

Supplementary Material

Degradation potential of xerophilic and xerotolerant fungi contaminating historic canvas paintings

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1 Supplementary Tables

Table S1: Cultures used in this study, their source and identification.

EXF strain nr.	Fungal name	Source	Support	Paint	Isolation side	Identification DNA barcode: GenBank No.	Reference
10648	<i>Akanthomyces muscarius</i>	painting GM 1	flax canvas	acrylate	V	ITS: MW288713	Zalar et al. 2023
10559	<i>Alternaria</i> sp.	painting GBJ 2	unknown canvas	oil	V	ITS: MW288710	Zalar et al. 2023
10651	<i>Alternaria</i> sp.	painting GM 2	veneer	oil	V	ITS: MW288712	Zalar et al. 2023
7660	<i>Aspergillus conicus</i>	painting RCS 16	flax canvas	oil or greasy tempera	R	<i>BenA</i> : MW357091	Zalar et al. 2023
7677	<i>Aspergillus creber</i>	painting RCS 19	flax canvas	oil	R	<i>BenA</i> : MW357095	Zalar et al. 2023
10360	<i>Aspergillus destruens</i>	painting RCS 25	flax canvas	oil	V	<i>BenA</i> : MW369690	Zalar et al. 2023
7651	<i>Aspergillus destruens</i>	painting RCS 15	flax canvas	oil	R	<i>BenA</i> : MW369703	Zalar et al. 2023
10462	<i>Aspergillus domesticus</i>	painting RCS 24	flax canvas	oil	V	<i>BenA</i> : MW357175	Zalar et al. 2023
10450	<i>Aspergillus infrequens</i>	painting RCS 25	flax canvas	oil	V	<i>BenA</i> : MW357179	Zalar et al. 2023

EXF strain nr.	Fungal name	Source	Support	Paint	Isolation side	Identification DNA barcode: GenBank No.	Reference
10405	<i>Aspergillus jensenii</i>	painting RCS 15	flax canvas	oil	R	BenA: MW357112	Zalar et al. 2023
10353	<i>Aspergillus magnivesiculatus</i>	painting RCS 24	flax canvas	oil	V	BenA: MW357145	Zalar et al. 2023
10425	<i>Aspergillus penicillioides</i>	painting RCS 24	flax canvas	oil	V	BenA: MW357162	Zalar et al. 2023
15555	<i>Aspergillus proliferans</i>	painting ART-4	unknown canvas	oil	R	BenA: PP034129	Zalar et al. 2023
15119	<i>Aspergillus pseudoglaucus</i>	painting RCS 22	hemp and flax canvas	oil or greasy tempera	V	BenA: MW357166	Zalar et al. 2023
14316	<i>Aspergillus pseudoglaucus</i>	mock up sample contamination	wood impregnated with animal glue, oil paint, and Regalrez 1126	oil	V	BenA: PP034128	this study
7678	<i>Aspergillus puulaauensis</i>	painting RCS 19	flax canvas	oil	R	BenA: MW357120	Zalar et al. 2023
10429	<i>Aspergillus reticulatus</i>	painting RCS 21	flax canvas	oil or greasy tempera	R	BenA: MW357169	Zalar et al. 2023
10401	<i>Aspergillus salinicola</i>	painting RCS 22	hemp and flax canvas	oil or greasy tempera	V	BenA: MW357181	Zalar et al. 2023
7656	<i>Aspergillus sloanii</i>	painting RCS 16	flax canvas	oil or greasy tempera	R	BenA: MW357182	Zalar et al. 2023
10431	<i>Aspergillus tardicrescens</i>	painting RCS 25	flax canvas	oil	R	BenA: MW357143	Zalar et al. 2023
10463	<i>Aspergillus vitricola</i>	painting RCS 26	flax canvas	oil	R	BenA: MW357199	Zalar et al. 2023
15210	<i>Aspergillus vitricola</i>	painting RCS 22	hemp canvas	oil or greasy tempera	R	ITS: PP033020	Zalar et al. 2023
10372	<i>Aureobasidium melanogenum</i>	air in RCS depository	-	-	-	ITS: MW288717	Zalar et al. 2023
14317	<i>Aureobasidium pullulans</i>	mock up sample contamination	wood, animal glue, oil paint, Beva 371	oil	V	ITS: PP033021	this study
10556	<i>Beauveria pseudobassiana</i>	painting GBJ 2	unknown canvas	oil	V	ITS: MW288719	Zalar et al. 2023
15111	<i>Bjerkandera adusta</i>	painting RCS 22	hemp and flax canvas	oil or greasy tempera	V	ITS: MW288722	Zalar et al. 2023
10840	<i>Botryotrichum domesticum</i>	painting RCS 24	flax canvas	oil	V	ITS: MW288937	Zalar et al. 2023
7669	<i>Chaetomium cochlioides</i>	painting RCS 16	flax canvas	oil or greasy tempera	R	ITS: MW288932	Zalar et al. 2023
7690	<i>Chaetomium globosum</i>	painting RCS 18	hemp canvas	oil	R	ITS: MW288933	Zalar et al. 2023
10573	<i>Cladosporium allicinum</i>	painting GBJ 1	plywood	oil	V	act: MW387133	Zalar et al. 2023
14315	<i>Cladosporium cladosporioides</i>	mock up sample contamination	glass impregnated with Regalrez 1126	-	-	act: PP034131	this study

EXF strain nr.	Fungal name	Source	Support	Paint	Isolation side	Identification DNA barcode: GenBank No.	Reference
10496	<i>Cladosporium pseudocladosporioides</i>	painting GBJ 2	unknown canvas	oil	V	act: MW369723	Zalar et al. 2023
14314	<i>Cladosporium pseudocladosporioides</i>	mock up sample contamination	glass impregnated with Paraloid B72	-	V	act: PP034132	this study
10492	<i>Cladosporium westerdijkiae</i>	painting GBJ 1	plywood	oil	V	tefI: MW387144	Zalar et al. 2023
10656	<i>Cladosporium xylophilum</i>	painting GM 2	veneer	oil	V	tefI: MW387151	Zalar et al. 2023
15505	<i>Coniochaeta ligninaria</i>	painting ART-4	unknown canvas	oil	V	ITS: OR097691	Zalar et al. 2023
15086	<i>Cylindrobasidium sp.</i>	painting ART-1	flax canvas	oil	V	ITS: MW288728	Zalar et al. 2023
10652	<i>Debaryomyces hansenii</i>	painting GM 2	veneer	oil	V	ITS: MW288763	Zalar et al. 2023
10694	<i>Parengyodontium album</i>	Celje ceiling	linen canvas	tempera	V	ITS: MZ687377	Kavkler et al. 2022
10663	<i>Parengyodontium album</i>	Celje ceiling	linen canvas	tempera	V	ITS: MZ687373	Kavkler et al. 2022
10693	<i>Parengyodontium album</i>	Celje ceiling	linen canvas	tempera	V	ITS: MZ687376	Kavkler et al. 2022
10584	<i>Penicillium bialowiezense</i>	painting RCS 15	flax canvas	oil	V	BenA: MW357228	Zalar et al. 2023
10484	<i>Penicillium brevicompactum</i>	painting GBJ 1	plywood	oil	V	BenA: MW357229	Zalar et al. 2023
10495	<i>Penicillium chrysogenum</i>	painting GBJ 2	unknown canvas	oil	V	BenA: MW357233	Zalar et al. 2023
15508	<i>Penicillium chrysogenum</i>	painting ART-4	unknown canvas	oil	V	BenA: PP034130	Zalar et al. 2023
7655	<i>Penicillium corylophilum</i>	painting RCS 16	flax canvas	oil or greasy tempera	V	BenA: MW357217	Zalar et al. 2023
15064	<i>Penicillium corylophilum</i>	painting ART-1	flax canvas	oil	V	BenA: MW357214	Zalar et al. 2023
10368	<i>Penicillium palitans</i>	painting RCS 26	flax canvas	oil	V	BenA: MW357080	Zalar et al. 2023
10503	<i>Penicillium rubens</i>	painting GBJ 2	unknown canvas	oil	V	BenA: MW357086	Zalar et al. 2023
10557	<i>Penicillium scabrosum</i>	painting GBJ 2	unknown canvas	oil	V	BenA: MW357087	Zalar et al. 2023
15049	<i>Trametes versicolor</i>	air, RCS depository	-	-	-	ITS: MW288749	Zalar et al. 2023
10502	<i>Trichoderma longibrachiatum</i>	painting GBJ 2	unknown canvas	oil	V	ITS: MW288751	Zalar et al. 2023
10120	<i>Wallemia aff. muriae</i>	painting RCS 20	flax canvas	oil and greasy tempera	V	ITS: MW288065	Zalar et al. 2023
10342	<i>Wallemia canadensis</i>	painting RCS 21	flax canvas	oil and greasy tempera	R	ITS: MW288071	Zalar et al. 2023
10650	<i>Zalaria obscura</i>	painting GM 2	veneer	oil	V	ITS: MW288752	Zalar et al. 2023

Legend: GM: Regional Museum Goriški muzej, Solkan (Slovenia); GB: Božidar Jakac Art Museum, Kostanjevica na Krki (Slovenia); RCS: Restoration Centre, Institute for the Protection of Cultural Heritage of Slovenia, Ljubljana (Slovenia); ART-1: painting in church, Koper (Slovenia); ART-4: painting in church, Leskovec at Višnja gora (Slovenia). V: isolated from the verso (front side) of the painting; R: isolated from the recto (back side) of the painting. ITS, internal transcribed spacer region including intervening 5.8S rRNA gene; *act*, partial actin gene; *tef1*, partial translation elongation factor 1-alpha gene; *BenA*, partial beta-tubulin gene; For more information on paintings we refer to Zalar et al. (2023). EXF - designation of fungal strains in Ex, Microbial Culture Collection of the Department of Biology, Biotechnical Faculty, University of Ljubljana (Infrastructural Centre Mycosmo, MRIC UL, Slovenia).

References:

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Table S2: Adaptation to low a_w (xero-tolerance/-phily, halo-tolerance/-phily), growth at different temperatures, production of acids and pigments of tested fungal species.

EXF	Fungal name	XERO	HALO	TEMP	pH	PIGM
10648	<i>Akanthomyces muscarius</i>	1	2	2	0	0
10559	<i>Alternaria</i> sp.	2	1	2	0	1
10651	<i>Alternaria</i> sp.	2	2	2	0	0
7660	<i>Aspergillus conicus</i>	3	3	2	0 [^]	0
7677	<i>Aspergillus creber</i>	3	3	2	0 [^]	0
10360	<i>Aspergillus destruens</i>	3	3	2	0 [^]	0
7651	<i>Aspergillus destruens</i>	4	4	2	0 [^]	0
10462	<i>Aspergillus domesticus</i>	4	4	1	0 [^]	0
10450	<i>Aspergillus infrequens</i>	4	4	3	0 [^]	0
10405	<i>Aspergillus jensenii</i>	3	3	2	0 [^]	1
10353	<i>Aspergillus magnivesiculatus</i>	4	4	4	0 [^]	0
10425	<i>Aspergillus penicillioides</i>	4	4	4	0 [^]	0
15555	<i>Aspergillus proliferans</i>	3	5	1	0	1
15119	<i>Aspergillus pseudoglaucus</i>	3	3	2	0 [^]	1
14316	<i>Aspergillus pseudoglaucus</i>	3	3	2	0	1
7678	<i>Aspergillus puulaauensis</i>	3	3	2	0 [^]	0
10429	<i>Aspergillus reticulatus</i>	3	3	2	0 [^]	0
10401	<i>Aspergillus salinicola</i>	5	3	2	0 [^]	0
7656	<i>Aspergillus sloanii</i>	4	3	2	0 [^]	0
10431	<i>Aspergillus tardicrescens</i>	4	4	2	0 [^]	0
10463	<i>Aspergillus vitricola</i>	4	4	2	0 [^]	0
15210	<i>Aspergillus vitricola</i>	4	4	3	0 [^]	0
10372	<i>Aureobasidium melanogenum</i>	3	2	2	0	0
14317	<i>Aureobasidium pullulans</i>	2	3	2	0	0
10556	<i>Beauveria pseudobassiana</i>	1	1	2	0	0
15111	<i>Bjerkandera adusta</i>	0	0	3	0	0
10840	<i>Botryotrichum domesticum</i>	1	0	2	0	0
7669	<i>Chaetomium cochlioides</i>	1	1	2	0	0
7690	<i>Chaetomium globosum</i>	1	0	2	0	1
10573	<i>Cladosporium allcinum</i>	2	2	3	0	0
14315	<i>Cladosporium cladosporioides</i>	3	2	2	0	1
10496	<i>Cladosporium pseudocladosporioides</i>	2	2	2	0	0
14314	<i>Cladosporium pseudocladosporioides</i>	3	2	3	0	0
10492	<i>Cladosporium westerdijkiae</i>	2	2	3	0	0
10656	<i>Cladosporium xylophilum</i>	2	2	3	0	0
15505	<i>Coniochaeta ligninaria</i>	1	1	3	0	0
15086	<i>Cylindrobasidium</i> sp.	1	0	3	0	0
10652	<i>Debaryomyces hansenii</i>	3	3	3	0	0
10694	<i>Parengyodontium album</i>	1	2	3	0	0

10663	<i>Parengyodontium album</i>	1	2	2	0	0
10693	<i>Parengyodontium album</i>	1	2	3	0	0
10584	<i>Penicillium bialowiezense</i>	3	3	2	1	0
10484	<i>Penicillium brevicompactum</i>	3	3	2	1	0
10495	<i>Penicillium chrysogenum</i>	3	3	3	2	1
15508	<i>Penicillium chrysogenum</i>	3	3	3	2	1
7655	<i>Penicillium corylophilum</i>	3	3	2	1	0
15064	<i>Penicillium corylophilum</i>	3	3	3	1	1
10368	<i>Penicillium palitans</i>	3	3	2	2	0
10503	<i>Penicillium rubens</i>	3	3	3	1	1
10557	<i>Penicillium scabrosum</i>	3	3	2	2	1
15049	<i>Trametes versicolor</i>	1	0	3	0	0
10502	<i>Trichoderma longibrachiatum</i>	1	1	3	0	1
10120	<i>Wallemia aff. muriae</i>	4	4	2	0^	0
10342	<i>Wallemia canadensis</i>	3	3	2	0^	0
10650	<i>Zalaria obscura</i>	2	3	3	0	0

Legend: Activities are shown as groups according to four criteria: (i) 0-5 shown in red, (ii) 1-4 shown in green, (iii) 0-2 shown in blue, (iv) 0-1 shown in yellow; 0 = no activity; 1, 2 or 5 = maximum activities, except for the green criteria; XERO: xerophily; 0= non-xerotolerant fungi (growth only in medium without added glycerol); 1= weakly xerotolerant (growth on agar media without and with 18% glycerol); 2= moderately xerotolerant; 3= moderately xerophilic (growth on all tested agar media); 4= obligately or extremely xerophilic fungi growing on 18% glycerol; 5= obligately or extremely xerophilic fungi growing only on 30 and 40% glycerol. HALO: halophily; 0= non-halotolerant (no growth on media supplemented with 10% NaCl); 1= weakly halotolerant (growth without and with 10% NaCl); 2= moderately halotolerant (growth without and with maximally 15% NaCl); 3= moderately halophilic (growth at 10, 20, and 25% NaCl); 4= obligately or extremely halophilic fungi growing only in the presence of 10 or 15% NaCl; and 5= obligately or extremely halophilic fungi growing at minimally 15% NaCl. TEMP: temperature test (1=growth at 15 °C, no growth at 24 and 37 °C; 2= growth at 15 °C and 24 °C, no growth at 37 °C; 3= growth at 15, 24 and 37 °C; 4= growth at 24 and 37 °C, no growth at 15 °C. pH: acid production (0= no change in pH, final pH 6.0–6.1; 1= final pH 5.0–5.9; 2= final pH 4.0–4.9). PIGM: production of soluble pigments (0= no production; 1= pigment production), ^ addition of 10% NaCl. Strain numbers in bold: obligate or extreme xerophiles.

Table S3: Enzymatic (amylase, endocellulase, β -glucosidase, caseinase, gelatinase, esterase, lipase, lecithinase, laccase, urease, and DNase) and other activities (assimilation of hydrocarbons, dissolution of CaCO_3 and siderophore formation) of tested fungal species.

EXF	Fungal name	AMY	ENDO	β -GLU	CAS	GEL	ES	LIP	LEC	LAC gua	LAC abts	URE	DNA	CaCO_3	HEX	MO	SID
10648	<i>Akanthomyces muscarius</i>	1	0	5	1	0	1	0	0	0	0	1	1	2	2	2	4
10559	<i>Alternaria</i> sp.	1	1	2	1	1	1	0	1	0	0	0	0	0	2	0	0^
10651	<i>Alternaria</i> sp.	1	1	1	1	0	1	0	1	0	0	1	2	0	2	0	0
7660	<i>Aspergillus conicus</i>	0*	4*	5*	0*	0*	2	0	0	0*	0*	1	0*	1*	2°	0°	3*^
7677	<i>Aspergillus creber</i>	1*	1	1*	1*	2*	1	3	1	0*	0*	1*	3	0	0°	1°	0
7651	<i>Aspergillus destruens</i>	1*	0*	4*	0*	0*	0	/	0	0*	0*	0*	1*^	1*	0°	0°	0*
10360	<i>Aspergillus destruens</i>	0*	2*	4*	0*	0*	5	0	0	0*	0*	0*	0*	1*	0°	0°	5*^
10462	<i>Aspergillus domesticus</i>	1*	1*	3*	0*	0*	0*	0	0	0*	0*	0*	4*^	1*	1°	0°	5*^
10450	<i>Aspergillus infrequens</i>	1*	0	3*	0*	0*	0	/	0	0*	0*	1*	3*^	1	2°	0°	0*
10405	<i>Aspergillus jensenii</i>	1*	5*	1*	0*	5	4	2	1	0*	0*	1*	4	0	0°	2°	0^
10353	<i>Aspergillus magnivesiculatus</i>	1*	2*	1*	0*	0*	0*	/	0	0*	0*	1*	3*	0*	1°	0°	0*
10425	<i>Aspergillus penicillioides</i>	/	3*	3*	0*	0*	0*	3	1	0*	0*	1*	3*^	0*	0°	0°	0*
15555	<i>Aspergillus proliferans</i>	0	0	1*	1*	1*	0	5	1	0*	0*	1	0*	0	0°	0°	0*
15119	<i>Aspergillus pseudoglaucus</i>	1*	0	1*	0*	0*	3	2	1	0	0	0*	2	1	0°	0°	0
14316	<i>Aspergillus pseudoglaucus</i>	0	0	4*	0*	0*	4	2	1	0	0	0*	1	1	0°	0°	0
7678	<i>Aspergillus puulaauensis</i>	2*	2	1*	0*	0	3	1	1	0	0	1*	3	0	0°	2°	0
10429	<i>Aspergillus reticulatus</i>	1*	2*	3*	0*	0*	5	0	0	0*	0*	1*	0*	1*	2°	0°	0*
10401	<i>Aspergillus salinicola</i>	1*	0	1*	0*	0*	3	2	1	0*	0*	1*	3*	0*	0°	0°	0*
7656	<i>Aspergillus sloanii</i>	1	1*	2	0*	0*	0*	0	1	0*	0*	1*	0*	0	0°	0°	0*
10431	<i>Aspergillus tardicrescens</i>	1*	4*	3*	0*	0*	0*	/	0	0*	0*	0*	3*^	1*	0°	0°	0*
10463	<i>Aspergillus vitricola</i>	0*	0*	1*	0*	0*	0*	/	0	0*	0*	0*	5*^	1*	0°	0°	0*
15210	<i>Aspergillus vitricola</i>	0*	1*	2*	0*	0*	0*	/	0	0*	0*	0*	0*	0	0°	0°	0*
10372	<i>Aureobasidium melanogenum</i>	1	2	2	4	0	5	1	0	0	0	1	4	2	1	0	0
14317	<i>Aureobasidium pullulans</i>	4	2	2	0	2	5	4	1	0	0	1	5	2	0	0	0
10556	<i>Beauveria pseudobassiana</i>	1	0	4	0	0	1	0	0	3	5	1	0	1	2	2	1
15111	<i>Bjerkandera adusta</i>	1	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0
10840	<i>Botryotrichum domesticum</i>	2	1	2	0	0	1	0	0	0	0	1	2	0	2	0	0
7669	<i>Chaetomium cochlioides</i>	0	1	1	0	/	1	0	0	0	0	1	0	0	2^	1^	0
7690	<i>Chaetomium globosum</i>	1	1	2	0	/	1	0	0	0	0	1	0	0	2	1	0
10573	<i>Cladosporium allcinum</i>	3	2	4	3	1	5	0	0	3	2	1	4	0	1	0	0
14315	<i>Cladosporium cladosporioides</i>	1	2	2	2	1	3	1	1	5	5	1	4	0	1	0	0
10496	<i>Cladosporium pseudocladosporioides</i>	2	2	2	1	0	5	0	0	0	1	1	2	0	1	0	0

14314	<i>Cladosporium pseudocladosporioides</i>	3	2	2	4	0	5	/	0	0	0	1	3	0	1	0	0
10492	<i>Cladosporium westerdijkiae</i>	1	2	3	1	1	3	0	0	2	3	1	1	0	1	0	0
10656	<i>Cladosporium xylophilum</i>	1	2	4	1	0	5	0	0	0	0	1	2	0	1	0	0
15505	<i>Coniochaeta ligninaria</i>	1	1	2	1	0	3	0	1	0	0	1	4 [^]	1	2 [^]	0 [^]	0
15086	<i>Cylindrobasidium</i> sp.	/	0	1	1	2	1	0	0	0	0	0	0	0	0	0	0
10652	<i>Debaryomyces hansenii</i>	0	0	5	0	0	5	0	0	0	0	1 [^]	0	0	0	0	0
10663	<i>Parengyodontium album</i>	1	1	3	5	0	3	2	1	0	0	1	2	0	2 [^]	2 [^]	0
10693	<i>Parengyodontium album</i>	1	1	3	1	0	3	3	1	0	0	1	2	0	2 [^]	2 [^]	0
10694	<i>Parengyodontium album</i>	1	1	4	1	0	1	1	1	0	0	1	3	0	2 [^]	2 [^]	0
10584	<i>Penicillium bialowiezense</i>	1*	5*	4	0*	2	3	2	1	0	0	1	5	2	2	2	0
10484	<i>Penicillium brevicompactum</i>	4	3	4	5	1	4	2	1	0	0	1	5	1	2	1	5
10495	<i>Penicillium chrysogenum</i>	5	1	2	0	2	1	1	1	0	0	1	2	2	2	2	1
15508	<i>Penicillium chrysogenum</i>	4	1	2	0	2	2	0	1	0	0	1	3	2	2	0	2
7655	<i>Penicillium corylophilum</i>	2	0	3	1	0	4	0	0	0	0	0 [^]	1	0	2	2	2 [^]
15064	<i>Penicillium corylophilum</i>	1	0	5	1 [^]	0	2	0	1	0	0	1	1	0	2	2	0
10368	<i>Penicillium palitans</i>	5	2	4	0	0	2	2	1	0	0	1	1	2	2	2	4
10503	<i>Penicillium rubens</i>	4	1	1	0	4	1	0	1	0	0	1	1	2	2	2	1
10557	<i>Penicillium scabrosum</i>	2	1	3	5	5	2	1	1	0	0	1	4	1	2	2	2
15049	<i>Trametes versicolor</i>	0	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0
10502	<i>Trichoderma longibrachiatum</i>	1	1	1	1	2	1	0	1	0	0	1	2	0	0	0	0 [^]
10120	<i>Wallemia aff. muriae</i>	0*	5*	3*	0*	0*	0*	/	0	0*	0*	1*	0*	0	0°	0°	0*
10342	<i>Wallemia canadensis</i>	0*	5*	4	0*	0*	2	0	0	0*	/	1*	0*	0	0°	0°	0*
10650	<i>Zalaria obscura</i>	5	0	5	0	0	2	0	0	0	0	1	0	2	0	0	0

Legend: Activities are shown as factors according to three criteria: (i) 0-5 shown in red, (ii) 0-1 shown in yellow and (iii) 0-2 shown in blue; 0 = no activity, maximum value (1,2 or 5) = maximum activity. AMY: amylase; ENDO: endocellulase; β -GLU: β -glucosidase; CAS: caseinase; GEL: gelatinase; ES: esterase, LIP: lipase; LEC: lecithinase; LAC: laccase (GUA: guaiacol, abts: ABTS); URE: urease; DNA: DNase; CaCO₃: carbonate (CaCO₃) dissolution; HEX: assimilation of hexadecane, MO: assimilation of mineral oil; SID: siderophores formation. * reduced water activity with addition of 18% glycerol; ° reduced water activity with addition of 10% NaCl; ^ prolonged incubation; / no information; extreme values are underlined. Obligately or extremely xerophilic species are bolded.

2 Supplementary Figures

Figure S1. Biodegradation assays with negative (upper row) and positive (lower row) enzymatic activities.



Legend: AMY: amylase - white unstained area around colonies in the otherwise violet medium dyed with iodine solution indicates starch degradation; ENDO: endoglucanase - light red halo on CMC agar dyed with Congo Red indicates cellulose degradation; β-GLU: β-glucosidase - black precipitate indicates β-glucosidase activity on aesculin agar; CAS: caseinase - transparent zone in otherwise opaque medium indicates casein degradation; GEL: gelatinase - solubilization of gelatine; ES: esterase - color change of pH indicator from yellow to purple indicates esterase activity; LAC: laccase - red halo indicates laccase activity on agar containing guaiacol; CaCO₃: CaCO₃ solubilization - transparent zone in otherwise opaque medium indicates carbonate dissolution; SID: siderophore production - orange stained areas around colonies indicate synthesis of siderophores; URE: urease - change of pH indicator from orange to purple indicates urea degradation.