Functional characterization of orchid mycorrhizal fungi isolated from *Anacamptis morio* in Northern Italy

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Supplementary Information

Table S1 Order of the columns in the heatmap in Fig. 4, from left to right, where each column represents a substrate of the BIOLOG® FF MicroPlates™.

Order	Substrate	Chemical group
1	L-Fucose	Monosaccharides
2	L-Threonine	Nitrogen-containing compounds
3	D-Arabinose	Monosaccharides
4	D-Ribose	Monosaccharides
5	D-Xylose	Monosaccharides
6	Sebacic Acid	Carboxylic acids, esters, and alcohols
7	D-Galacturonic Acid	Carboxylic acids, esters, and alcohols
8	Glucuronamide	Nitrogen-containing compounds
9	beta-Hydroxybutyric Acid	Carboxylic acids, esters, and alcohols
10	Succinamic Acid	Nitrogen-containing compounds
11	gamma-Aminobutyric Acid	Nitrogen-containing compounds
12	D-Arabitol	Carboxylic acids, esters, and alcohols
13	L-Sorbose	Monosaccharides
14	Quinic Acid	Carboxylic acids, esters, and alcohols
15	Alaninamide	Nitrogen-containing compounds
16	Adenosine-5'-Monophosphate	Phosphorylated compounds
17	D-Glucosamine	Monosaccharides
18	alpha-Methyl-D-Glucoside	Non-monosaccharides
19	L-Rhamnose	Monosaccharides
20	Uridine	Nitrogen-containing compounds
21	N-Acetyl-D-Galactosamine	Monosaccharides
22	Succinic Acid Mono-Methyl Ester	Carboxylic acids, esters, and alcohols
23	N-Acetyl-L-Glutamic Acid	Nitrogen-containing compounds
24	i-Erythritol	Carboxylic acids, esters, and alcohols
25	m-Inositol	Carboxylic acids, esters, and alcohols
26	N-Acetyl-D-Glucosamine	Monosaccharides
27	N-Acetyl-D-Mannosamine	Monosaccharides
28	Putrescine	Nitrogen-containing compounds
29	D-Tagatose	Monosaccharides
30	2-Amino Ethanol	Nitrogen-containing compounds
31	Maltitol	Non-monosaccharides
32	Turanose	Non-monosaccharides
33	Xylitol	Carboxylic acids, esters, and alcohols
34	beta-Cyclodextrin	Non-monosaccharides
35	Adenosine	Nitrogen-containing compounds
36	Tween 80	Non-monosaccharides
37	D-Glucuronic Acid	Carboxylic acids, esters, and alcohols
38	Sucrose	Non-monosaccharides
39	alpha-D-Glucose	Monosaccharides
40	D-Trehalose	Non-monosaccharides
41	L-Phenylalanine	Nitrogen-containing compounds
42	Fumaric Acid	Carboxylic acids, esters, and alcohols
43	L-Malic Acid	Carboxylic acids, esters, and alcohols
44	Bromosuccinic Acid	Carboxylic acids, esters, and alcohols
45	Succinic Acid	Carboxylic acids, esters, and alcohols
46	Dextrin	Non-monosaccharides
47	D-Cellobiose	Non-monosaccharides
48	Gentiobiose	Non-monosaccharides
49	beta-Methyl-D-Glucoside	Non-monosaccharides
50	Salicin	Non-monosaccharides
51	Glycogen	Non-monosaccharides
52	Maltotriose	Non-monosaccharides
53	D-Fructose	Monosaccharides
54	D-Mannose	Monosaccharides
55	alpha-Ketoglutaric Acid	Carboxylic acids, esters, and alcohols
56	L-Glutamic Acid	Nitrogen-containing compounds
57	L-Arabinose	Monosaccharides
58	D-Galactose	Monosaccharides
59	Lactulose	Non-monosaccharides
60	alpha-Methyl-D-Galactoside	Non-monosaccharides
61	Adonitol	Carboxylic acids, esters, and alcohols
62	D-Mannitol	Carboxylic acids, esters, and alcohols
63	beta-Methyl-D-Galactoside	Non-monosaccharides
64	alpha-D-Lactose	Non-monosaccharides
65	D-Melibiose	Non-monosaccharides
66	2-Keto-D-Gluconic Acid	Carboxylic acids, esters, and alcohols
67	gamma-Hydroxybutyric Acid	Carboxylic acids, esters, and alcohols
68	D-Malic Acid	Carboxylic acids, esters, and alcohols
69	Amygdalin	Non-monosaccharides
70	Glycerol	Carboxylic acids, esters, and alcohols
71	Glucose-1-Phosphate	Phosphorylated compounds
72	L-Alanyl-Glycine	Nitrogen-containing compounds
73	D-Sorbitol	Carboxylic acids, esters, and alcohols
74	p-Hydroxyphenylacetic Acid	Carboxylic acids, esters, and alcohols
75	Stachyose	Non-monosaccharides
76	D-Raffinose	Non-monosaccharides
77	Glycyl-L-Glutamic Acid	Nitrogen-containing compounds
78	Arbutin	Non-monosaccharides
79	D-Psicose	Monosaccharides
80	L-Lactic Acid	Carboxylic acids, esters, and alcohols
81	L-Proline	Nitrogen-containing compounds
82	alpha-Cyclodextrin	Non-monosaccharides
83	L-Alanine	Nitrogen-containing compounds
84	D-Gluconic Acid	Carboxylic acids, esters, and alcohols
85	L-Ornithine	Nitrogen-containing compounds
86	Palatinose	Non-monosaccharides
87	L-Pyroglutamic Acid	Nitrogen-containing compounds
88	Maltose	Non-monosaccharides
89	D-Lactic Acid Methyl Ester	Carboxylic acids, esters, and alcohols
90	D-Saccharic Acid	Carboxylic acids, esters, and alcohols
91	L-Serine	Nitrogen-containing compounds
92	D-Melezitose	Non-monosaccharides
93	L-Aspartic Acid	Nitrogen-containing compounds
94	Sedoheptulosan	Carboxylic acids, esters, and alcohols
95	L-Asparagine	Nitrogen-containing compounds

Table S2. Order of the columns in the heatmap in Fig. S3, from left to right, where each column represents a substrate of the BIOLOG® FF MicroPlates™.

Order	Substrate	Chemical group
1	D-Ribose	Monosaccharides
2	D-Xylose	Monosaccharides
3	Tween 80	Non-monosaccharides
4	D-Glucuronic Acid	Carboxylic acids, esters and alcohols
5	Sucrose	Non-monosaccharides
6	D-Trehalose	Non-monosaccharides
7	Maltose	Non-monosaccharides
8	Maltotriose	Non-monosaccharides
9	alpha-D-Glucose	Monosaccharides
10	Dextrin	Non-monosaccharides
11	D-Cellobiose	Non-monosaccharides
12	Gentiobiose	Non-monosaccharides
13	Glycogen	Non-monosaccharides
14	beta-Methyl-D-Glucoside	Non-monosaccharides
15	D-Raffinose	Non-monosaccharides
16	D-Fructose	Monosaccharides
17	D-Mannose	Monosaccharides
18	Arbutin	Non-monosaccharides
19	Stachyose	Non-monosaccharides
20	Succinic Acid	Carboxylic acids, esters and alcohols
21	Fumaric Acid	Carboxylic acids, esters and alcohols
22	L-Phenylalanine	Nitrogen-containing compounds
23	Sedoheptulosan	Carboxylic acids, esters and alcohols
24	alpha-Ketoglutaric Acid	Carboxylic acids, esters and alcohols
25	L-Glutamic Acid	Nitrogen-containing compounds
26	Salicin	Non-monosaccharides
27	Bromosuccinic Acid	Carboxylic acids, esters and alcohols
28	L-Malic Acid	Carboxylic acids, esters and alcohols
29	Amygdalin	Non-monosaccharides
30	Glycerol	Carboxylic acids, esters and alcohols
31	L-Arabinose	Monosaccharides
32	beta-Methyl-D-Galactoside	Non-monosaccharides
33	L-Sorbose	Monosaccharides
34	Succinamic Acid	Nitrogen-containing compounds
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40	L-Pyroglutamic Acid	Nitrogen-containing compounds
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42	gamma-Aminobutyric Acid	Nitrogen-containing compounds
43	Putrescine	Nitrogen-containing compounds
44	N-Acetyl-L-Glutamic Acid	Nitrogen-containing compounds
45	D-Arabitol	Carboxylic acids, esters and alcohols
46	beta-Hydroxybutyric Acid	Carboxylic acids, esters and alcohols
47	beta-Cyclodextrin	Non-monosaccharides
48	D-Saccharic Acid	Carboxylic acids, esters and alcohols
49	L-Aspartic Acid	Nitrogen-containing compounds
50	L-Lactic Acid	Carboxylic acids, esters and alcohols
51	D-Psicose	Monosaccharides
52	D-Lactic Acid Methyl Ester	Carboxylic acids, esters and alcohols
53	L-Ornithine	Nitrogen-containing compounds
54	L-Threonine	Nitrogen-containing compounds
55	Glucuronamide	Nitrogen-containing compounds
56	Xylitol	Carboxylic acids, esters and alcohols
57	2-Keto-D-Gluconic Acid	Carboxylic acids, esters and alcohols
58	gamma-Hydroxybutyric Acid	Carboxylic acids, esters and alcohols
59	p-Hydroxyphenylacetic Acid	Carboxylic acids, esters and alcohols
60	D-Malic Acid	Carboxylic acids, esters and alcohols
61	Glycyl-L-Glutamic Acid	Nitrogen-containing compounds
62	D-Sorbitol	Carboxylic acids, esters and alcohols
63	L-Alanyl-Glycine	Nitrogen-containing compounds
64	L-Serine	Nitrogen-containing compounds
65	D-Melezitose	Non-monosaccharides
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89	L-Fucose	Monosaccharides
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91	Turanose	Non-monosaccharides
92	alpha-D-Lactose	Non-monosaccharides
93	Lactulose	Non-monosaccharides
94	D-Galactose	Monosaccharides
95	D-Melibiose	Non-monosaccharides

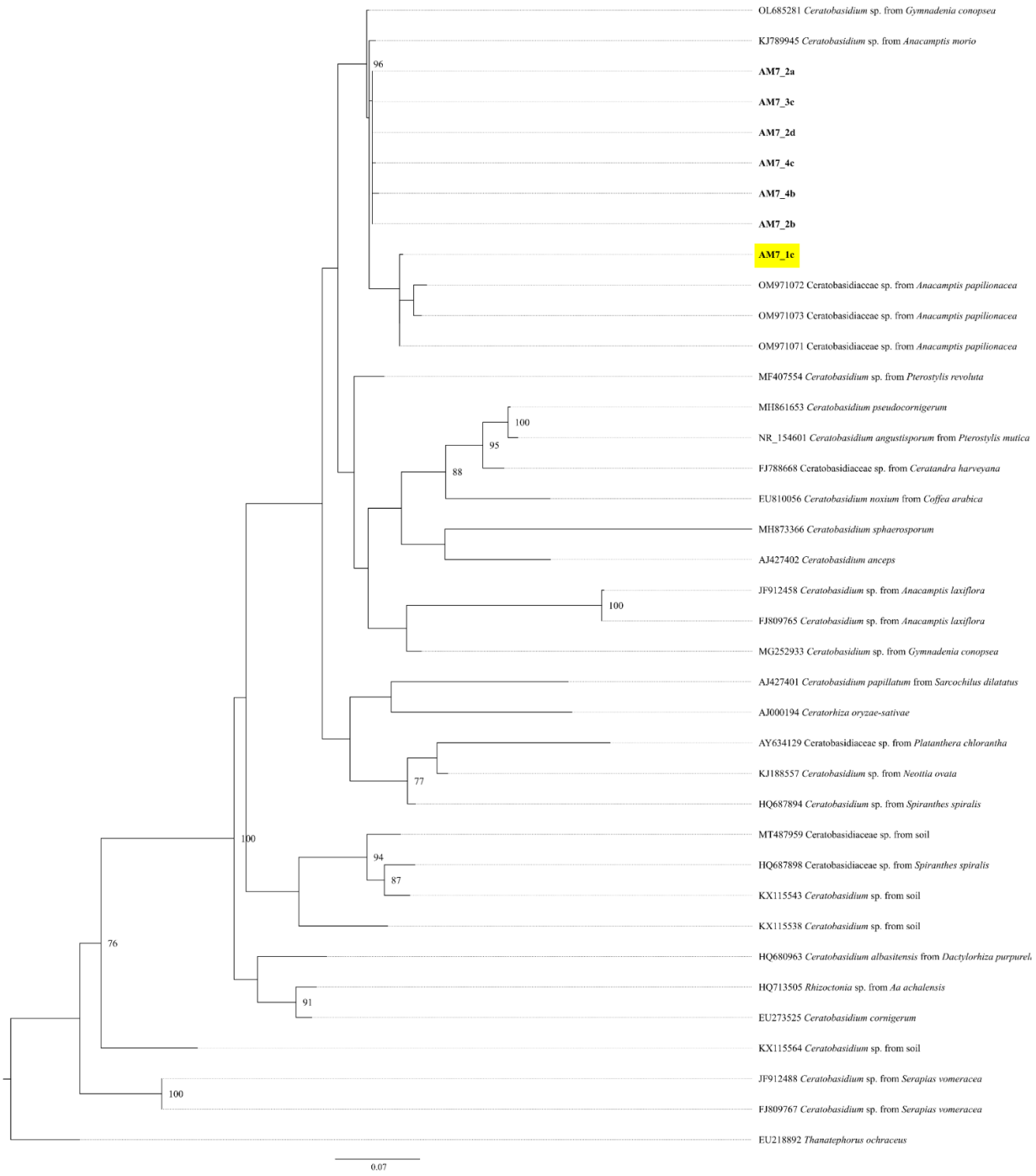

Figure S1 Phylogenetic tree of *Ceratobasidium* sp. isolates based on ITS sequences. Bootstrap values >70% are indicated at nodes. *Thanatephorus ochraceus* was used as outgroup. Isolates from this study are shown in bold. The isolate selected for further characterization is highlighted.

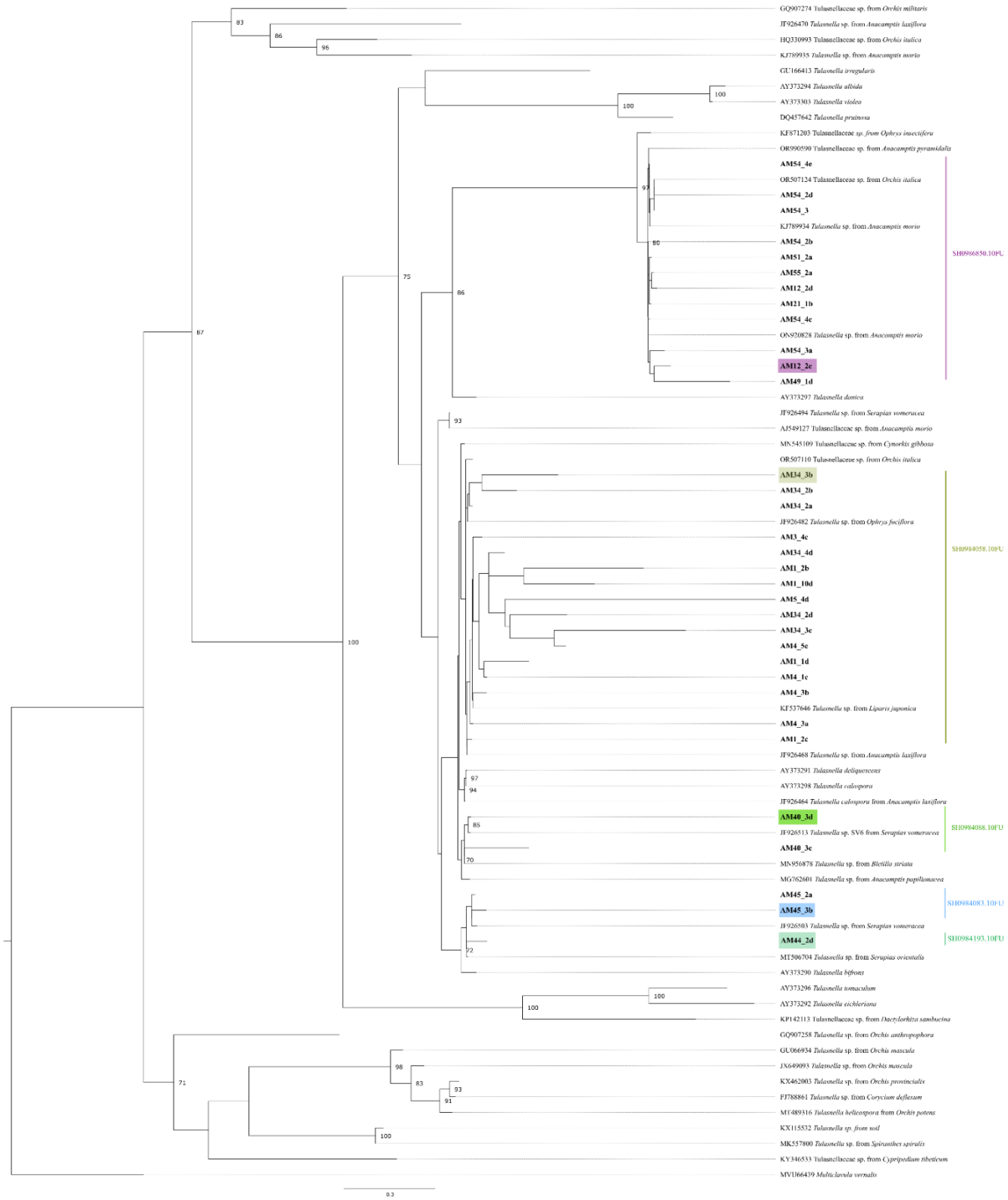

Figure S2 Phylogenetic tree of *Tulasnella* sp. isolates based on ITS sequences. Bootstrap values >70% are indicated at nodes. *Multiclavula vernalis* was used as outgroup. Isolates from this study are shown in bold and UNITE Species Hypotheses (SH) are reported. The isolates selected for further characterization are highlighted.

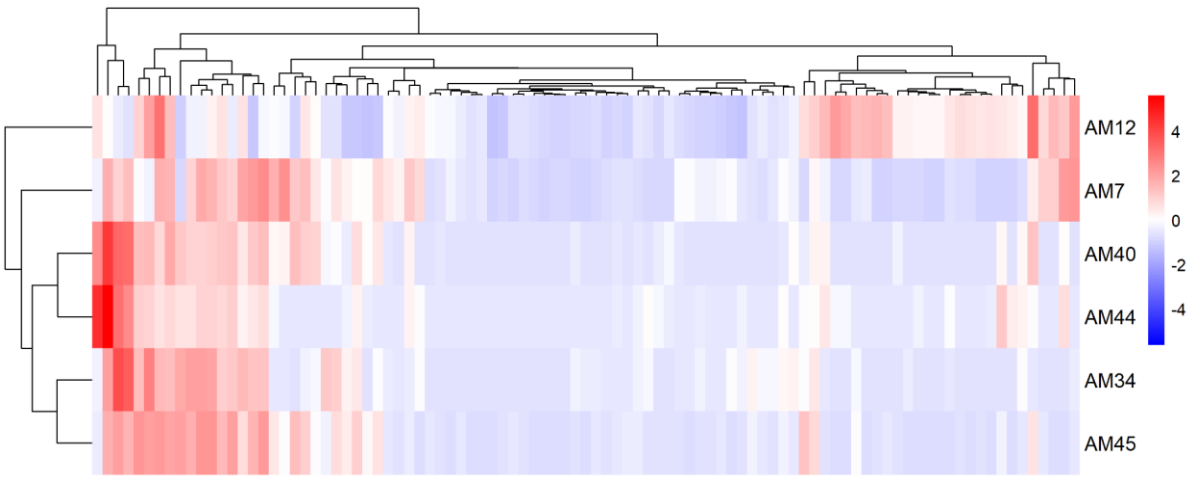

Figure S3. Heatmap scaled by rows to compare substrate preference by the same isolate. This column-scaled heatmap is normalized within each isolate and allows visualization of the substrates that are most actively metabolized by that specific isolate, rather than comparisons across isolates. The list of substrates, from left to right, can be found in Table S2