phaff collection
UCDAVIS

DECEMBER 2012

Phaff Collection News

Yeasts of yesterday and today, for research of tomorrow

A big year!

The year 2012 was full of activity at the Phaff Yeast Culture Collection, including several research projects, and useful additions to the collection catalog through internal research and deposits from external collections and researchers.

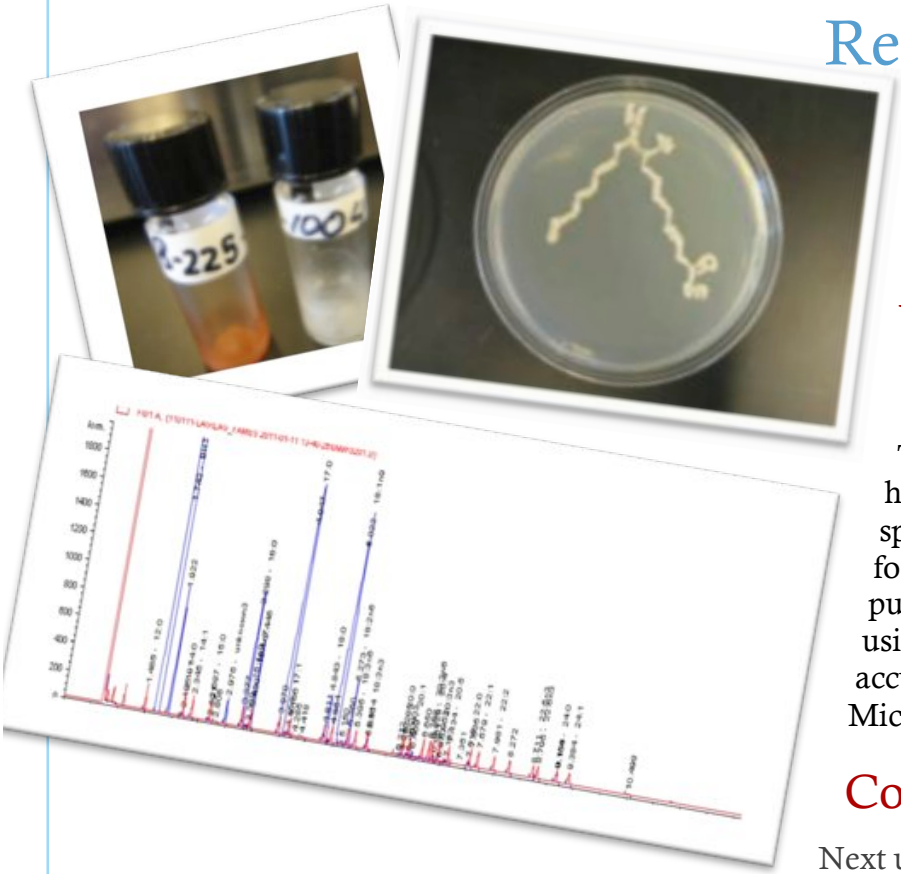
The Phaff collection is also participating in national and international efforts to improve the standing of microbial culture collections.

The Phaff Yeast Culture Collection is the fourth largest collection of its kind, with over 7,000 strains in the public catalog.

2012 at the Phaff Yeast Culture Collection

The Phaff Yeast Culture Collection is in good company -- there are a number of excellent yeast culture collections around the world. To help publicize these collections to potential users in the biotechnology field, Boundy-Mills sent a survey to selected yeast collection curators to gather information about uses of their culture collections. This information was combined with data gleaned from the World Data Centre for Microorganisms website, and published in the Journal for Industrial Microbiology and Biotechnology (Boundy-Mills, JIMB 39 (5) 673-680).

In this issue



Research publications

Phaff collection research related to food spoilage, yeast lipids and yeast/insect ecology

Yeast lipids

We are working to develop new yeast oils for fuels, chemicals, and food ingredients. The long-term goals are to identify specific high-oil yeast strains that grow well on specific feedstocks such as agricultural and food processing waste. We recently published an improved screening protocol using Nile Red staining, to identify lipid-accumulating yeasts (Sitepu et al., Journal of Microbiological Methods, 91 (2) 321-328).

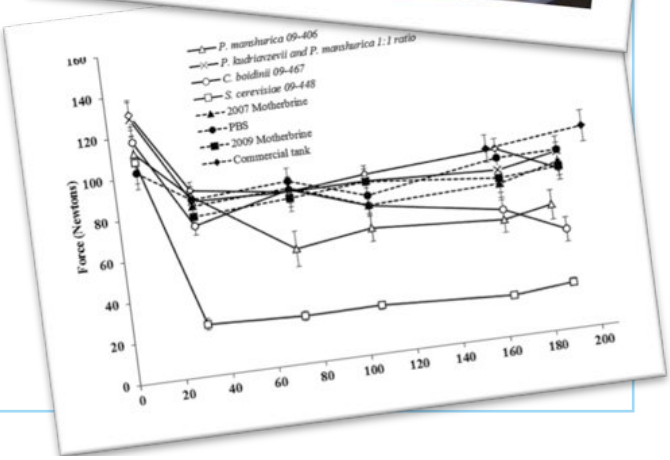
Continuing work on yeast lipids

Next up: a survey of dozens of potential lipid-accumulating yeasts.

Pectinolytic yeast causes olive softening

In a project led by Maria Marco (Food Science and Technology, UC Davis), we examined microbes associated with spoiled and unspoiled Sicilian-style olives, in an attempt to identify the agent causing softening of the mesocarp. We isolated and identified a number of pectinolytic yeasts, including a particularly active strain of *Saccharomyces cerevisiae*. When this yeast was inoculated into pilot-scale fermentations, the olives became soft, indicating that we may have identified the spoilage culprit. This was published in 2012 (Golomb et al., Food Microbiology 33(1) 97-106). We are now working on olive fermentation inoculation conditions to help prevent this type of spoilage.

QUESTION: Could the pectinolytic strains of *S. cerevisiae, Pichia manshurica,* and *Candida boidinii* that we isolated be useful for conversion of food processing or other plant waste to biofuels?



New work on *Drosophila*-yeast associations

Drosophila melanogaster: In a long series of studies in collaboration with Judy Stamps (Evolution and Ecology, UC Davis), we examined the effects of *Drosophila melanogaster* flies on yeast abundance and diversity in banana exposed to adults or larvae. We found evidence of niche construction: presence of flies resulted in more predictable numbers of yeasts, and a narrower range of species. Larvae excrete viable yeasts in their fecal pools, yeast species that they find palatable, and discourage growth of filamentous fungi. We published these observations of proto-agriculture in PLoS ONE (Stamps et al. 2012, PLoS ONE 7(7) 1-10).

Drosophila suzukii: In a project led by Frank Zalom (Department of Entomology, UC Davis) and his PhD student Kelly Hamby and visiting professor Alejandro Hernandez (Universidad de Extremadura, Badajoz, Spain), we studied yeasts associated with the agricultural pest *Drosophila suzukii*. This fruit fly recently invaded California, and infests many soft fruits such as cherries and raspberries. We are working with the Zalom lab to develop an improved yeast-based lure for this fly. We used culture-based and molecular methods to profile yeasts in infested cherries and raspberries, and adult flies and larvae, and found a variety of yeast species. Surprisingly, just about every adult fly, larva and infested fruit sampled contained *Hanseniaspora uvarum*. This was published in Applied and Environmental Microbiology (Hamby et al., AEM 78(14) 4869-4873). A very artistic rendering by Hamby of *D. suzukii* using yeasts on an agar plate was the AEM July 2012 cover art!

Drosophila as a "model organism"

Drawing produced by Kelly Hamby
(PhD Student, Entomology, UC Davis)

INGREDIENTS:
1 Petri plate
Agar medium
2 active cultures of yeasts isolated from *Drosophila suzukii*
1 "model organism" willing to pose for a portrait
Patience

To highlight our work on yeasts associated with the agricultural pest *Drosophila suzukii* (Spotted Wing Drosophila, SWD), graduate student Kelly Hamby produced a drawing of SWD, using yeasts we isolated from SWD. Applied and Environmental Microbiology used the photo for the cover of their July 2012 issue.

Comparing Notes

Networking with collection curators

Public microbe collections are an important element of biological research infrastructure. While the collection of viable, pure, properly identified microbes are an essential element of a microbe collection, much more is required: knowledge of taxonomy, database management, customer service, quality control, intellectual property issues, and adherence to national and international regulations such as IATA and the Convention on Biodiversity. Networking with other collection curators makes these jobs easier. Over the years, the Phaff collection has improved collection management and customer service thanks to advice from other collection curators.

National networking

Kyria Boundy-Mills, curator of the Phaff Yeast Culture Collection, is on the steering committee of the US Culture Collection Network (USCCN). This five-year, NSF-funded project is led by Kevin McCluskey, curator of the Fungal Genetic Stock Center at the University of Missouri, Kansas City. The goals of the USCCN are to implement a National Microbial Germplasm system, and to foster communication between US collections, foreign collections, and international collection networks. In September 2012, Boundy-Mills attended the kick-off event of the USCCN, a gathering of curators of numerous US culture collections and other stakeholders and policy makers, held in Kansas City, MO in September. Discussions included pricing structures, databasing, quality control, financial support of collections, IP issues and customer service, which are resulting in improved service to Phaff collection users.

International networking

Boundy-Mills was also one of three representatives of the USCCN that attended the first meeting of an EU-funded effort being conducted in Europe called Microbial Resource Research Infrastructure (MIRRI), held in Braunschweig, Germany in December 2012. Implementation of the Convention on Biodiversity and Nagoya Protocol were hot issues. One of the high points of this trip was a tour of the DSMZ collection, an exemplary government-funded microbe collection in Germany.

Hundreds of yeast species, hundreds of potential uses!

In 2012, Phaff collection yeasts were distributed to academic, government agency and industrial researchers around the world for a broad variety of uses such as:

- Conversion of biomass to biofuels
- Control of agricultural pests
- Phylogenomics
- Taxonomy
- Validation of clinical diagnostic kits
- Development of a reference database for Illumina sequence data analysis
- And much more….

Does the Phaff collection have what you need for your research? The Phaff collection contains 7,000 yeasts belonging to over 750 different species, with anywhere from a single strain to over 500 strains per species. While other yeast collections emphasize lab strains, wine strains, or medical strains, the Phaff collection's main focus is yeasts isolated from environmental habitats. Many yeasts were isolated from decaying plant matter and the insects that inhabit them, making them particularly useful for research on conversion of biomass to value-added products.

Examples of habitats of origin include:

- FOODS AND BEVERAGES: wine, baking, brewing, spoiled beer, lambic beer, sausage, sauerkraut, olives, traditional fermentations, coffee beans, dairy products, fish, soft drinks, honey, meats
- FRUITS AND VEGETABLES: including apple, banana, cherry, raspberry, soybean, many fruit juices
- PLANTS: flowers from allium to zinnia, shrubs, grasses, dozens of cactus species, dozens of tree species such as aspen, birch, chestnut, and the rest of the alphabet
- INSECTS: ants, beetles, bees, cockroach, *Drosophila*, lacewing, mites, wasps, and much more
- OTHER ENVIRONMENTAL: oceans, rivers, lakes, swamps, glaciers, atmosphere, sewage sludge, wood pulp, soil
- CLINICAL ISOLATES: cerebrospinal fluid, colostrum, dandruff, teeth, feces, hair, lung, sputum

New additions to the public catalog of the Phaff collection in 2012 include:

- Strains of *Cryptococcus, Candida* and other species isolated from oak, birch and maple, deposited by Joseph Heitman, Duke University
- Yeasts isolated from solitary bees and their feeding substrates by Ryder Diaz (Evolution and Ecology, UC Davis)
- Yeasts isolated from cockroach and stick insects by Matan Shelomi (Entomology, UC Davis)
- Yeasts and filamentous fungi isolated from walnut twig beetle (in collaboration with Steve Seybold, USDA Forest Service, Davis, CA)

A full strain catalog is available online at www.phaffcollection.org. You can search by genus, species, strain ID number, geographic location, source habitat, etc.

Yeast species available from the Phaff collection, and the number of strains of each, are listed below. In addition, there are dozens of undescribed species, awaiting names. Contact collection curator Kyria Boundy-Mills for more information, klbmills@ucdavis.edu.

1 *Aciculoconidium aculeatum*
5 *Ambrosiozyma angophorae*
1 *Ambrosiozyma monospora*
1 *Ambrosiozyma philentoma*
1 *Ambrosiozyma platypodis*
83 *Aureobasidium pullulans*
1 *Babjaviella inositovora*
13 *Barnettozyma californica*
8 *Barnettozyma hawaiiensis*
5 *Barnettozyma populi*
1 *Barnettozyma pratensis*
3 *Barnettozyma salicaria*
1 *Barnettozyma wickerhamii*
1 *Blastobotrys americana*
1 *Blastobotrys arbuscula*
1 *Blastobotrys capitula*
1 *Blastobotrys chiropterorum*
1 *Blastobotrys indianaensis*
1 *Blastobotrys muscicola*
1 *Blastobotrys parvus*
1 *Blastobotrys robertii*
4 *Brettanomyces bruxellensis*
1 *Brettanomyces claussenii*
2 *Brettanomyces custersianus*
2 *Brettanomyces naardenensis*
2 *Brettanomyces nanus*
2 *Bullera alba*
2 *Bullera dendrophila*
1 *Bullera ninhbinhensis*
2 *Bullera pseudoalba*
2 *Bulleromyces albus*
4 *Candida aaseri*
2 *Candida abiesophila*
1 *Candida alimentaria*
1 *Candida amapae*
1 *Candida ambrosiae*
2 *Candida anatomiae*
2 *Candida anglica*
8 *Candida apicola*
2 *Candida apis*
2 *Candida arabinofermentans*
1 *Candida arcana*
1 *Candida asiatica*
4 *Candida asparagi*
1 *Candida atlantica*
3 *Candida atmosphaerica*
1 *Candida auringiensis*
1 *Candida azyma*
1 *Candida batistae*
1 *Candida bentonensis*
84 *Candida boidinii*
1 *Candida boleticola*
7 *Candida bombi*
1 *Candida buinensis*
50 *Candida californica*
5 *Candida carpophila*
17 *Candida caseinolytica*
1 *Candida castellii*
6 *Candida catenulata*
1 *Candida cerambycidarum*
1 *Candida chilensis*
1 *Candida chiropterorum*
1 *Candida cidri*
2 *Candida cleridarum*
1 *Candida coipomoensis*
2 *Candida cylindracea*
1 *Candida dendrica*
1 *Candida dendronema*
47 *Candida deserticola*
11 *Candida diddensiae*
4 *Candida diversa*
2 *Candida elateridarum*
1 *Candida emberorum*
3 *Candida eremophila*
1 *Candida ergatensis*
4 *Candida etchellsii*
7 *Candida ethanolica*
1 *Candida fabianii*
6 *Candida famata*
1 *Candida fermentati*
1 *Candida flavicans*
1 *Candida floccose*
1 Candida floricola
1 *Candida floris*
2 *Candida fluviatilis*
2 *Candida fragi*
5 *Candida freyschussii*
3 *Candida friedrichii*
1 *Candida galacta*
1 *Candida geochares*
1 *Candida gropengiesseri*
1 *Candida guaymorum*
12 *Candida guilliermondii*
1 *Candida heliconiae*
1 *Candida hollandica*
1 *Candida homilentoma*
5 *Candida humilis*
1 *Candida incommunis*
6 *Candida inconspicua*
1 *Candida insectamans*
8 *Candida insectorum*
5 *Candida intermedia*
1 *Candida ipomoeae*
1 *Candida ishiwadae*
1 *Candida* jaroonii
1 *Candida kefyr*
1 *Candida kofuensis*
1 *Candida kruisii*
1 *Candida kuoi*
3 *Candida lactis-condensi*
8 *Candida lambica*
1 *Candida lassenensis*
2 *Candida leandrae*
1 *Candida lipolytica*
1 *Candida lipophila*
4 *Candida lusitaniae*
1*Candida magnoliae*
7 *Candida maltosa*
1 *Candida maris*
16 *Candida maritima*
2 *Candida melibiosica*
4 *Candida membranifaciens*
8 *Candida mesenterica*
1 *Candida methanosorbosa*
1 *Candida milleri*
4 *Candida mogii*
2 *Candida molischiana*
1 *Candida montana*
4 *Candida multigemmis*
5 *Candida musae*
1 *Candida mycetangii*
1 *Candida nanaspora*
3 *Candida natalensis*
1 *Candida nemodendra*
5 *Candida nitratophila*
16 *Candida norvegica*
1 *Candida novakii*
2 *Candida odintsovae*
15 *Candida oleophila*
12 *Candida orba*
13 *Candida oregonensis*
1 *Candida orthopsilosis*
1 *Candida oslonensis*
1 *Candida palmioleophila*
2 *Candida parapsilosis*
2 *Candida pararugosa*
5 *Candida pelliculosa*
1 *Candida peltata*
2 *Candida peoriensis*
1 *Candida picachoensis*
5 *Candida piceae*
1 *Candida picinguabensis*
3 *Candida pignaliae*
18 *Candida pimensis*
3 *Candida pini*
1 *Candida ponderosae*
12 *Candida populi*
1 *Candida pseudointermedia*
1 *Candida pyralidae*
2 *Candida quercitrusa*
4 *Candida quercuum*
12 *Candida railenensis*
3 *Candida rancensis*
1 *Candida rhagii*
2 *Candida rugopelliculosa*
6 *Candida rugosa*
54 *Candida sake*
2 *Candida salmanticensis*
12 *Candida santamariae*
1 *Candida santjacobensis*
1 *Candida saopaulonensis*
1 *Candida schatavii*
1 *Candida scorzettiae*
2 *Candida sequanensis*
4 *Candida shehatae*
1 *Candida silvae*
5 *Candida silvanorum*
1 *Candida silvatica*
11 *Candida silvicola*
15 *Candida solani*
233 *Candida sonorensis*
2 *Candida sorbophila*
3 *Candida sorbosa*
2 *Candida sorboxylosa*
2 *Candida spandovensis*
1 *Candida spencermartinsiae*
1 *Candida sphagnicola*
1 *Candida spherica*
1 *Candida stelleta*
1 *Candida stellimalicola*
1 *Candida subhashii*
1 *Candida succiphila*
1 *Candida suecica*
1 *Candida suzukii*
1 *Candida tallmaniae*
1 *Candida tartarivorans*
9 *Candida tenuis*
1 *Candida tepae*
2 *Candida torresii*
1 *Candida tropicalis*
1 *Candida tsuchiyae*
1 *Candida ubatubensis*
1 *Candida ulmi*
7 Candida utilis
15 Candida valida
2 *Candida vartiovaarae*
2 *Candida versatilis*
14 *Candida vini*
2 Candida wickerhamii
18 *Candida wyomingensis*
1 *Candida xylopsoci*
116 *Candida zemplinina*
9 *Candida zeylanoides*
1 *Cephaloascus fragrans*
4 *Citeromyces hawaiiensis*
7 *Citeromyces matritensis*
1 *Cladosporium cladosporioides*
9 *Clavispora lusitaniae*
138 *Clavispora opuntiae*
2 *Cryptococcus taibaiensis*
2 *Cryptococcus aerius*
40 *Cryptococcus albidus*
1 *Cryptococcus amylolyticus*
1 *Cryptococcus armeniacus*
1 *Cryptococcus aureus*
7 *Cryptococcus bhutanensis*
1 *Cryptococcus bromeliarum*
22 *Cryptococcus carnescens*
2 *Cryptococcus chernovii*
1 *Cryptococcus cistialbidi*
2 *Cryptococcus curvatus*
5 *Cryptococcus dimennae*
2 *Cryptococcus ferigula*
1 *Cryptococcus festocosus*
3 *Cryptococcus flavescens*
1 *Cryptococcus flavus*
3 *Cryptococcus foliicola*
3 *Cryptococcus gastricus*
1 *Cryptococcus guttulatus*
2 *Cryptococcus heveanensis*
35 *Cryptococcus humicola*
1 *Cryptococcus infirmo-miniatus*
42 *Cryptococcus laurentii*
12 *Cryptococcus luteolus*
12 *Cryptococcus macerans*
32 *Cryptococcus magnus*
2 *Cryptococcus marinus*
5 *Cryptococcus oeirensis*
4 *Cryptococcus ramirezgomezianu*
10 *Cryptococcus saitoi*
13 *Cryptococcus skinneri*
5 *Cryptococcus stepposus*
1 *Cryptococcus tephrensis*
9 *Cryptococcus terreus*
1 *Cryptococcus uniguttulatus*
2 *Cryptococcus uzbekistanensis*
51 *Cryptococcus victoriae*
2 *Cryptococcus vishniacii*
1 *Cryptococcus watticus*
3 *Cryptococcus wieringae*
3 *Cuniculitrema polymorpha*
1 *Curvibasidium cygneicollum*
3 *Cyberlindnera amylophila*
1 *Cyberlindnera bimundalis*
1 *Cyberlindnera euphorbiae*
1 *Cyberlindnera euphorbiiphila*
2 *Cyberlindnera fabianii*
1 *Cyberlindnera lachancei*
1 *Cyberlindnera lachancei*
1 *Cyberlindnera meyerae*
1 *Cyberlindnera misumaiensis*
1 *Cyberlindnera mrakii*
1 *Cyberlindnera rhodanensis*
1 *Cyberlindnera sargentensis*
2 *Cyberlindnera subsufficiens*
4 *Cystofilobasidium bisporidii*
2 *Cystofilobasidium capitatum*
30 *Cystofilobasidium infirmominiatum*
1 *Cystofilobasidium macerans*
1 *Debaryomyces coudertii*
1 *Debaryomyces fabryi*
68 *Debaryomyces hansenii*
1 *Debaryomyces maramus*
1 *Debaryomyces nepalensis*
9 *Debaryomyces prosopidis*
1 *Debaryomyces robertsiae*
1 *Debaryomyces tamarii*
2 *Dekkera anomala*
16 *Dekkera bruxellensis*
1 *Dioszegia catarinonii*
1 *Dioszegia cryoxerica*
1 *Dioszegia fristingensis*
1 *Dioszegia hungarica*
1 *Dioszegia zsoltii*
2 *Dipodascopsis uninucleata*
16 *Dipodascus aggregatus*
1 *Dipodascus albidus*
1 *Dipodascus armillariae*
1 *Farysizyma acheniorum*
1 *Farysizyma setubalensis*
1 *Fellomyces penicillatus*
1 *Fellomyces polyborus*
1 *Fibulobasidium inconspicuum*
3 *Filobasidium capsuligenum*
4 *Filobasidium floriforme*
17 *Filobasidium globisporum*
22 *Galactomyces geotrichum*
5 *Galactomyces reessii*
2 *Geotrichum citri-aurantii*
1 *Geotrichum fermentans*
10 *Geotrichum klebahnii*
2 *Guehomyces pullulans*
1 *Hanseniaspora clermontiae*
10 *Hanseniaspora guilliermo*
4 *Hanseniaspora meyeri*
5 *Hanseniaspora occidentalis*
4 *Hanseniaspora opuntiae*
5 *Hanseniaspora osmophila*
288 *Hanseniaspora uvarum*
14 *Hanseniaspora valbyensis*
2 *Hanseniaspora vineae*
1 *Holtermanniella festucosus*
5 *Hyphopichia burtonii*
7 *Kazachstania exigua*
1 *Kazachstania gamospora*
4 *Kazachstania lodderae*
1 *Kazachstania pintolopesii*
1 *Kazachstania rosinii*
1 *Kazachstania servazzii*
1 *Kazachstania spencerorum*
1 *Kazachstania telluris*
5 *Kazachstania unispora*
1 *Kazachstania viticola*
1 *Kloeckera africana*
10 *Kloeckera apiculata*
8 *Kloeckera apis*
1 *Kloeckera japonica*
1 *Kloeckera javanica*
5 *Kloeckera lindneri*
3 *Kluyveromyces aestuarii*
2 *Kluyveromyces dobzhanskii*
38 *Kluyveromyces lactis*
66 *Kluyveromyces marxianus*
7 *Kluyveromyces wickerhami*
1 *Kodamaea laetipori*
1 *Kodamaea nitidulidarum*
14 *Kodamaea ohmeri*
7 *Komagataella pastoris*
1 *Komagataella phaffi*
1 *Komagataella populi*
1 *Komagataella pseudopastor*
1 *Kregervanrija delftensis*
15 *Kregervanrija fluxuum*
22 *Kuraishia capsulata*
1 *Kuraishia molischiana*
1 *Kwoniella mangroviensis*
1 *Lachancea cidri*
19 *Lachancea fermentati*
21 *Lachancea kluyveri*
51 *Lachancea thermotolerans*
7 *Lachancea waltii*
1 *Leucosporidiella creatinivor*
5 *Leucosporidiella muscorum*
1 *Leucosporidium scottii*
3 *Lindnera bimundalis*
1 *Lindnera fabianii*
15 *Lindnera lachancei*
1 *Lindnera mississippiensis*
2 *Lindnera misumaiensis*
3 *Lindnera mrakii*
4 *Lindnera rhodanensis*
1 *Lindnera sargentensis*
9 *Lindnera saturnus*
1 *Lindnera suaveolens*
2 *Lindnera veronae*
1 *Lipomyces arxii*
1 *Lipomyces kockii*
2 *Lipomyces kononenkoae*
3 *Lipomyces lipofer*

7 *Lipomyces starkeyi*
1 *Lipomyces suomiensis*
5 *Lipomyces tetrasporus*
4 *Lodderomyces elongisporus*
8 *Magnusiomyces capitatus*
5 *Magnusiomyces ingens*
6 *Magnusiomyces magnusii*
6 *Magnusiomyces ovetensis*
3 *Magnusiomyces spicifer*
32 *Magnusiomyces starmeri*
2 *Magnusiomyces tetrasperma*
2 *Metschnikowia agaves*
6 *Metschnikowia australis*
37 *Metschnikowia bicuspidata*
5 *Metschnikowia chrysoperlae*
1 *Metschnikowia corniflorae*
5 *Metschnikowia fructicola*
13 *Metschnikowia gruessii*
2 *Metschnikowia hawaiiensis*
1 *Metschnikowia kamienski*
6 *Metschnikowia krissii*
2 *Metschnikowia lunata*
1 *Metschnikowia orientalis*
1 *Metschnikowia proteae*
39 *Metschnikowia pulcherrima*
33 *Metschnikowia reukaufii*
1 *Metschnikowia vanudenii*
8 *Metschnikowia zobellii*
4 *Meyerozyma caribbica*
14 *Meyerozyma guilliermondii*
1 *Millerozyma acaciae*
7 *Millerozyma farinosa*
1 *Moniliella megachiliens*
1 *Moniliella suaveolens*
1 *Myxozyma geophila*
1 *Myxozyma kluyveri*
2 *Myxozyma melibiosi*
1 *Myxozyma monticola*
52 *Myxozyma mucilagina*
2 *Myxozyma neglecta*
1 *Myxozyma neotropica*
1 *Myxozyma nipponensis*
1 *Myxozyma sirexii*
1 *Myxozyma vanderwaltii*
2 *Nadsonia commutata*
11 *Nadsonia fulvescens*
2 *Nakaseomyces bacillisporus*
3 *Nakaseomyces delphensis*
20 *Nakazawaea holstii*
2 *Naumovomyces dairenensis*
1 *Naumovozyma castellii*
1 *Occultifur externus*
1 *Ogataea allantospora*
1 *Ogataea dorogensis*
4 *Ogataea glucozyma*
2 *Ogataea henricii*
1 *Ogataea kodamae*
1 *Ogataea methanolica*
1 *Ogataea methylivora*
7 *Ogataea minuta*
2 *Ogataea naganishii*
3 *Ogataea philodendri*
2 *Ogataea pilisensis*
15 *Ogataea pini*
2 *Ogataea polymorpha*
1 *Ogataea populialbae*
1 *Ogataea ramenticola*
1 *Ogataea trehaloabstinens*
4 *Ogataea trehalophila*
3 *Ogataea wickerhamii*
1 *Oosporidium margaritiferum*
3 *Pachysolen tannophilus*
8 *Peterozyma toletana*
2 *Peterozyma xylosa*
11 *Phaffia rhodozyma*
20 *Phaffomyces antillensis*
42 *Phaffomyces opuntiae*
27 *Phaffomyces thermotolerans*
33 *Pichia barkeri*
443 *Pichia cactophila*
15 *Pichia cephalocereana*
19 *Pichia deserticola*
2 *Pichia dianae*
55 *Pichia eremophila*
4 *Pichia exigua*
9 *Pichia fermentans*
63 *Pichia heedii*
9 *Pichia insulana*
204 *Pichia kluyveri*
62 *Pichia kudriavzevii*
67 *Pichia manshurica*
69 *Pichia membranifaciens*
9 *Pichia nakasei*
2 *Pichia norvegensis*
5 *Pichia occidentalis*
23 *Pichia pseudocactophila*
14 *Pichia scutulata*
48 *Pichia terricola*
11 *Priceomyces carsonii*
1 *Priceomyces castillae*
3 *Priceomyces haplophilus*
1 *Priceomyces medius*
1 *Priceomyces melissophilus*
1 *Pseudozyma aphidis*
1 *Pseudozyma graminicola*
1 *Pseudozyma hubeiensis*
1 *Pseudozyma rugulosa*
2 *Pseudozyma shanxiensis*
1 *Rhodosporidium paludigenu*
17 *Rhodosporidium diobovatu*
1 *Rhodosporidium fluviale*
3 *Rhodosporidium kratochvilov*
3 *Rhodosporidium paludigenu*
4 *Rhodosporidium sphaerocarp*
13 *Rhodosporidium toruloides*
9 *Rhodotorula araucariae*
7 *Rhodotorula aurantiaca*
1 *Rhodotorula babjevae*
3 *Rhodotorula bacarum*
1 *Rhodotorula bogoriensis*
1 *Rhodotorula buffonii*
1 *Rhodotorula calyptogenae*
4 *Rhodotorula colostri*
6 *Rhodotorula creatinivora*
3 *Rhodotorula dairenensis*
25 *Rhodotorula fujisanensis*
33 *Rhodotorula glutinis*
20 *Rhodotorula graminis*
2 *Rhodotorula hylophila*
1 *Rhodotorula ingeniosa*
3 *Rhodotorula lactosa*
1 *Rhodotorula laryngis*
4 *Rhodotorula marina*
27 *Rhodotorula minuta*
57 *Rhodotorula mucilaginosa*
1 *Rhodotorula nothofagi*
1 *Rhodotorula pallida*
3 *Rhodotorula pinicola*
1 *Rhodotorula pustula*
7 *Rhodotorula slooffiae*
36 *Saccharomyces bayanus*
1 *Saccharomyces cariocanus*
516 *Saccharomyces cerevisiae*
2 *Saccharomyces kudriavzevii*
1 *Saccharomyces mikatae*
19 *Saccharomyces paradoxus*
7 *Saccharomyces pastorianus*
4 *Saccharomyces servazzii*
2 *Saccharomyces uvarum*
7 *Saccharomycodes ludwigii*
2 *Saccharomycodes sinensis*
3 *Saccharomycopsis capsularis*
1 *Saccharomycopsis crataegens*
3 *Saccharomycopsis fibuligera*
7 *Saccharomycopsis javanensis*
1 *Saccharomycopsis malanga*
1 *Saccharomycopsis schoenii*
1 *Saccharomycopsis selenospor*
1 *Saccharomycopsis synnaeden*
9 *Sakaguchia dacryoidea*
6 *Saprochaete clavata*
2 *Saprochaete suaveolens*
1 *Saturnispora besseyi*
4 *Saturnispora dispora*
4 *Saturnispora saitoi*
3 *Scheffersomyces spartinae*
17 *Scheffersomyces stipitis*
1 *Schizoblastosporion starkeyi-henricii*
2 *Schizosaccharomyces japonicu*
2 *Schizosaccharomyces octospor*
9 *Schizosaccharomyces pombe*
2 *Schwanniomyces capriotti*
2 *Schwanniomyces etchellsii*
23 *Schwanniomyces occidentali*
13 *Schwanniomyces polymorph*
2 *Schwanniomyces pseudopolymorphus*
9 *Schwanniomyces vanrijiae*
4 *Sporidiobolus johnsonii*
2 *Sporidiobolus metaroseus*
14 *Sporidiobolus pararoseus*
11 *Sporidiobolus ruineniae*
23 *Sporidiobolus salmonicolor*
2 *Sporobolomyces gracilis*
3 *Sporobolomyces odoratus*
1 *Sporobolomyces oryzicola*
41 *Sporobolomyces roseus*
1 *Sporobolomyces ruberrimus*
1 *Sporobolomyces singularis*
2 *Sporobolomyces tsugae*
128 *Sporopachydermia cereana*
2 *Sporopachydermia lactativora*
1 *Sporopachydermia oaxacaensi*
110 *Sporopachydermia opuntia*
1 *Sporopachydermia quercuum*
1 *Sporopachydermia stenocerea*
29 *Starmera amethionina*
38 *Starmera caribaea*
2 *Starmera dryadoides*
16 *Starmera pachycereana*
1 *Starmera quercuum*
3 *Starmerella bombicola*
1 *Sugiyamaella americana*
1 *Sugiyamaella chiloensis*
1 *Taphrina communis*
1 *Taphrina deformans*
1 *Taphrina wiesneri*
1 *Tetrapisispora blattae*
1 *Tetrapisispora phaffii*
1 *Tilletiopsis washingtonensis*
60 *Torulaspora delbrueckii*
4 *Torulaspora globosa*
3 *Torulaspora microellipsoides*
8 *Torulaspora pretoriensis*
2 *Tremella aurantia*
3 *Tremella encephala*
2 *Tremella foliacea*
1 *Tremella fuciformis*
1 *Tremella globispora*
1 *Tremella indecorata*
1 *Tremella mesenterica*
2 *Tremella moriformis*
1 *Trichomonascus farinosus*
1 *Trichomonascus petasosporus*
5 *Trichosporon asahii*
1 *Trichosporon asteroides*
2 *Trichosporon coremiiforme*
1 *Trichosporon cutaneum*
2 *Trichosporon dermatis*
1 *Trichosporon domesticum*
1 *Trichosporon guehoae*
1 *Trichosporon insectorum*
2 *Trichosporon laibachii*
1 *Trichosporon montevideense*
5 *Trichosporon porosum*
1 *Trigonopsis californica*
3 *Trigonopsis variabilis*
1 *Trigonopsis vinaria*
1 *Udeniomyces pannonicus*
1 *Udeniomyces puniceus*
3 *Udeniomyces pyricola*
1 *Ustilago cynodontis*
3 *Vanderwaltozyma polyspora*
1 *Vanderwaltozyma yarrowii*
1 *Wickerhamia fluorescens*
3 *Wickerhamomyces alni*
55 *Wickerhamomyces anomalus*
1 *Wickerhamomyces bisporus*
1 *Wickerhamomyces bovis*
16 *Wickerhamomyces canadensis*
1 *Wickerhamomyces chambardii*
6 *Wickerhamomyces ciferrii*
1 *Wickerhamomyces hampshirensis*
1 *Wickerhamomyces mucosus*
1 *Wickerhamomyces onychis*
3 *Wickerhamomyces pijperi*
2 *Wickerhamomyces silvicola*
1 *Wickerhamomyces strasburgensis*
5 *Wickerhamomyces strasburgensis*
1 *Wickerhamomyces sydowiorum*
1 *Xanthophyllomyces dendrorhous*
36 *Yamadazyma mexicana*
1 *Yamadazyma nakazawae*
47 *Yamadazyma scolyti*
3 *Yamadazyma triangularis*
22 *Yarrowia lipolytica*
4 *Zygoascus hellenicus*
3 *Zygoascus meyerae*
1 *Zygoascus ofunaensis*
1 *Zygoascus tannicolus*
44 *Zygosaccharomyces bailii*
8 *Zygosaccharomyces bisporus*
1 *Zygosaccharomyces kombuchaensis*
5 *Zygosaccharomyces mellis*
18 *Zygosaccharomyces rouxii*
2 *Zygotorulaspora florentina*
1 *Zygotorulaspora mrakii*

Phaff Collection Quick Facts:

- Over **7,000** strains in the public catalog
- Over **750** different yeast species (roughly half of the known yeast species)
- Oldest yeast: isolated by the UC Berkeley cellarmaster in **1893**
- Percent of strains not available from any other collection: **80%**

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