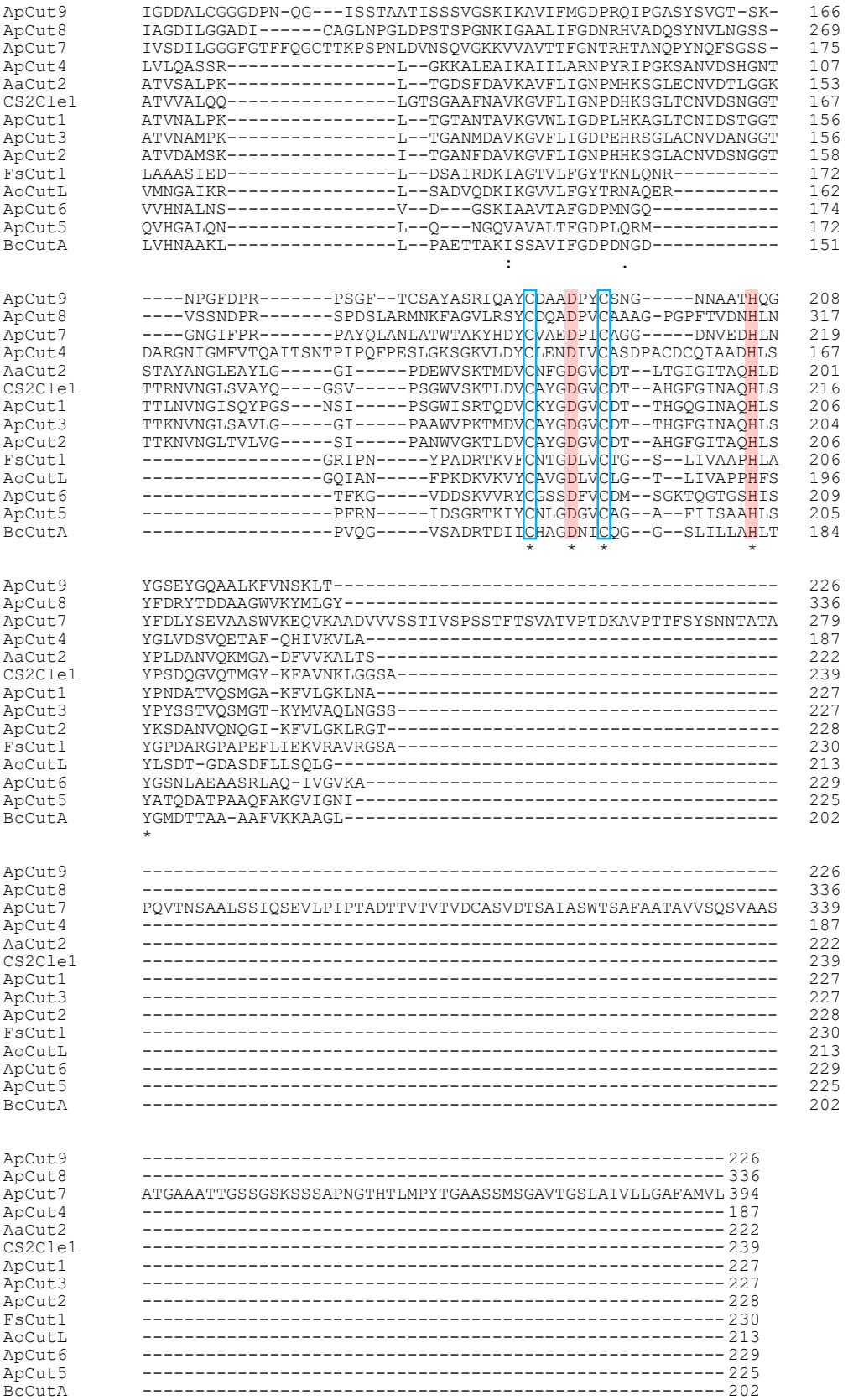
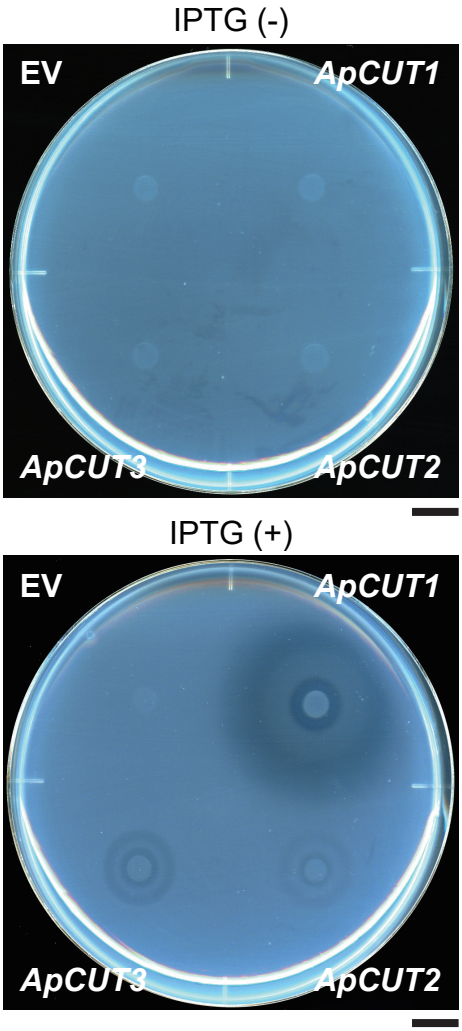
Supplementary Fig. S1

Supplementary Fig. S1 Alignment of amino acid sequences of known cutinases and ApCut1 to ApCut9. A red open box indicates a highly conserved GYSQG motif in the catalytic site. Pink-shaded residues show the position of a classical α/β-hydrolase catalytic triad Ser-His-Asp. Blue open boxes represent conserved cysteine residues that form disulfide bonds to maintain the conformation of the enzyme.

Supplementary Fig. S1 *(continued)*

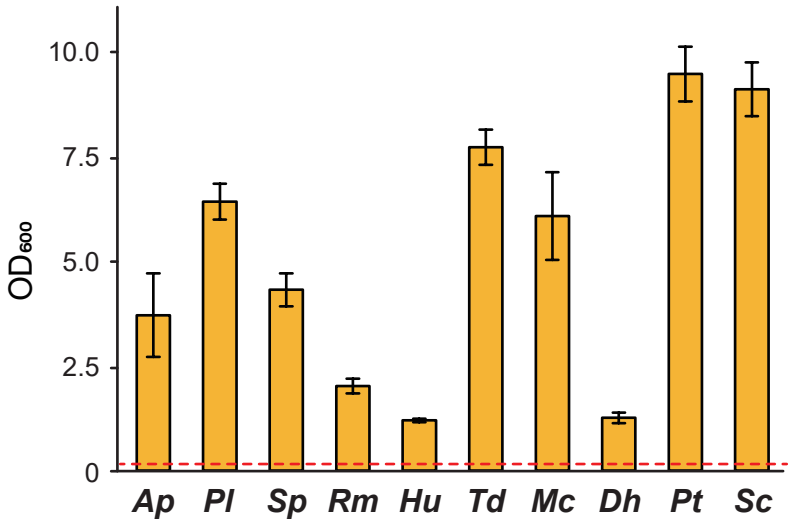


Supplementary Fig. S2



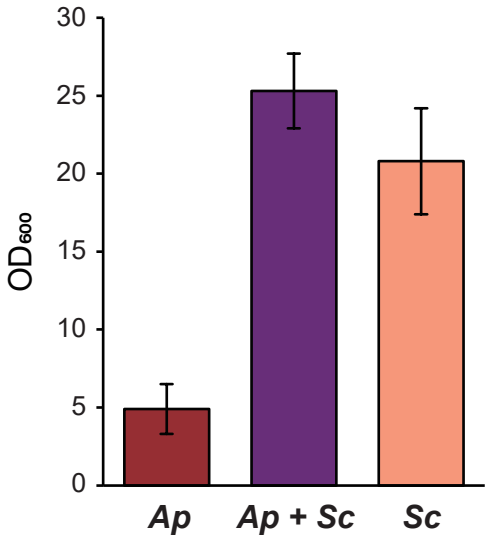
Supplementary Fig. S2 PCL-plate clearing assay of the extracts of ApCut1- to ApCut3-expressing *E. coli* cells. EV, empty vector. Bar, 1 cm.

Supplementary Fig. S3



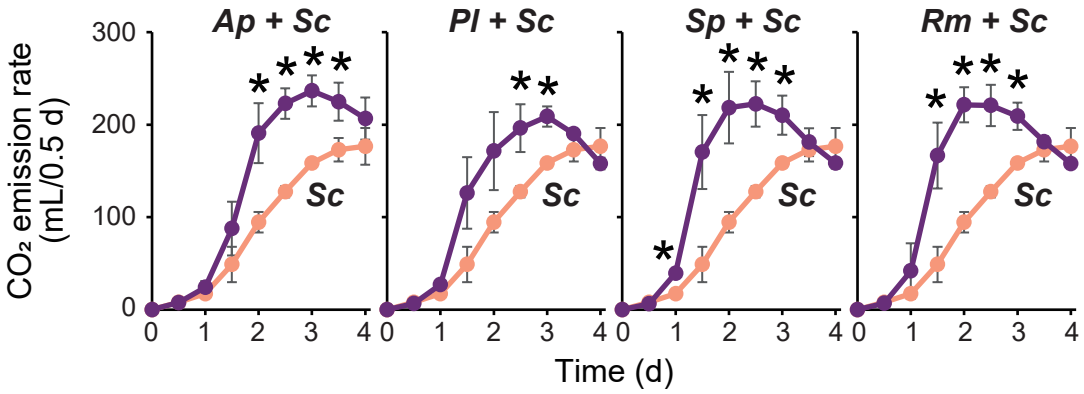
Supplementary Fig. S3 Growth of grape-skin residents and *S. cerevisiae* in YNB medium containing 10% (w/v) glucose as a sole carbon source. The graph indicates OD_{600} values after the 6-d fermentation test in YNB medium containing 10% (w/v) glucose. A red dashed line shows the initial OD_{600} value (OD_{600} = 0.1). Data represent mean values and standard deviations from three independent experiments. *Ap*, *A. pullulans*; *Pl*, *P. laurentii*; *Sp*, *S. pararoseus*; *Rm*, *R. mucilaginosa*; *Hu*, *H. uvarum*; *Td*, *T. delbrueckii*; *Mc*, *M. caribbica*; *Dh*, *D. hansenii*; *Pt*, *P. terricola*; *Sc*, *S. cerevisiae*.

Supplementary Fig. S4



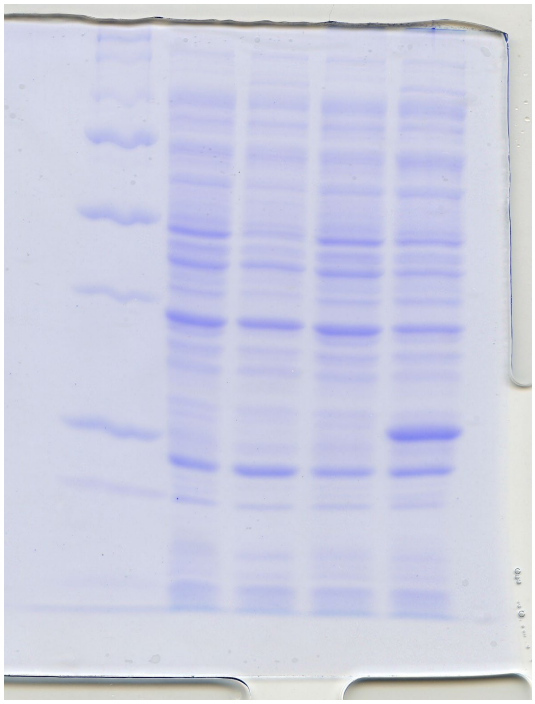
Supplementary Fig. S4 Growth in coculture of *A. pullulans* and *S. cerevisiae* in YNB medium containing 10% glucose as a sole carbon source. The graph indicates OD_{600} values after the 6-d fermentation test in YNB medium containing 10% (w/v) glucose. Data represent mean values and standard deviations from three independent experiments. *Ap*, inoculated with *A. pullulans* (red); *Ap* + *Sc*, coinoculated with *A. pullulans* and *S. cerevisiae* (violet); *Sc*, inoculated with *S. cerevisiae* (pink).

Supplementary Fig. S5

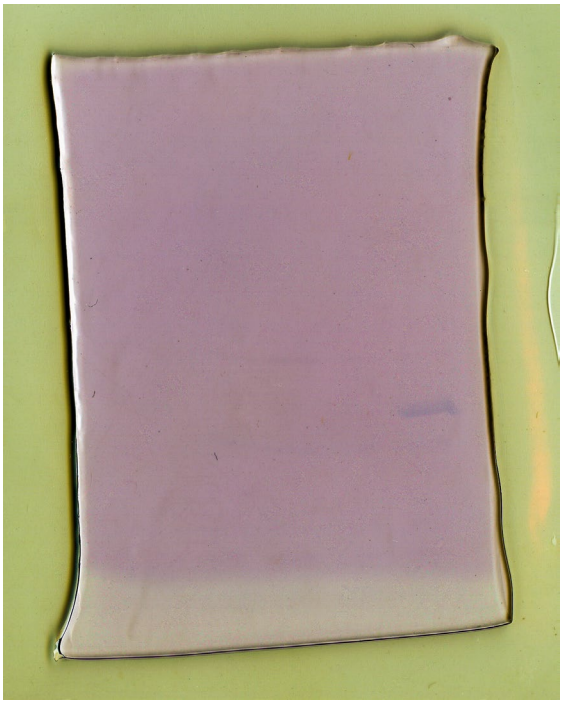


Supplementary Fig. S5 Alcoholic fermentation of intact grapes in coculture of grape-skin residents and *S. cerevisiae*. Carbon dioxide emission rates in a mixture of equal weight of YNB medium and intact grape berries are shown. Data represent mean values and standard deviations from two independent experiments. *Sc*, inoculated with *S. cerevisiae* (pink); *Ap* + *Sc*, coinoculated with *A. pullulans* and *S. cerevisiae*, *Pl* + *Sc*, coinoculated with *P. laurentii* and *S. cerevisiae*, *Sp* + *Sc*, coinoculated with *S. pararoseus* and *S. cerevisiae*, *Rm* + *Sc*, coinoculated with *R. mucilaginosa* and *S. cerevisiae* (violet). Asterisks indicate statistically significant increases of carbon dioxide emission compared with Sc (t test, $p < 0.05$).

Supplementary Fig. S6



CBB staining



His-detect

Supplementary Fig. S6 Full-length gel images of Fig. 8b.

Supplementary Table S1 Yeasts or yeast-like microoganisms isolated from grapes in this study*.

No.	Grape variety	Grape species	Isolated from	Yeast species	Family	Category
1	Delaware	*Vitis* hybrid	Enrichment culture in water	*Aureobasidium pullulans*	Dothioraceae	Yeast-like fungus
2	**Delaware**	***Vitis* hybrid**	**Enrichment culture in water**	***Aureobasidium pullulans***	**Dothioraceae**	**Yeast-like fungus**
3	Delaware	*Vitis* hybrid	Enrichment culture in 5% sucrose	*Aureobasidium pullulans*	Dothioraceae	Yeast-like fungus
4	Delaware	*Vitis* hybrid	Enrichment culture in 5% sucrose	*Aureobasidium pullulans*	Dothioraceae	Yeast-like fungus
5	Delaware	*Vitis* hybrid	Enrichment culture in 5% sucrose	*Aureobasidium pullulans*	Dothioraceae	Yeast-like fungus
6	Delaware	*Vitis* hybrid	Surface-washed suspensions	*Sporobolomyces* sp.	Sporidiobolaceae	Basidiomycetous yeast
7	Delaware	*Vitis* hybrid	Surface-washed suspensions	*Sporobolomyces* sp.	Sporidiobolaceae	Basidiomycetous yeast
8	Delaware	*Vitis* hybrid	Surface-washed suspensions	*Aureobasidium pullulans*	Dothioraceae	Yeast-like fungus
9	Delaware	*Vitis* hybrid	Surface-washed suspensions	*Sporobolomyces* sp.	Sporidiobolaceae	Basidiomycetous yeast
10	Delaware	*Vitis* hybrid	Surface-washed suspensions	*Tremella yokohamensis* (*Cryptococcus yokohamensis*)	Tremellaceae	Basidiomycetous yeast
11	Delaware	*Vitis* hybrid	Surface-washed suspensions	*Tremella yokohamensis* (*Cryptococcus yokohamensis*)	Tremellaceae	Basidiomycetous yeast
12	Kyoho	*Vitis* hybrid	Juice (stem)	*Moesziomyces aphidis*	Ustilaginaceae	Basidiomycetous yeast
13	Kyoho	*Vitis* hybrid	Juice (stem)	*Moesziomyces aphidis*	Ustilaginaceae	Basidiomycetous yeast
14	Kyoho	*Vitis* hybrid	Juice (stem)	*Moesziomyces aphidis*	Ustilaginaceae	Basidiomycetous yeast
15	Kyoho	*Vitis* hybrid	Juice (stem)	*Moesziomyces aphidis*	Ustilaginaceae	Basidiomycetous yeast
16	Kyoho	*Vitis* hybrid	Juice	*Moesziomyces aphidis*	Ustilaginaceae	Basidiomycetous yeast
17	Kyoho	*Vitis* hybrid	Juice	*Moesziomyces aphidis*	Ustilaginaceae	Basidiomycetous yeast
18	**Kyoho**	***Vitis* hybrid**	**Juice**	***Sporidiobolus pararoseus* (*Sporobolomyces shibatanus*)**	**Sporidiobolaceae**	**Basidiomycetous yeast**
19	Kyoho	*Vitis* hybrid	Juice	*Sporidiobolus pararoseus* (*Sporobolomyces shibatanus*)	Sporidiobolaceae	Basidiomycetous yeast
20	Kyoho	*Vitis* hybrid	Juice	*Sporidiobolus pararoseus* (*Sporobolomyces shibatanus*)	Sporidiobolaceae	Basidiomycetous yeast
21	Kyoho	*Vitis* hybrid	Juice	*Sporidiobolus pararoseus* (*Sporobolomyces shibatanus*)	Sporidiobolaceae	Basidiomycetous yeast
22	Kyoho	*Vitis* hybrid	Juice	*Sporobolomyces* sp.	Sporidiobolaceae	Basidiomycetous yeast
23	Kyoho	*Vitis* hybrid	Juice	*Aureobasidium pullulans*	Dothioraceae	Yeast-like fungus
24	Kyoho	*Vitis* hybrid	Juice	*Aureobasidium pullulans*	Dothioraceae	Yeast-like fungus
25	**Shine Muscat**	***Vitis* hybrid**	**Juice**	***Rhodotorula mucilaginosa***	**Sporidiobolaceae**	**Basidiomycetous yeast**
26	Shine Muscat	*Vitis* hybrid	Juice	*Sporobolomyces* sp.	Sporidiobolaceae	Basidiomycetous yeast
27	Shine Muscat	*Vitis* hybrid	Juice	*Sporobolomyces* sp.	Sporidiobolaceae	Basidiomycetous yeast
28	Shine Muscat	*Vitis* hybrid	Juice	*Sporobolomyces* sp.	Sporidiobolaceae	Basidiomycetous yeast
29	Shine Muscat	*Vitis* hybrid	Juice	*Debaryomyces hansenii* (*Candida famata*)	Saccharomycetaceae	Ascomycetous yeast
30	**Shine Muscat**	***Vitis* hybrid**	**Juice**	***Debaryomyces hansenii* (*Candida famata*)**	**Saccharomycetaceae**	**Ascomycetous yeast**
31	Shine Muscat	*Vitis* hybrid	Juice	*Debaryomyces hansenii* (*Candida famata*)	Saccharomycetaceae	Ascomycetous yeast
32	Shine Muscat	*Vitis* hybrid	Surface-washed suspensions	*Sporobolomyces* sp.	Sporidiobolaceae	Basidiomycetous yeast
33	Shine Muscat	*Vitis* hybrid	Surface-washed suspensions	*Sporobolomyces* sp.	Sporidiobolaceae	Basidiomycetous yeast
34	Shine Muscat	*Vitis* hybrid	Surface-washed suspensions	*Papiliotrema aurea* (*Cryptococcus aureus*)	Tremellaceae	Basidiomycetous yeast
35	Shine Muscat	*Vitis* hybrid	Surface-washed suspensions	*Papiliotrema aurea* (*Cryptococcus aureus*)	Tremellaceae	Basidiomycetous yeast
36	Kyoho	*Vitis* hybrid	Surface-washed suspensions	*Sporobolomyces sp.*	Sporidiobolaceae	Basidiomycetous yeast
37	Kyoho	*Vitis* hybrid	Surface-washed suspensions	*Sporobolomyces sp.*	Sporidiobolaceae	Basidiomycetous yeast
38	Kyoho	*Vitis* hybrid	Juice	*Sporidiobolus pararoseus* (*Sporobolomyces shibatanus*)	Sporidiobolaceae	Basidiomycetous yeast
39	Shine Muscat	*Vitis* hybrid	Fermented juice	*Meyerozyma caribbica* (*Candida fermentati*)	Saccharomycetaceae	Ascomycetous yeast
40	Shine Muscat	*Vitis* hybrid	Fermented juice	*Meyerozyma caribbica* (*Candida fermentati*)	Saccharomycetaceae	Ascomycetous yeast
41	**Pinot noir**	***Vitis vinifera***	**Juice**	***Meyerozyma caribbica* (*Candida fermentati*)**	**Saccharomycetaceae**	**Ascomycetous yeast**
42	Pinot noir	*Vitis vinifera*	Juice	*Meyerozyma caribbica* (*Candida fermentati*)	Saccharomycetaceae	Ascomycetous yeast
43	**Pinot noir**	***Vitis vinifera***	**Juice**	***Pichia terricola***	**Saccharomycetaceae**	**Ascomycetous yeast**
44	Pinot noir	*Vitis vinifera*	Juice	*Pichia terricola*	Saccharomycetaceae	Ascomycetous yeast
45	**Pinot noir**	***Vitis vinifera***	**Juice**	***Hanseniaspora uvarum***	**Saccharomycetaceae**	**Ascomycetous yeast**
46	Pinot noir	*Vitis vinifera*	Juice	*Hanseniaspora uvarum*	Saccharomycetaceae	Ascomycetous yeast
47	Pinot noir	*Vitis vinifera*	Juice	*Hanseniaspora uvarum*	Saccharomycetaceae	Ascomycetous yeast
48	Pinot noir	*Vitis vinifera*	Juice	*Zygoascus meyerae* (*Candida hellenica*)	Saccharomycetaceae	Ascomycetous yeast
49	Pinot noir	*Vitis vinifera*	Fermented juice	*Pichia manshurica*	Saccharomycetaceae	Ascomycetous yeast
50	Pinot noir	*Vitis vinifera*	Fermented juice	*Hanseniaspora uvarum*	Saccharomycetaceae	Ascomycetous yeast
51	Pinot noir	*Vitis vinifera*	Fermented juice	*Hanseniaspora uvarum*	Saccharomycetaceae	Ascomycetous yeast
52	Pinot noir	*Vitis vinifera*	Fermented juice	*Hanseniaspora uvarum*	Saccharomycetaceae	Ascomycetous yeast
53	Pinot noir	*Vitis vinifera*	Fermented juice	*Meyerozyma caribbica* (*Candida fermentati*)	Saccharomycetaceae	Ascomycetous yeast
54	**Pinot noir**	***Vitis vinifera***	**Fermented juice**	***Torulaspora delbrueckii* (*Candida colliculosa*)**	**Saccharomycetaceae**	**Ascomycetous yeast**
55	Pinot noir	*Vitis vinifera*	Surface-washed suspensions	*Meyerozyma caribbica* (*Candida fermentati*)	Saccharomycetaceae	Ascomycetous yeast
56	Pinot noir	*Vitis vinifera*	Surface-washed suspensions	*Meyerozyma guilliermondii* (*Candida guilliermondii*)	Saccharomycetaceae	Ascomycetous yeast
57	Pinot noir	*Vitis vinifera*	Surface-washed suspensions	*Hanseniaspora uvarum*	Saccharomycetaceae	Ascomycetous yeast
58	Pinot noir	*Vitis vinifera*	Surface-washed suspensions	*Hanseniaspora uvarum*	Saccharomycetaceae	Ascomycetous yeast
59	Pinot noir	*Vitis vinifera*	Surface-washed suspensions	*Hanseniaspora uvarum*	Saccharomycetaceae	Ascomycetous yeast
60	Seto Giants	*Vitis* hybrid	Surface-washed suspensions	*Sporidiobolus pararoseus* (*Sporobolomyces shibatanus*)	Sporidiobolaceae	Basidiomycetous yeast
61	Seto Giants	*Vitis* hybrid	Fermented juice	*Rhodotorula paludigena*	Sporidiobolaceae	Basidiomycetous yeast
62	Seto Giants	*Vitis* hybrid	Fermented juice	*Rhodotorula paludigena*	Sporidiobolaceae	Basidiomycetous yeast
63	Muscat of Alexandria	*Vitis vinifera*	Fermented juice	*Trichosporon asahii*	Trichosporonaceae	Basidiomycetous yeast
64	Muscat of Alexandria	*Vitis vinifera*	Fermented juice	*Trichosporon asahii*	Trichosporonaceae	Basidiomycetous yeast
65	Gorbi	*Vitis* hybrid	Fermented juice	*Meyerozyma guilliermondii* (*Candida guilliermondii*)	Saccharomycetaceae	Ascomycetous yeast
66	Gorbi	*Vitis* hybrid	Fermented juice	*Meyerozyma guilliermondii* (*Candida guilliermondii*)	Saccharomycetaceae	Ascomycetous yeast
67	Pinot noir	*Vitis vinifera*	Surface-washed suspensions	*Hanseniaspora uvarum*	Saccharomycetaceae	Ascomycetous yeast
68	Pinot noir	*Vitis vinifera*	Surface-washed suspensions	*Hanseniaspora uvarum*	Saccharomycetaceae	Ascomycetous yeast
69	Pinot noir	*Vitis vinifera*	Surface-washed suspensions	*Hanseniaspora uvarum*	Saccharomycetaceae	Ascomycetous yeast
70	**Pinot noir**	***Vitis vinifera***	**Surface-washed suspensions**	***Papiliotrema laurentii* (*Cryptococcus laurentii*)**	**Tremellaceae**	**Basidiomycetous yeast**
71	Pinot noir	*Vitis vinifera*	Surface-washed suspensions	*Papiliotrema laurentii* (*Cryptococcus laurentii*)	Tremellaceae	Basidiomycetous yeast
72	Pinot noir	*Vitis vinifera*	Surface-washed suspensions	*Papiliotrema flavescens* (*Cryptococcus flavescens*)	Tremellaceae	Basidiomycetous yeast
73	Pinot noir	*Vitis vinifera*	Enrichment culture in water	*Hanseniaspora uvarum*	Saccharomycetaceae	Ascomycetous yeast
74	Pinot noir	*Vitis vinifera*	Enrichment culture in water	*Hanseniaspora uvarum*	Saccharomycetaceae	Ascomycetous yeast
75	Pinot noir	*Vitis vinifera*	Enrichment culture in water	*Papiliotrema laurentii* (*Cryptococcus laurentii*)	Tremellaceae	Basidiomycetous yeast
76	Pinot noir	*Vitis vinifera*	Enrichment culture in water	*Papiliotrema laurentii* (*Cryptococcus laurentii*)	Tremellaceae	Basidiomycetous yeast

*All clones shared >99% nucleotide identity in the rRNA gene ITS region, based on NCBI BLAST searches.