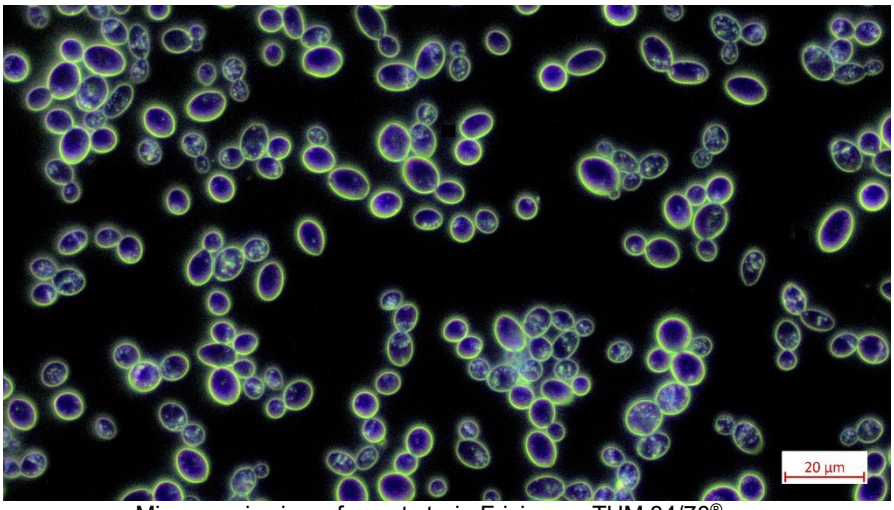
FORSCHUNGSZENTRUM
WEIHENSTEPHAN
für Brau- und Lebensmittelqualität

Frisinga - TUM 34/70® & Proles - TUM 34/78®

Saccharomyces pastorianus ssp. carlsbergensis
bottom fermenting brewing yeast

Short description
These yeast strains are excellently suited for the production of bottom-fermented beers of all types. The resulting beer possesses an extremely pure flavor, a fine, subtle aroma and a mild overall impression. Fermentation is rapid with optimal yeast flocculation. The degree to which the color lightens during fermentation is sufficient.
The principle difference between Frisinga - TUM 34/70® and Proles - TUM 34/78® is their flocculation behavior during primary fermentation. Proles - TUM 34/78® can remain somewhat longer in suspension. The length of time that the yeast remains in suspension is dependent on conditions present in the brewery.

Examination parameters	**Result**
Original extract (%)	11.6
Apparent degree of attenuation (%)	73
Cells in suspension (Mio/ml)	12.5
pH value	4.6
Diacetyl (mg/l)	0.7
Acetaldehyde (mg/l)	6
Higher aliphatic alcohols (mg/l)	58
Esters (mg/l)	18.5
Foam according to Ross & Clark (sec)	132
Short characteristics	
Fermentation rate	high
pH drop	normal
Flocculation	optimal
Diacetyl reduction	very good
Foam	very good
Acetaldehyde	normal
Higher alcohols	very low
Esters	pronounced

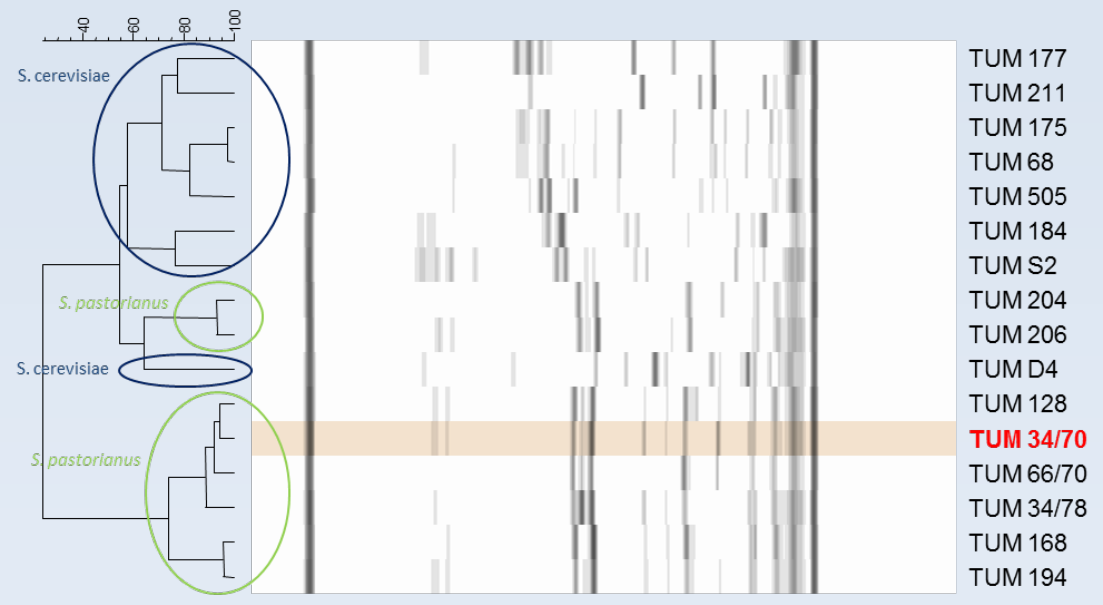


Microscopic view of yeast strain Frisinga – TUM 34/70®
(Picture Frisinga – TUM 34/70® © FZW BLQ)

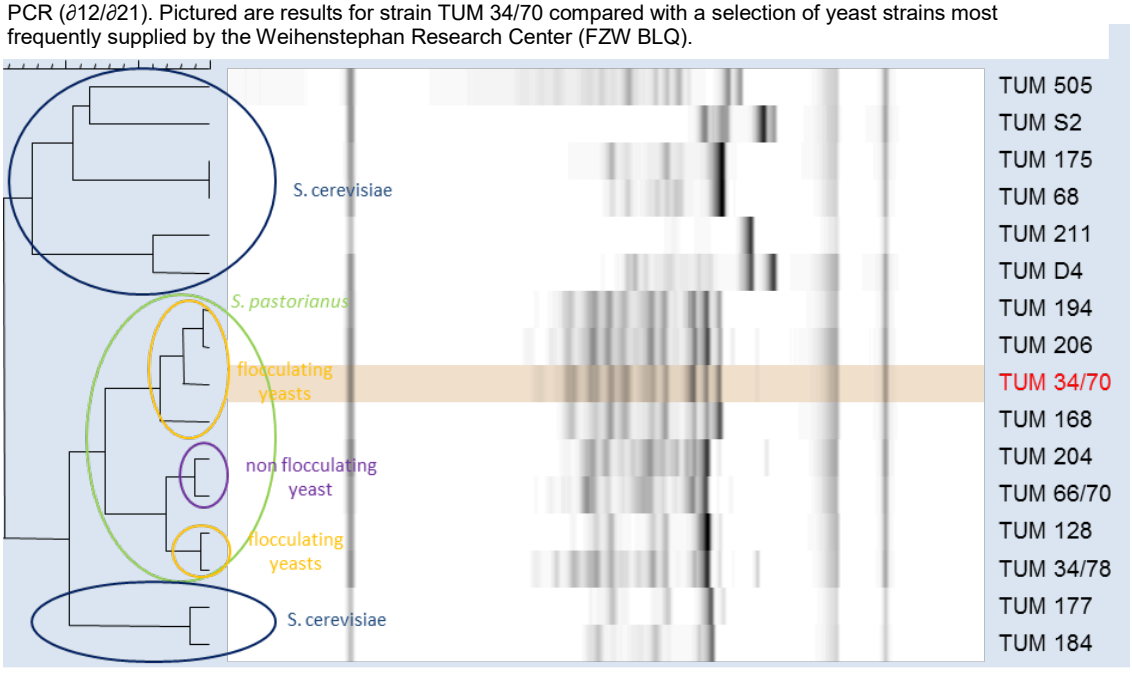
Real-time PCR Screening Profile:
Comparison of individual qualitative results from real-time PCR systems for the differentiation of industrial *Saccharomyces* strains (with a focus on *S. cerevisiae* and *S. pastorianus* (bottom-fermenting strains)) (according to Hutzler, M. 2009, Hutzler, M. 2010)

Yeast	Strain	PCR System					
		Sc-GRC3	Sce	OG-COXII	Sbp	UG-LRE1	UG-300
S. bayanus	DSM 70412T, 70547, BTII K 1-C-3	-	-	-	+	-	-
	70411, 70508	-	-	-	+	+	+
S. bayanus/ pastorianus	CBS 2440, 6017	-	-	-	+	+	+
S. pastorianus	CBS 1503, 1513, 1538, DSM 6580NT, 6581	-	-	-	+	+	+
S. pastorianus (bottom-fermenting)	TUM 26, 44, 34/70, 34/78, 44, 54, 59, 69, 84, 105, 109, 120, 128, 168, 172, 180, 194, 199, 206 (flocculent yeasts) TUM 71, 144 (low or non-flocculent yeasts) CBS 1484, 5832, CBS 6903, NBRC 2003, BTII K B-I-4, B-J-4, B-J-5	+	+	-	+	+	+
	TUM 120 (flocculent yeast) TUM 66, 66/70, 204 (low or non-flocculent yeasts) CBS 5832, CBS 6903	+	+	-	+/-	+	+
S. cerevisiae	DSM 70424, 70449T, 70451, CBS 1464, 8803, BT II K 3-A-1, 3-C-3, 3-G-1, 5-A-7, 6-I-1, 6-F-4	+	+	+	-	-	-
S. cerevisiae (top-fermenting)	TUM 68, 127, 149, 175, 205, BTII K 5-A-8 (Southern German style wheat beer yeast)	+	+	+	-	-	-
	TUM 148, 184, 208 (alt yeast)	+	+	+	-	-	-
	TUM 165, 177 (kölsch yeast)	+	+	+	-	-	-
	TUM 210, 211, 213 (ale yeast)	+	+	+	-	-	-
	TUM Bingen, Bordeaux, Eperney, Laureiro, Stein, Wädensvill (wine yeast)	+	+	+	-	-	-
	TUM B4 (distillers' yeast)	+	+	+	-	-	-
	TUM S2 (sparkling wine yeast)	+	+	+	-	-	-
S. cerevisiae var. diastaticus	CBS 1782, DSM 70487, BTII K 1-B-8, 1-H-7, 2-A-7, K 2-F-1, 3-D-2, 3-H-2, 3-H-4	+	+	+	-	-	-
S. cariocanus	CBS 7995, 8841	-	+	-	-	-	-
	CBS 5313	+	+	+	-	-	-
S. kudriavzevii	CBS 8840	-	-	-	-	-	-
S. mikatae	CBS 8839	-	-	-	-	-	-
S. paradoxus	CBS 406, 432, 2908, 5829, 7400, 8436	-	+	-	-	-	-

Genetic fingerprint profile:



The virtual electrophoresis gel depicted above was created using capillary electrophoresis separated by interdelta PCR (∂12/∂21). Pictured are results for strain TUM 34/70 compared with a selection of yeast strains most frequently supplied by the Weihenstephan Research Center (FZW BLQ).



A virtual image of the rDNA IGS2_314 genetic fingerprint of yeast strains separated using capillary gel electrophoresis is depicted above. Pictured are the results for strain Frisinga - TUM 34/70® compared with a selection of yeast strains most frequently supplied by the Weihenstephan Research Center (FZW BLQ)

References:

Hutzler M.:	Dissertation : "Entwicklung und Optimierung von Methoden zur Identifizierung und Differenzierung von getränkerelevanten Hefen" (2009)
Hutzler M.:	Book: "Getränkerelevante Hefen- Identifizierung und Differenzierung: Wie können Hefen praxisrelevant unterschieden werden, und wie können Identifizierungsergebnisse technologisch bewertet werden?" (2010) ISBN 978-3-8381-1482-8
Stretz D.; Hutzler M.; et al.:	Brauwelt: "Qualitätssicherung beginnt bei der Hefeanzucht – Hefe in Reinstform" (2010)
Riedl R.; et al.:	EBC Congress Glasgow: „Yeast Strain Identification by a Combination of Partial IGS2-rDNA-PCR and Rep-PCR Fingerprinting" (2011)
Geiger E.; Tenge C.:	Lecture "Biologische Analyse und Betriebsüberwachung" (Stand SS 2007)
Geiger E.; Tenge C.:	Lecture "Technologie der Gärung" (Stand WS 2007/2008)
Geiger E.; Tenge C.:	Laboratory script "Gärungstechnologie/Organoleptik" (Stand SS 2007)
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