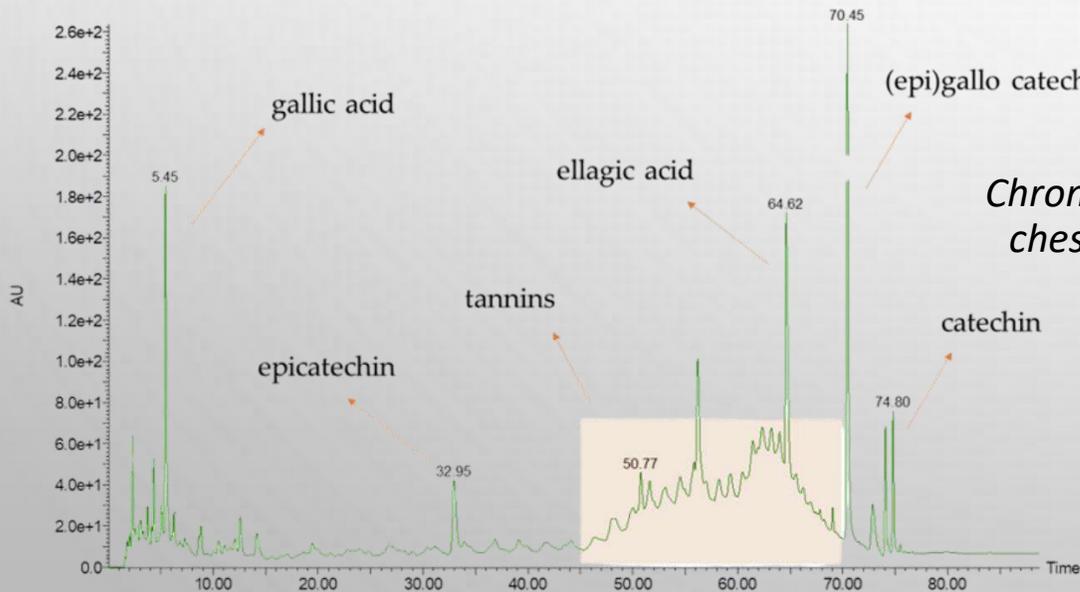
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## ESAC PROJECT

Final products rich in **polyphenols**,  
powerful **natural antioxidants**

Plant Waste Extraction with Water Without Organic Solvents



*Chromatogram LC-MS of  
chestnut peels extract*



*Chestnut peels extract dried with spray-  
drier*



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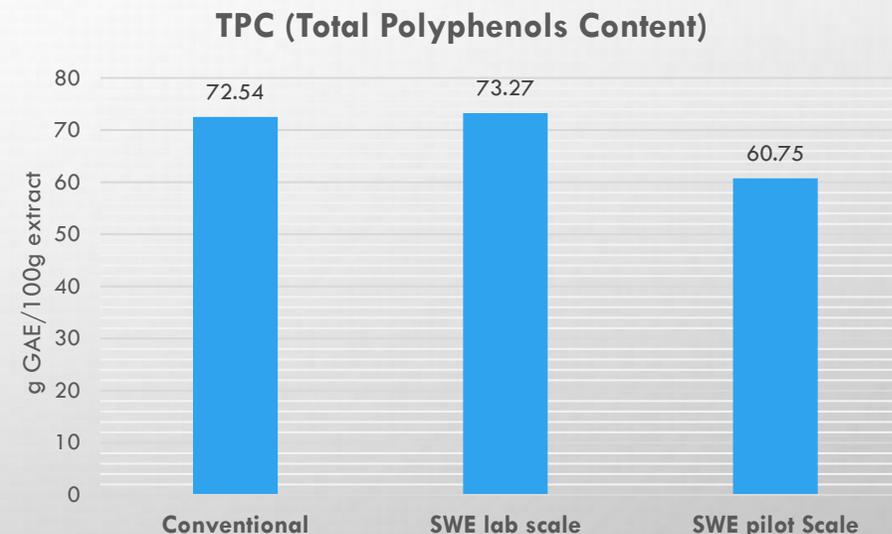
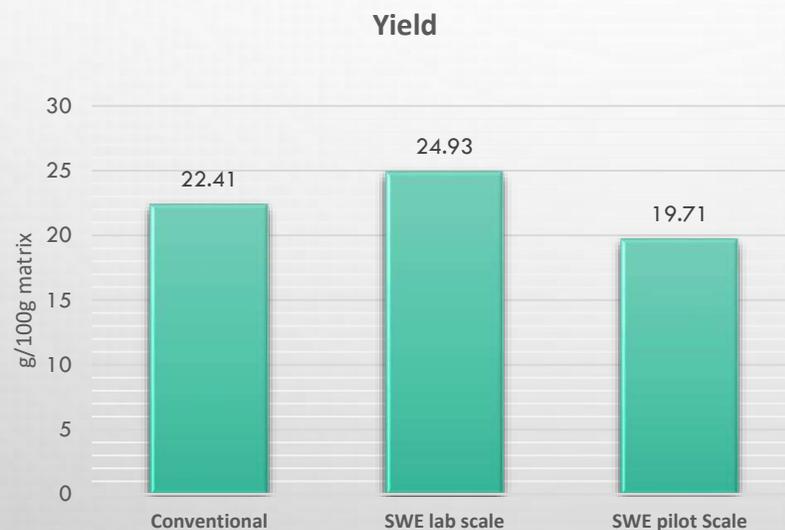
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## ESAC PROJECT

**Extraction yield and selectivity** in terms of **antioxidant action** is comparable with conventional extraction processes that use organic solvents

Plant Waste Extraction with Water Without Organic Solvents



Hazelnuts skin	Yield (g/100g matrix)	TPC (g GAE/100g extract)
Conventional	22,41	72,54
SWE lab scale	24,93	73,27
SWE pilot Scale	19,71	60,75

*Comparison of hazelnuts skin extract yield and selectivity between conventional and subcritical water (SWE) extraction technologies*



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## ESAC PROJECT

Plant Waste Extraction with Water Without Organic Solvents



Extracts (produced in liquid or dried form)  
contains **high value antioxidant** and  
**health related** compounds



Those extracts can serve as  
active ingredients for  
**nutraceutical** and **cosmetic**  
formulations





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## PILOT PLANT

*Bra (CN) – GIEMME headquarters*

Development and efficiency of a  
selective extraction process with  
water



*Water extractor*



*Analytical equipment for extracts  
analysis*





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## SCALE-UP

### PAST

Lab scale tests  
*100 ml – 0,5 lt*



*Acquired Know-How*

### PRESENT

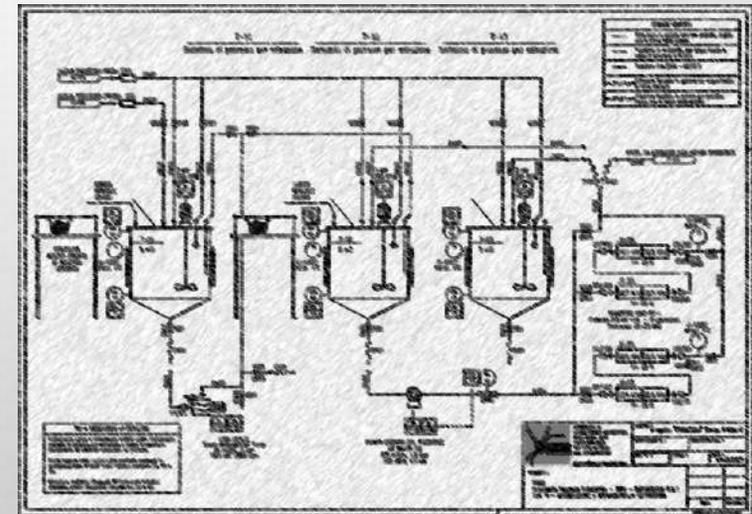
Pilot plant  
*10 - 50 lt*



*Study of scale-up conditions*

### FUTURE

Industrial plant  
*500 – 5'000 lt*



*Commercialization*



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Circular economy

Sustainable development

Green chemistry

Eco-friendly

Zero waste



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## ESAC PROJECT

Plant Waste Extraction with Water Without Organic Solvents

Contact us for more informations!

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We'll be pleased to know **your target specifications** in order to optimize and make **our product the best for you!**