Nutraceutical Potential of Lentinula edodes' Spent Mushroom Substrate: A Comprehensive Study on Phenolic Composition, Antioxidant Activity, and Antibacterial Effects

Filipa Baptista, Joana Campos, Valéria Costa-Silva, Ana Rita Pinto, Maria José Saavedra, Luís Mendes Ferreira, Miguel Rodrigues and Ana Novo Barros

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CITAB

21 million tons by 2026

150 million € annually

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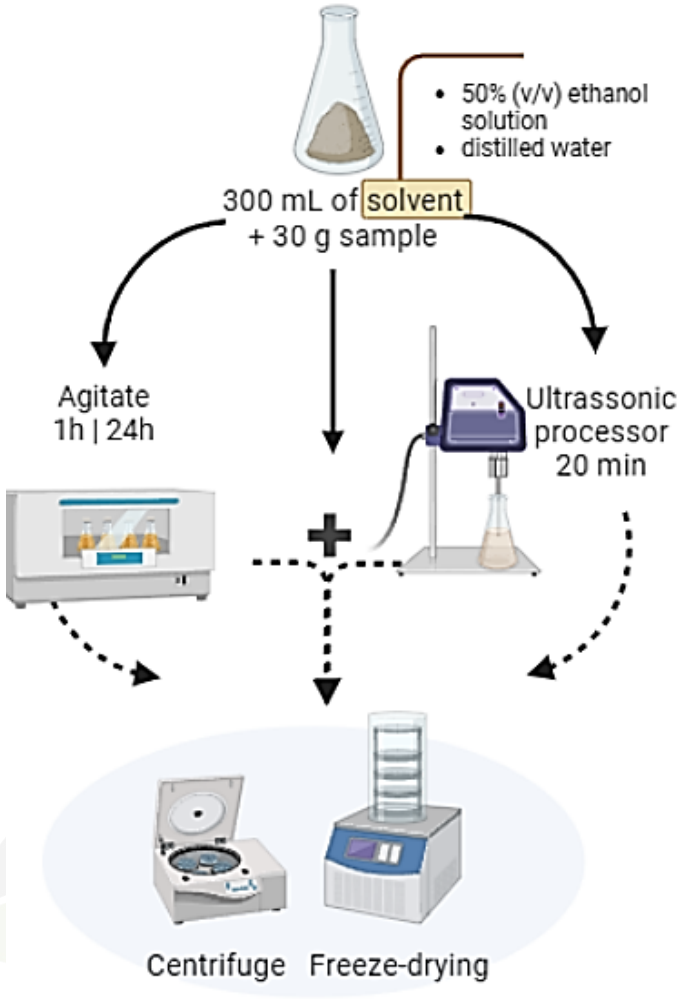
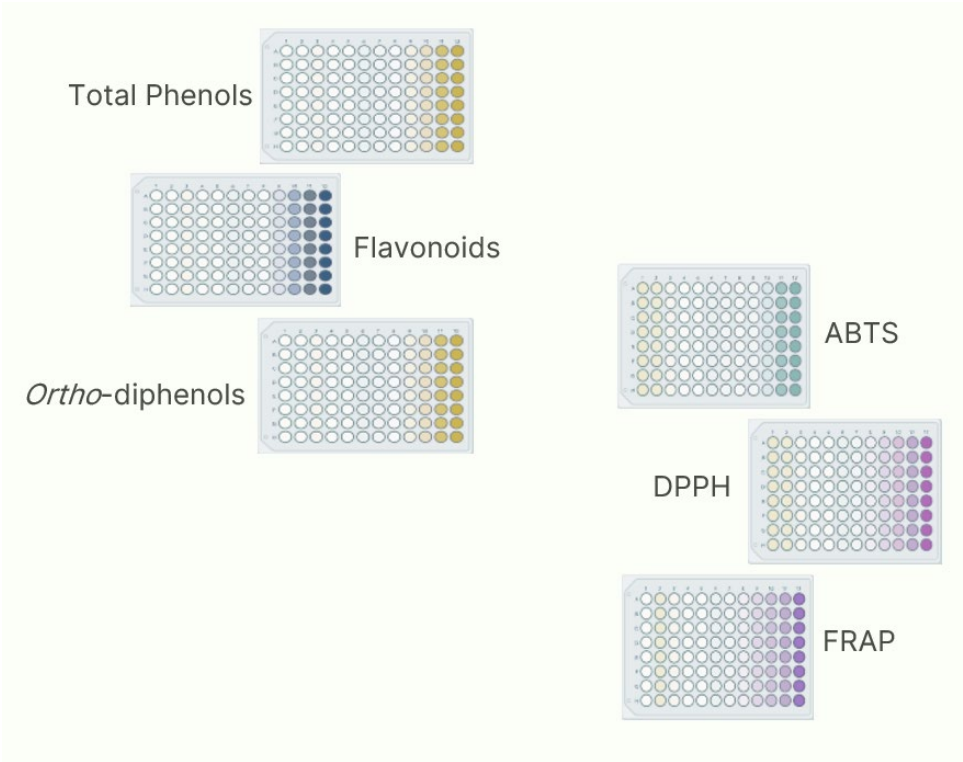
150 million € annually

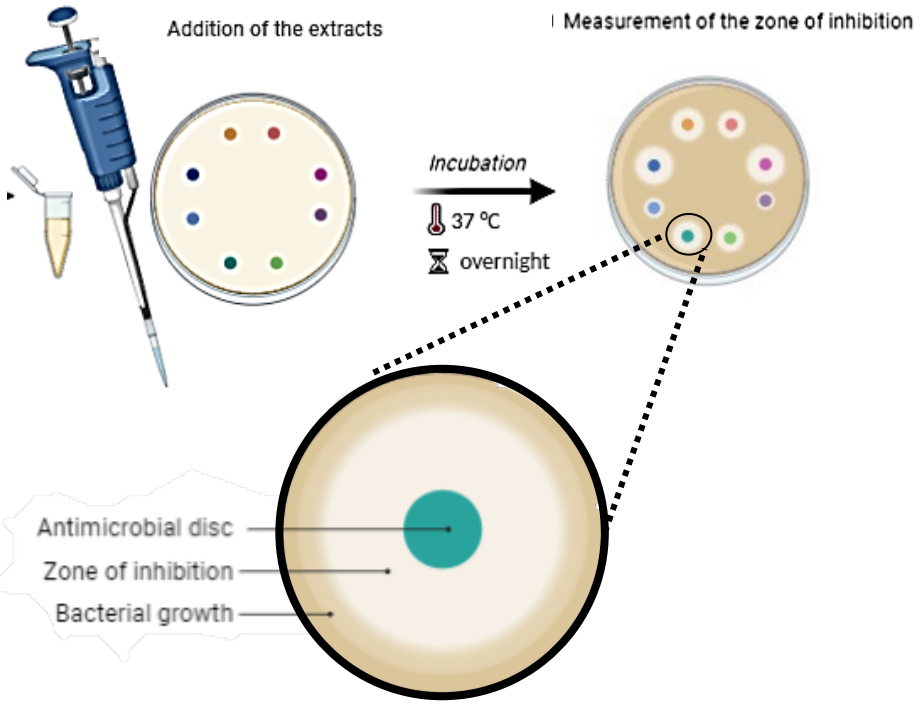
Extraction methods



Phenolic content & Antioxidant capacity

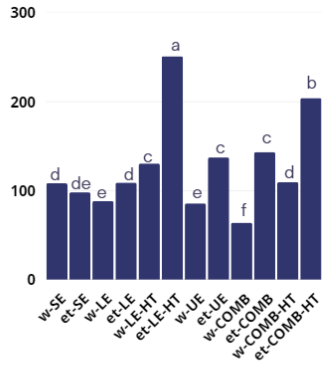


Antibacterial activity

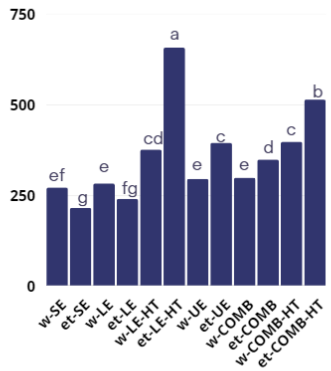


	Isolate	Code	Origin
Gram +	*Staphylococcus aureus*	ATCC 23235	American Type Culture Collection
	Staphylococcus aureus	C511; C612	Rabbit (GIT)
	Enterococcus faecium	C1; C14	Rabbit (GIT)
Gram -	*Escherichia coli*	ATCC 25922	American Type Culture Collection
	Aeromonas hydrophila	C2GSPA1	Horse mackerel (GIT)
	Pseudomonas aeruginosa	C3GSPR1	Horse mackerel (GIT)
	Vibrio fluvialis	RimA1TCBS	Fish (kidney)

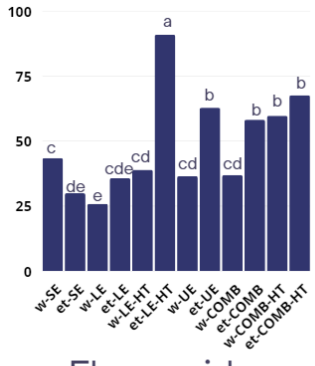
Phenolic content & Antioxidant capacity



Total Phenols
(mg GA g-1)

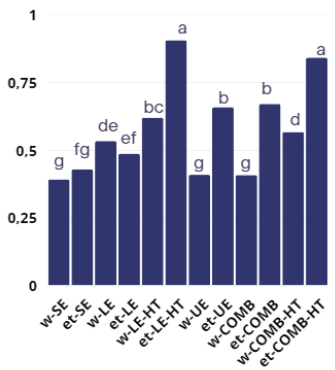


Ortho-dihpenols
(mg GA g-1)

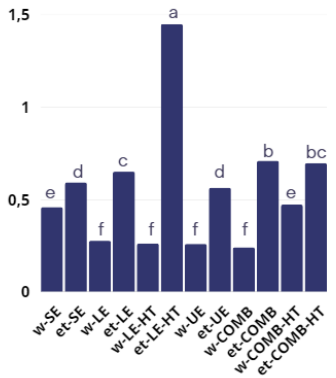


Flavonoids
(mg CAT g-1)

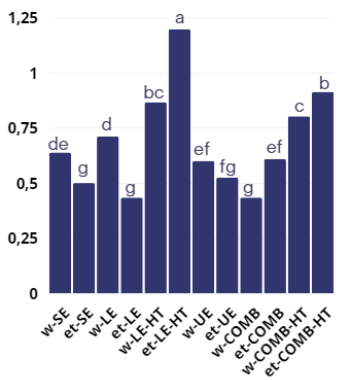
ABTS
(mmol Trolox g-1)

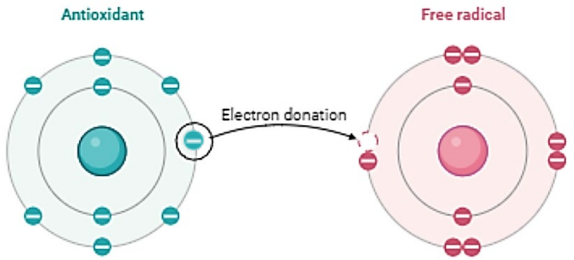


DPPH
(mmol Trolox g-1)

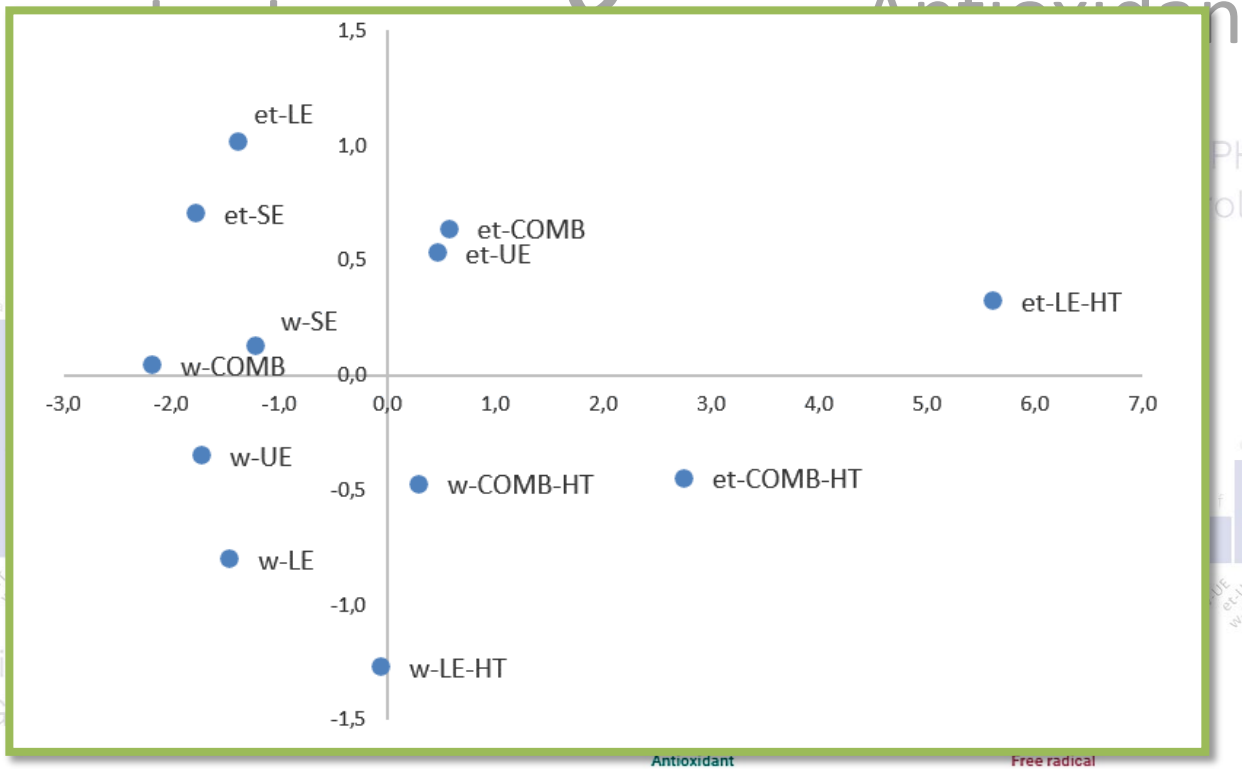


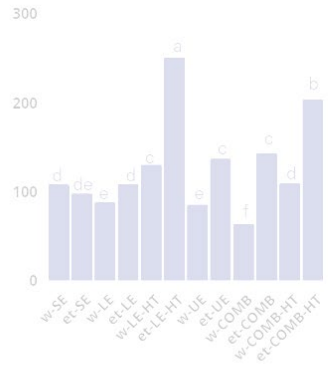
FRAP
(mmol Trolox g-1)



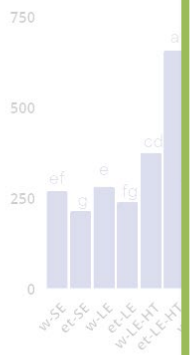


Phenolic & Antioxidant capacity



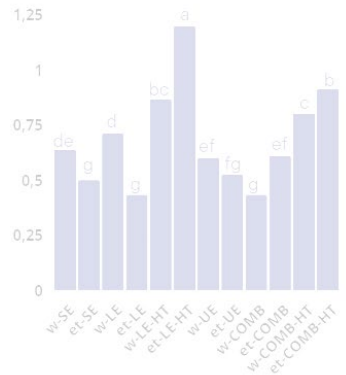


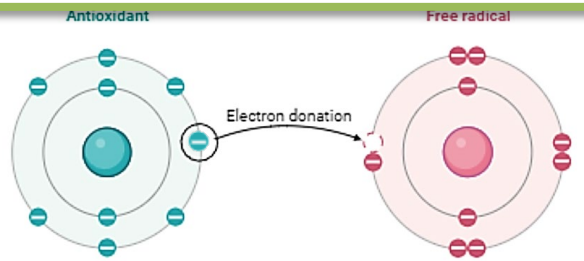
Total Phenols
(mg GA g-1)



Ortho-di
(mg G

PH
olox g-1)





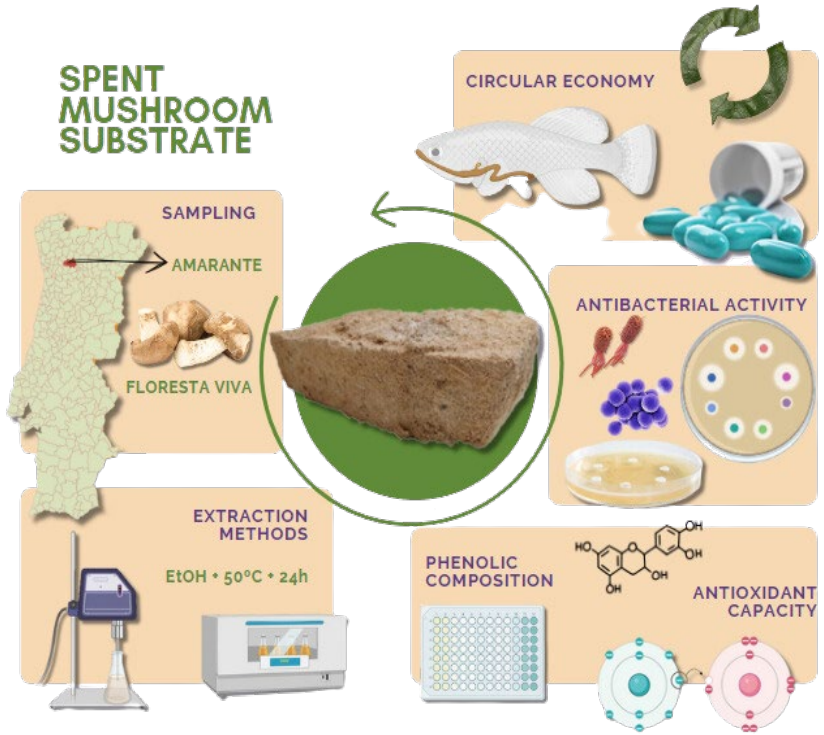
Antibacterial activity

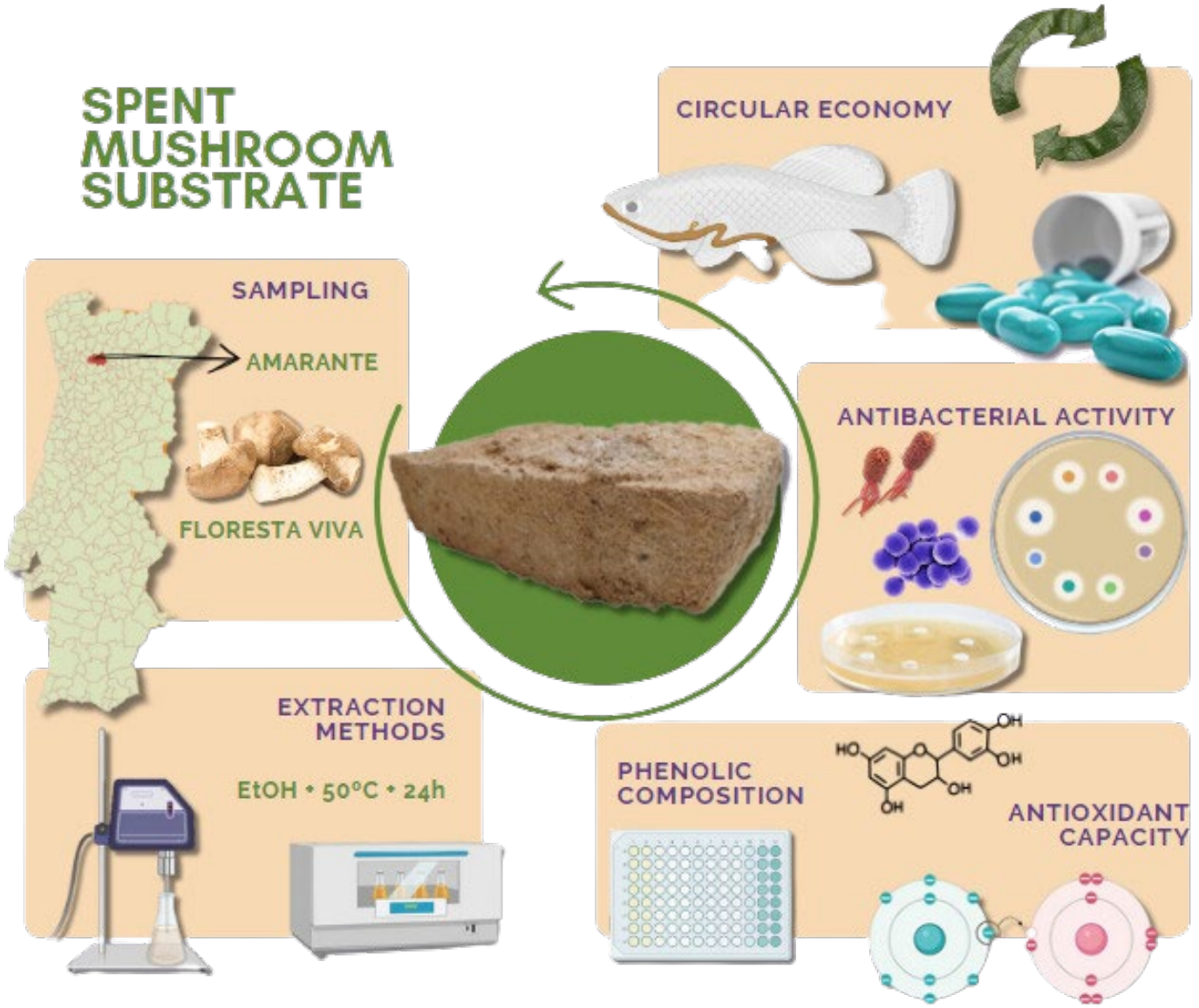
	Gram+									
	S. aureus (ATCC 23235)		*S. aureus* (C511)		*S. aureus* (C612)		*E. faecium* (C1)		*E. faecium* (C14)	
Extracts		CN10		CN10		CN10		CN10		CN10
w-SE	0	88.9	0	86.7	0	97.1	0	88.2	0	93.8
et-SE	38.9	94.4	0	86.7	0	91.2	0	88.2	0	93.8
w-LE	0	88.9	0	93.3	0	97.1	0	94.1	0	100.0
et-LE	38.9	94.4	0	86.7	0	97.1	0	97.1	0	103.1
w-LE-HT	0	94.4	0	100.0	0	100.0	0	94.1	0	100.0
et-LE-HT	38.9	88.9	0	93.3	0	97.1	0	94.1	0	100.0
w-UE	38.9	94.4	0	93.3	0	97.1	0	97.1	0	100.0
et-UE	0	94.4	0	86.7	0	94.1	0	100.0	0	106.3
w-COMB	0	88.9	0	93.3	0	97.1	0	97.1	0	103.1
et-COMB	0	94.4	0	86.7	0	94.1	0	94.1	0	100.0
w-COMB-HT	0	94.4	0	93.3	0	97.1	0	97.1	0	103.1
et-COMB-HT	38.9	100.0	0	100.0	0	97.1	0	102.9	0	109.4

	Gram-							
	E. coli (ATCC 25922)		*A. hydrophila* (C2GSPA1)		*P. aeruginosa* (C3GSPR1)		*Vibrio fluvialis* (RimA1TCBS)	
		CN10		CN10		CN10		CN10
0	0	44.4	88.9	66.7	75.0	30.4	89.1	
0	87.5	0	88.9	75.0	75.0	0	87.0	
0	0	50.0	94.4	75.0	83.3	30.4	87.0	
0	87.5	44.4	83.3	66.7	75.0	0	91.3	
0	43.8	50.0	100.0	75.0	83.3	0	87.0	
0	75.0	55.6	77.8	83.3	108.3	34.8	87.0	
0	100.0	44.4	88.9	66.7	75.0	30.4	87.0	
0	93.8	0	83.3	75.0	75.0	0	87.0	
0	81.3	38.9	88.9	58.3	75.0	0	82.6	
0	75.0	0	83.3	66.7	75.0	0	87.0	
0	81.3	44.4	88.9	66.7	75.0	30.4	87.0	
0	56.3	38.9	88.9	66.7	100.0	66.7	75.0	

Extract selection for animal trials

	Tmáx (°C)	Efficiency (%)		Performance		
				Phenolic	Antioxidant	Antibacterial
w-SE	50	10.21	**	*	*	**
et-SE	50	8.15	*	*	*	**
w-LE	40	9.78	*	*	*	**
et-LE	50	11.40	***	*	*	**
w-LE-HT	40	7.85	*	**	**	**
et-LE-HT	50	12.03	***	***	***	***
w-UE	40	10.74	**	*	*	**
et-UE	40	10.43	**	***	**	*
w-COMB	40	9.63	*	*	*	**
et-COMB	50	11.47	***	**	**	**
w-COMB-HT	40	9.13	*	**	**	*
et-COMB-HT	50	10.41	**	***	***	***




SPENT MUSHROOM SUBSTRATE
CIRCULAR ECONOMY
SAMPLING
AMARANTE
FLORESTA VIVA
ANTIBACTERIAL ACTIVITY
EXTRACTION METHODS
EtOH • 50°C • 24h
PHENOLIC COMPOSITION
ANTIOXIDANT CAPACITY

Thank you!

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MDPI

Article

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