Biotechnological potential of wood-rotting basidiomycetes

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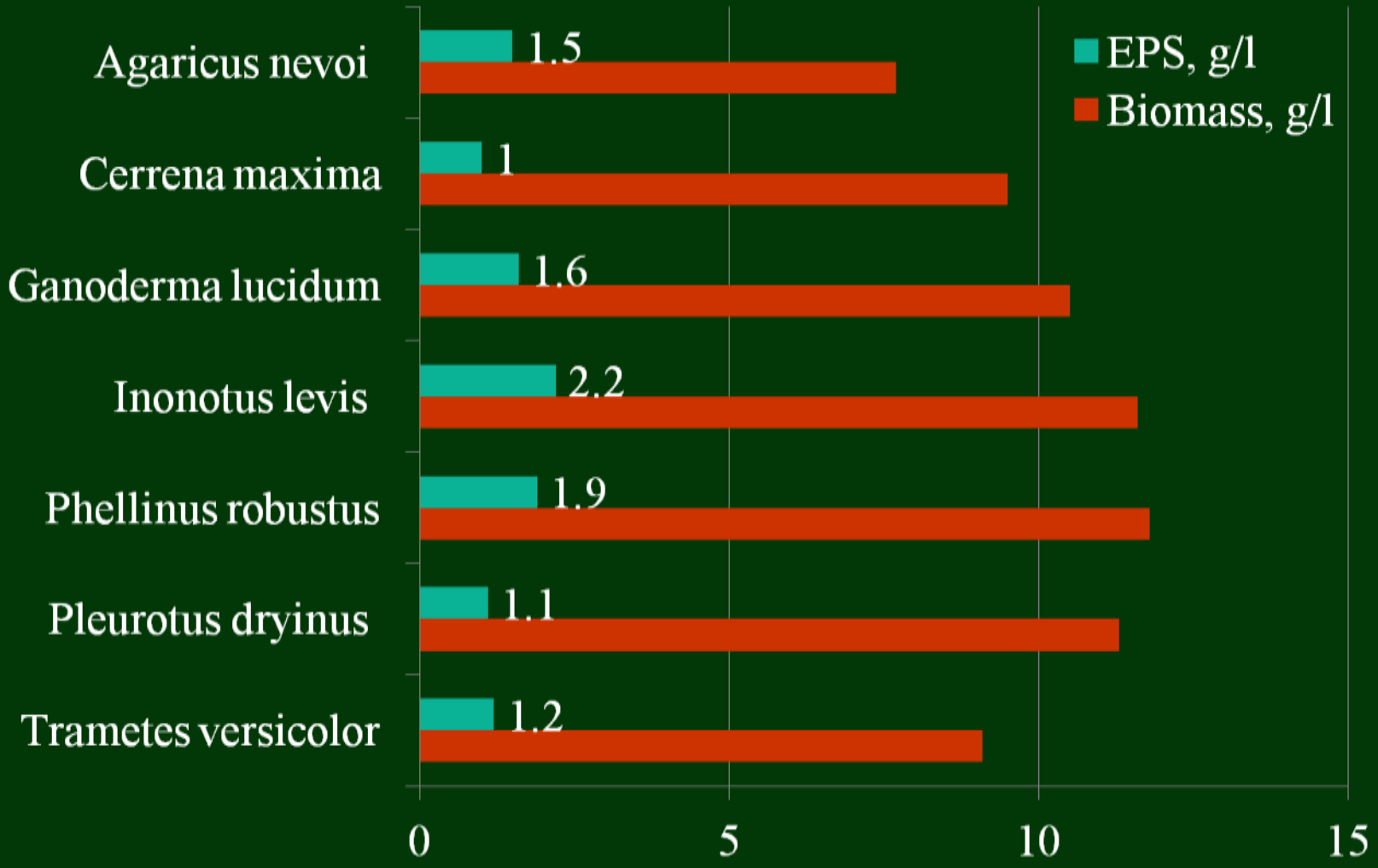
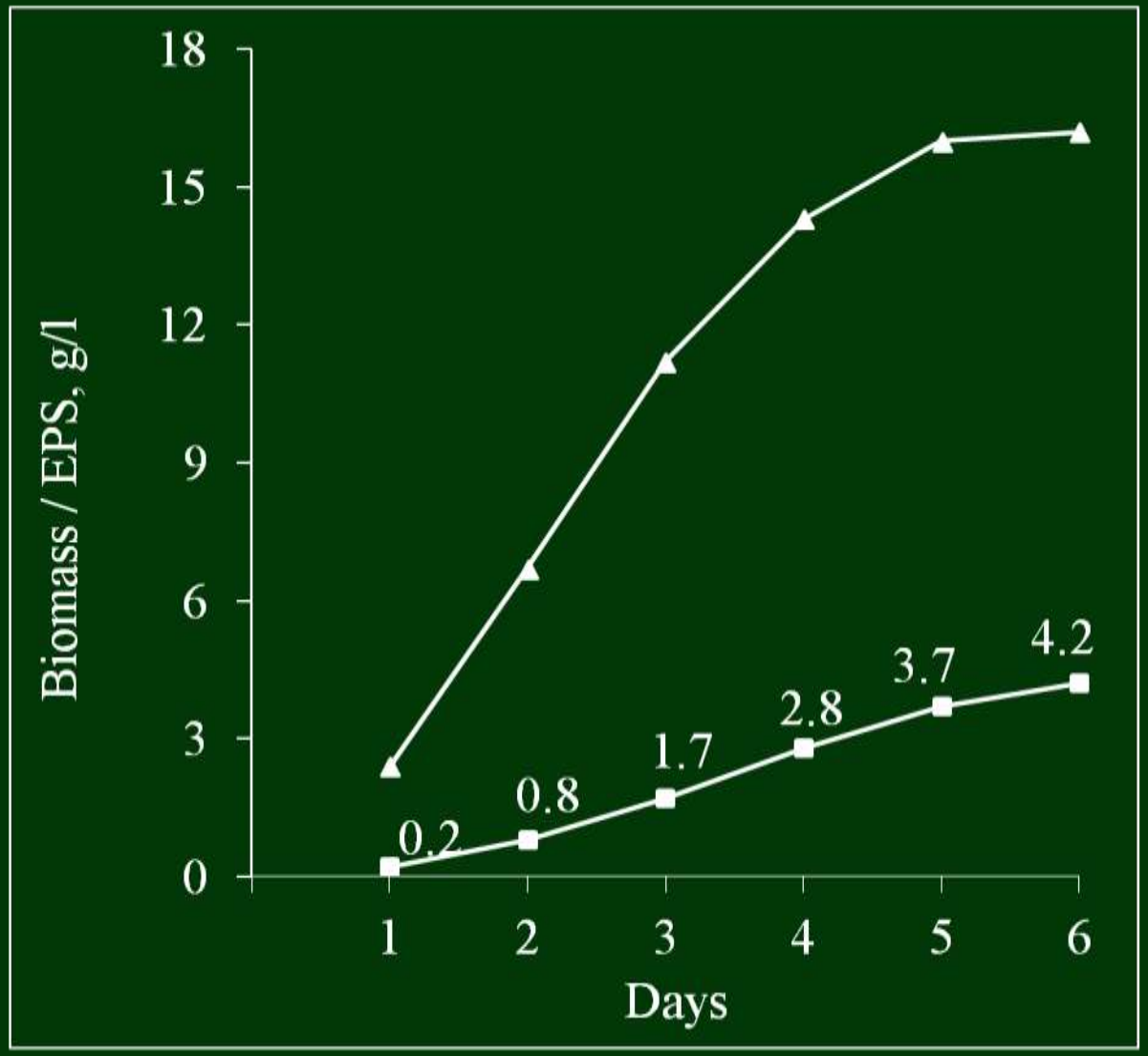
Biomass and EPS production in basidiomycetes submerged cultivation (2% glucose)



Profiles of *Inonotus levis* biomass (▲) and EPS (■) in laboratory fermenter



Basidiomycetes lectin activity in submerged and solid-state fermentation of wheat bran

Fungi	HA titer (T^{-1})		Specific HA (U mg^{-1})	
	SSF	SF	SSF	SF
C. unicolor 301	512	64	4761	1123
F. fomentarius 9	32	32	769	361
F. trogii 146	128	2	323	23
G. applanatum 25	16384	16	166667	286
P. ostreatus 108	256	32	2734	332
P. coccineus 310	4096	16	4462	57
T. versicolor 5	64	2	521	43

Effect of lignocellulosic substrates on the *C. unicolor* biomass and culture liquid lectin activity

Substrate	Specific hemagglutinating activity (U mg^{-1})			
	Biomass		Culture liquid	
Strains	301	302	301	302
Wheat bran	1123	4000	3333	274
EPR	847	303	455	0
Mandarin peels	1785	625	1667	196
Banana peels	641	714	3846	222
Walnut leaves	7692	2500	10000	34
Walnut pericarp	5882	3030	217	31

Basidiomycetes submerged biomass lectins sugar specificity

Fungi	Specificity to sugars
Cerrena unicolor	Gal, GalNAc, Mal
Daedalea quercina	Lac, Arab
Ganoderma applanatum	Mal, Arab, Man
Omphalotus olearius	Rham, Arab, GalNAc
Trametes versicolor	Gal, GalNAc, Rham

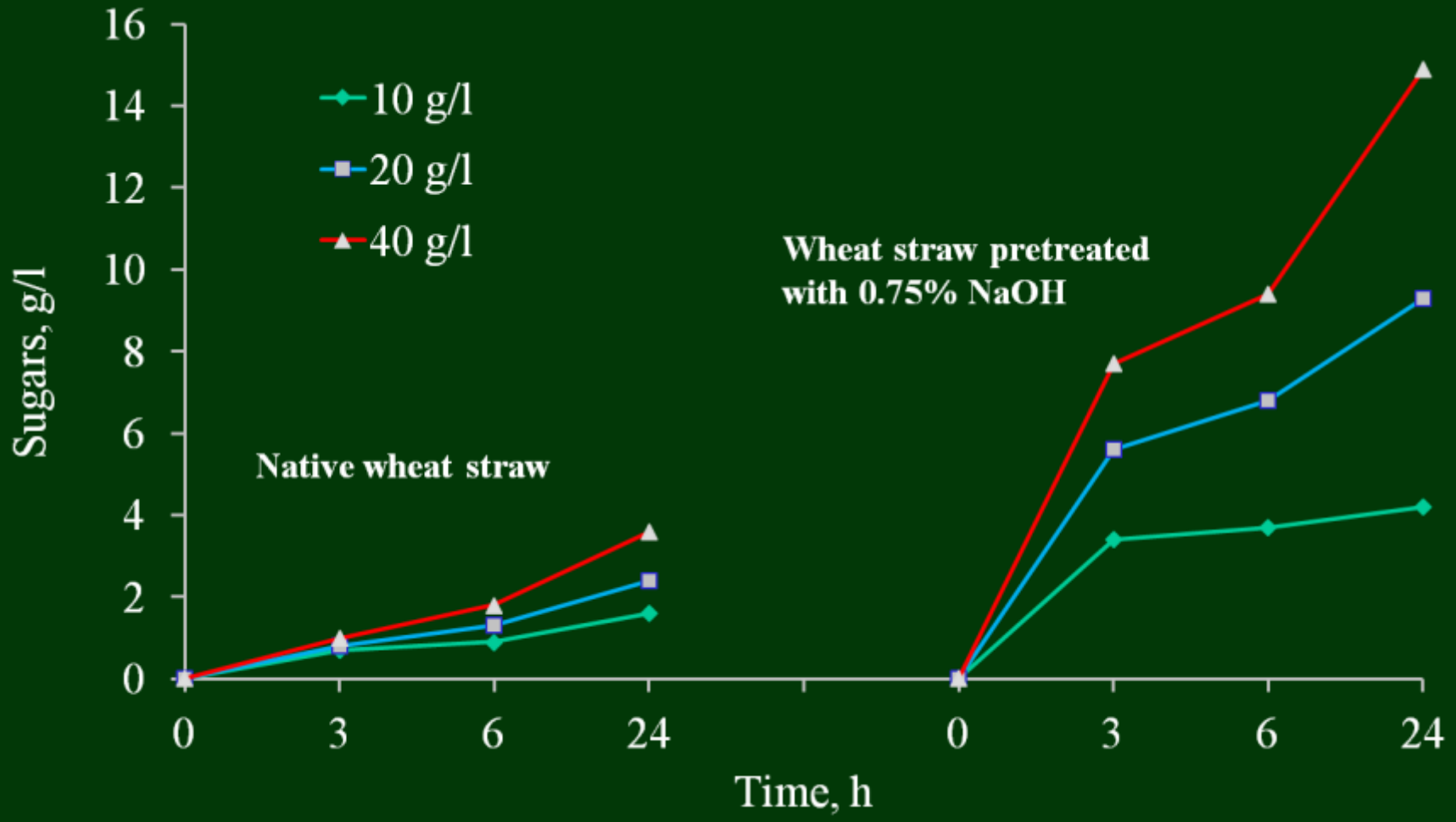
Antioxidant activity of extracts from submerged mycelia (2 mg/ml)

Fungi	Water extract	Ethanol extract
Agrocybe aegerita	65.8	46.6
Armillaria mellea	77.0	71.3
Agaricus nevoi	**86.9**	**92.1**
Coprinus comatus	26.0	0
Flammulina velutipes	**85.3**	77.3
Ganoderma lucidum	**81.2**	77.0
Pleurotus eyingii	62.5	71.5
Phellinus robustus	38.8	17.6
Trametes versicolor	29.5	72.8
BHA, 1 mg/ml	95	

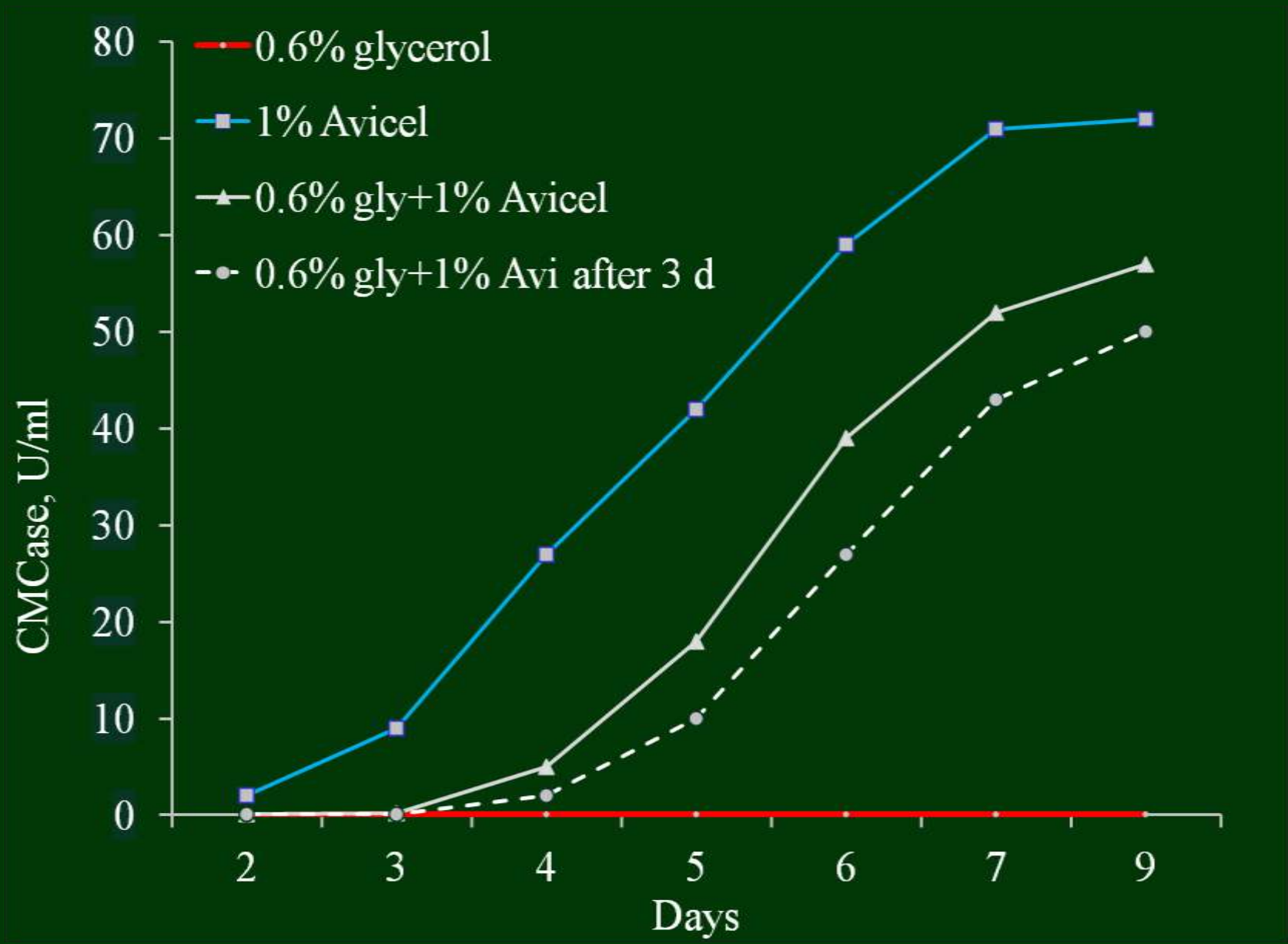
Basidiomycetes hydrolytic enzymes activity

Fungi	CMCase (U ml^{-1})	Xylanase (U ml^{-1})	FPA (U ml^{-1})
I. lacteus (1.5% Avicel)	86	96	4.9
(1.5% Avicel +4% MP)	187	137	6.5
P. coccineus (1.5% A)	79	109	6.1
(1.5% Avicel +4% MP)	90	79	8.9
S. commune (1.5% A)	53	678	5.4
(1.5% Avicel +4% MP)	71	280	7.3

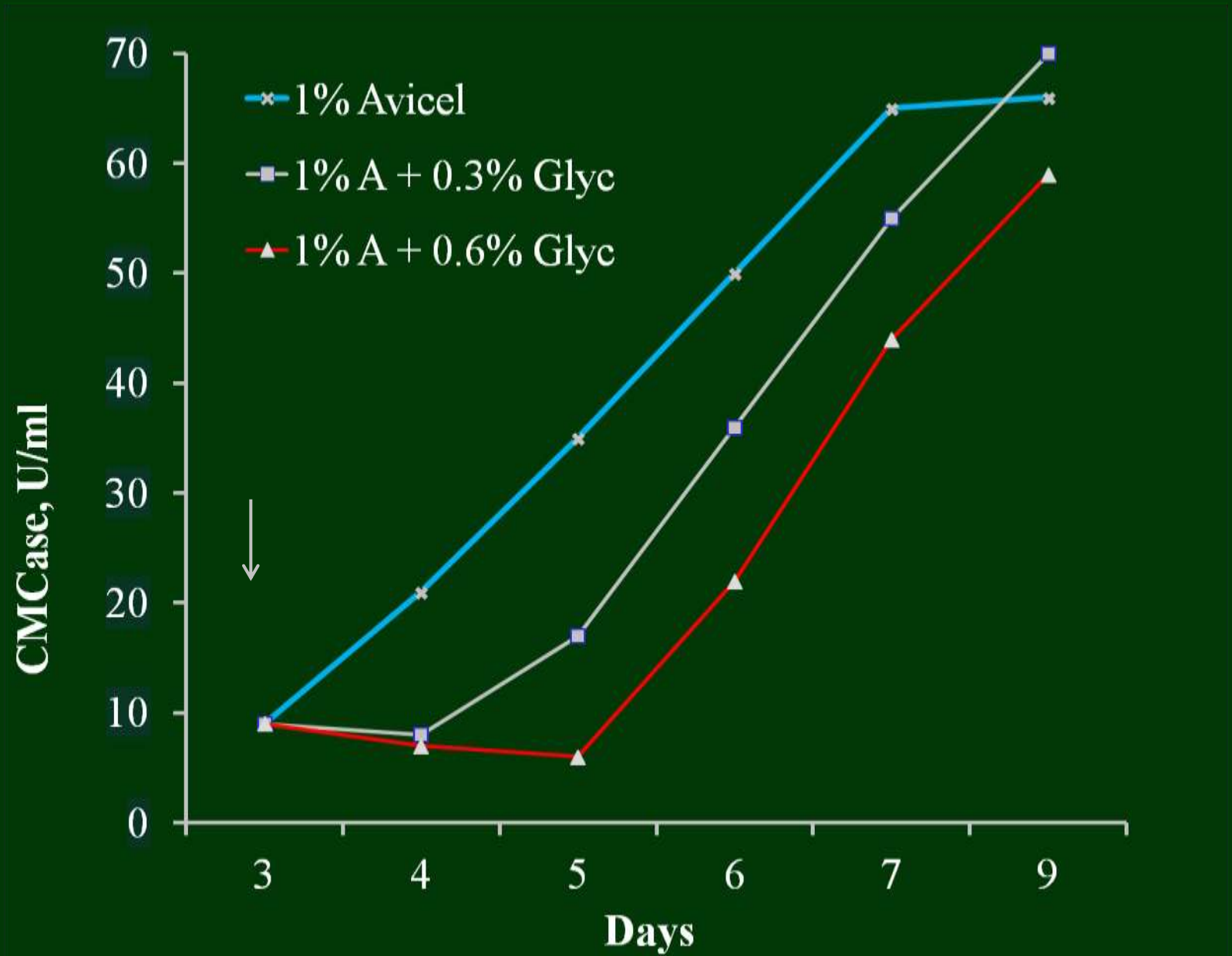
Saccharification of native and pretreated wheat straw (Enzyme load - 10 FPU/g)



Induction of *P. coccineus* cellulase synthesis



P. coccineus cellulase synthesis catabolite repression



Basidiomycetes enzyme activity in submerged fermentation of ethanol production residue

Fungi	Laccase (U ml^{-1})	MnP (U ml^{-1})
Cerrena unicolor 300	**93.1**	**2.41**
Fomes fomentarius 9	1.0	0.08
Ganoderma lucidum 447	61.5	0.10
Omphalotus olearius 174	1.3	0.12
Phellinus robustus 250	0.9	**4.40**
Trametes versicolor 13	19.0	0.90
Trametes zonata 540	0.4	0.10

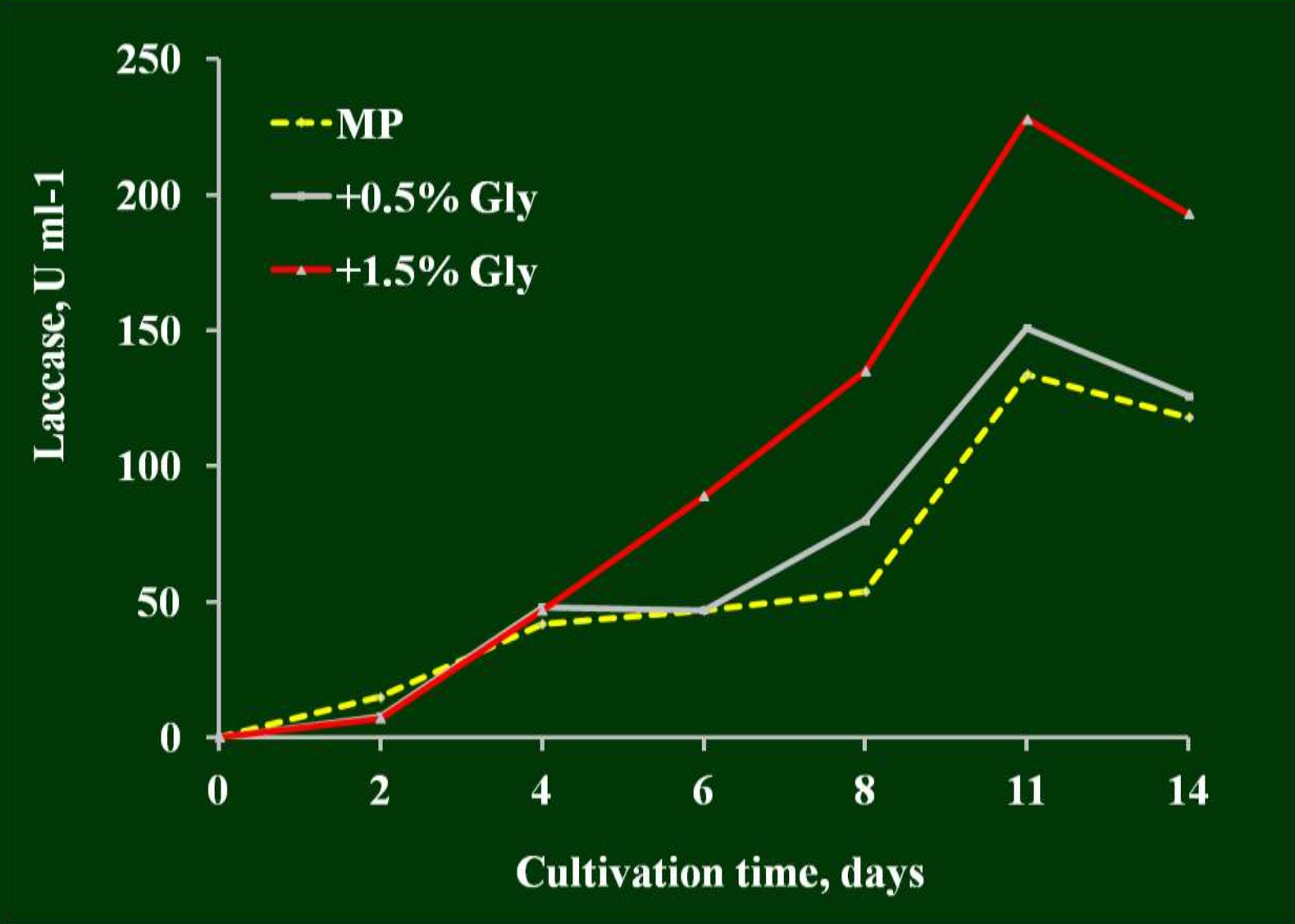
Fungi diversity in laccase activity (U ml^{-1})

Fungi	Glycerol	Mandarin peels
Cerrena unicolor 300	28.5	86.5
Coriolopsis gallica 1184	51.5	95.9
Fomes fomentarius 38	6.1	17.5
Ganoderma adspersum 845	0.3	22.5
Ganoderma lucidum 246	0.1	75.4
Ganoderma tsugae 1032	0.3	21.3
Panus lecometei 159	46.5	38.3
Pleurotus nebrodensis 1019	0.7	2.8
Trametes versicolor 775	14.8	7.3

Diversity toward lignocellulosic substrate (U ml^{-1})

Growth substrate	*C. unicolor*		*P. lecometei*	
	Laccase	MnP	Laccase	MnP
Wheat bran	151.6	0.7	6.3	1.5
Wheat straw	1.7	0.8	2.0	0.7
Mandarin peels	86.5	2.6	38.3	0.5
Banana peels	74.3	3.1	7.6	0.2
Walnut pericarp	15.7	8.3	76.7	0.2
OMW	78.6	2.8	2.1	0.6

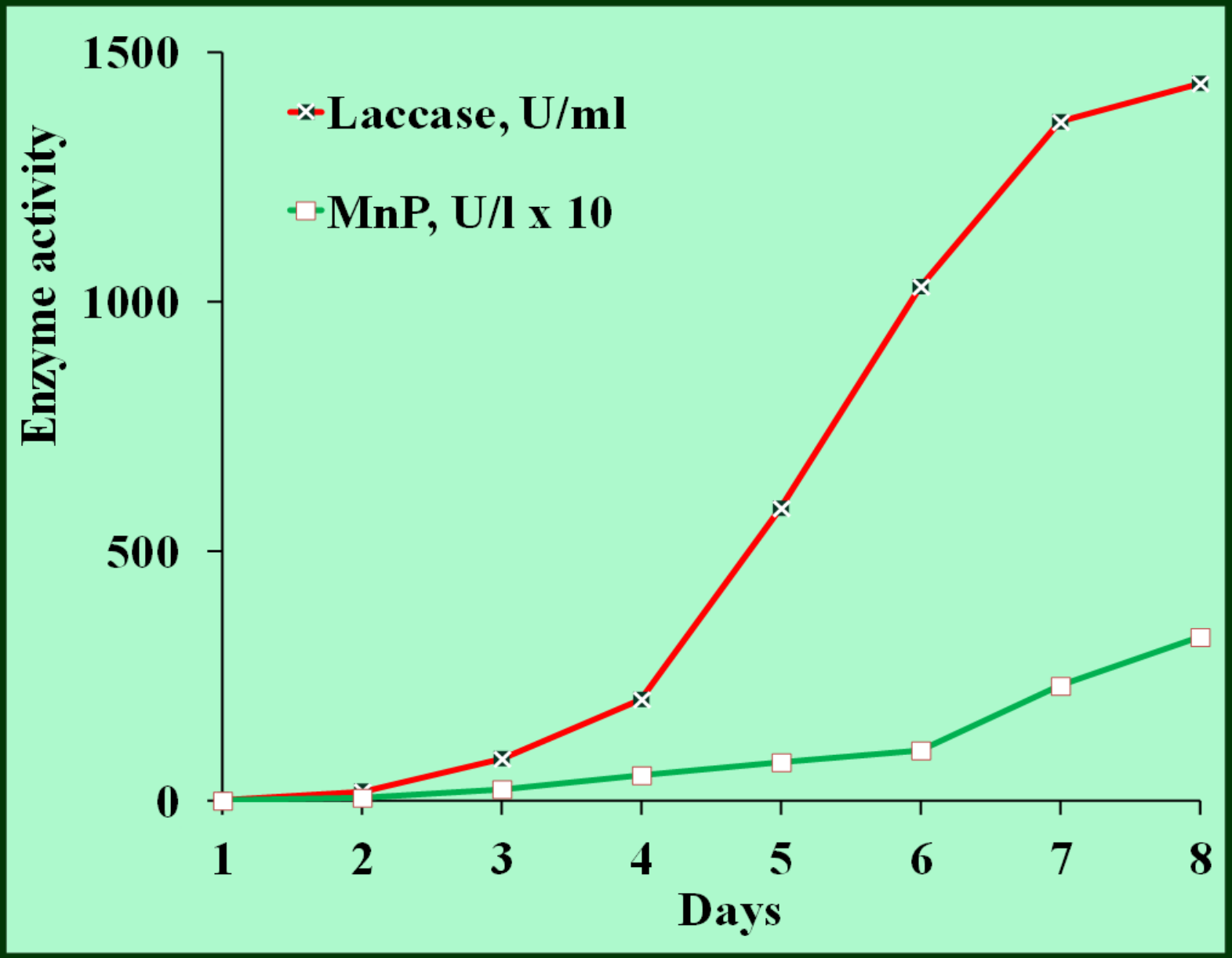
Effect of additional carbon source on the *C. unicolor* laccase production



Effect of aromatic compounds on the *C. unicolor* enzyme activity in mandarin peels-containing medium

Compounds	mM	Laccase, U ml^{-1}	MnP, U ml^{-1}
Control	0	107.7	2.4
Ferulic acid	1.0	93.5	2.8
Hydroquinone	0.3	62.2	1.5
Pirogallol	1.0	179.4	3.2
Veratryl alcohol	1.0	97.4	4.1
Xylidine	1.0	184.7	4.2
TNT	0.3	238.7	3.2

C. unicolor laccase and MnP ptoduction in fermenter



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(54) **OVERPRODUCTION OF LIGNINOLYTIC ENZYMES**

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C12N 9/02	(2006.01)

(52) **U.S. Cl.**

USPC **435/71.1**; 435/171; 435/189

(58) **Field of Classification Search**

None

See application file for complete search history.

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(57) **ABSTRACT**

Methods, compositions, and systems for overproducing lignicolytic enzymes from the basidiomycetous fungus are described herein. As described, the method can include incubating a fungal strain of *Cerrena unicolor* BB 305 in a fermentation system having growth medium which includes lignocellulosic material and then cultivating the fungal strain in the fermentation system under conditions wherein the fungus expresses the lignicolytic enzymes. In some cases, the lignocellulosic material is mandarin peel, ethanol production residue, walnut pericarp, wheat bran, wheat straw, or banana peel.

14 Claims, 3 Drawing Sheets

Thank you for your attention!