Assessment of Yeasts as Potential Probiotics: A Review of Gastrointestinal Tract Conditions and Investigation Methods

Supplementary Materials

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Table S1. The survivability of selected yeast strains undergo in-vitro gastric conditions

Genus	Species	Source	Survival Mean	Minimum	Maximum	Count	Reference
Aureobasidium	*Aureobasidium pullulans*	Greek black olives	35.55	35.55	35.55	1	(S Bonatsou et al., 2015)
		table olive fermentation	89.38	84.5	97.6	6	(Stamatoula Bonatsou et al., 2018)
Candida	*Candida adriatica*	Olive Oil	23.4	16.6	30.2	2	(Zullo & Ciafardini, 2019)
	Candida boidinii	fermented black olive	29.79	4.19	55.38	2	(Porru et al., 2018)
		fermented Portugalian table olives	16.16	16.16	16.16	1	(Oliveira et al., 2017)
		table olive fermentation	90.12	85.5	95.2	6	(Stamatoula Bonatsou et al., 2018)
	Candida diddensiae	fermented black olive	65.67	64.94	66.4	2	(Porru et al., 2018)
		Olive Oil	2.4	1.78	3.01	2	(Zullo & Ciafardini, 2019)
		table olive fermentation	81.73	77.3	88.2	3	(Stamatoula Bonatsou et al., 2018)
	Candida molendinolei	table olive fermentation	73.06	68.6	80.7	7	(Stamatoula Bonatsou et al., 2018)
	Candida naeodendra	table olive fermentation	86.7	81.4	92	2	(Stamatoula Bonatsou et al., 2018)
	Candida norvegica	fermented Portugalian table olives	49.75	49.75	49.75	1	(Oliveira et al., 2017)
	Candida silvae	Greek black olives	33.25	33.25	33.25	1	(S Bonatsou et al., 2015)
	Candida tropicalis	fermented Portugalian table olives	133.7	72.65	194.76	2	(Oliveira et al., 2017)
Citeromyces	*Citeromyces matrinensis*	table olive fermentation	86.9	86.9	86.9	1	(Stamatoula Bonatsou et al., 2018)
Cystofilobasidium	*Cystofilobasidium bisporidii*	table olive fermentation	94.8	94.8	94.8	1	(Stamatoula Bonatsou et al., 2018)
Debaryomyces	*Debaryomyces hansenii*	fermented Portugalian table olives	40.71	40.71	40.71	1	(Oliveira et al., 2017)
		Greek black olives	90.37	90.37	90.37	1	(S Bonatsou et al., 2015)
Metschnikowia	*Metschnikowia pulcherrima*	Greek black olives	75.01	75.01	75.01	1	(S Bonatsou et al., 2015)
		table olive fermentation	96.43	95.7	97.5	3	(Stamatoula Bonatsou et al., 2018)
Nakazawaea	*Nakazawaea molendini-olei*	fermented black olive	15.43	15.43	15.43	1	(Porru et al., 2018)
		Olive Oil	21.11	3.8	38.41	2	(Zullo & Ciafardini, 2019)
	Nakazawaea wickerhamii	Olive Oil	75.86	75.86	75.86	1	(Zullo & Ciafardini, 2019)
Pichia	*Pichia guilliermondii*	fermented Portugalian table olives	179.43	179.43	179.43	1	(Oliveira et al., 2017)
		Greek black olives	492.05	492.05	492.05	1	(S Bonatsou et al., 2015)
		table olive fermentation	93.85	91.3	96.4	2	(Stamatoula Bonatsou et al., 2018)
	Pichia kluyveri	Greek black olives	87.77	87.77	87.77	1	(S Bonatsou et al., 2015)
		table olive fermentation	83.5	78.7	88.3	2	(Stamatoula Bonatsou et al., 2018)
	Pichia manshurica	fermented Portugalian table olives	29.63	29.63	29.63	1	(Oliveira et al., 2017)
		Greek black olives	76.96	76.96	76.96	1	(S Bonatsou et al., 2015)
		table olive fermentation	91.87	90	92.9	3	(Stamatoula Bonatsou et al., 2018)
	Pichia membranifaciens	Greek black olives	60.44	60.44	60.44	1	(S Bonatsou et al., 2015)

Rhodotorula	*Rhodotorula diobovatum*	Greek black olives	47.54	47.54	47.54	1	(S Bonatsou et al., 2015)
	Rhodotorula glutinis	table olive fermentation	86.37	75.7	91.7	3	(Stamatoula Bonatsou et al., 2018)
	Rhodotorula mucilaginosa	Greek black olives	31.33	31.33	31.33	1	(S Bonatsou et al., 2015)
		table olive fermentation	82.7	82.7	82.7	1	(Stamatoula Bonatsou et al., 2018)
Saccharomyces	*Saccharomyces boulardii*	fermented black olive	95.88	95.88	95.88	1	(Porru et al., 2018)
		fermented Portugalian table olives	44.43	44.43	44.43	1	(Oliveira et al., 2017)
		Olive Oil	66.06	66.06	66.06	1	(Zullo & Ciafardini, 2019)
	Saccharomyces cerevisiae	fermented black olive	79.68	79.68	79.68	1	(Porru et al., 2018)
		fermented Portugalian table olives	21.16	3.16	39.15	2	(Oliveira et al., 2017)
		Greek black olives	51.02	51.02	51.02	1	(S Bonatsou et al., 2015)
		table olive fermentation	93.03	89.9	98.8	6	(Stamatoula Bonatsou et al., 2018)
Wickerhamomyces	*Wickerhamomyces anomalus*	fermented black olive	49.15	49.15	49.15	1	(Porru et al., 2018)
		Greek black olives	40.48	40.48	40.48	1	(S Bonatsou et al., 2015)
		Olive Oil	33.95	17.78	50.12	2	(Zullo & Ciafardini, 2019)
Yamadazyma	*Yamadazyma terventina*	Olive Oil	17.91	10.12	25.7	2	(Zullo & Ciafardini, 2019)
Zygoascus	*Zygoascus hellenicus*	table olive fermentation	93.87	91.2	97.7	3	(Stamatoula Bonatsou et al., 2018)
Zygosaccharomyces	*Zygosaccharomyces mrakii*	fermented black olive	19.54	19.54	19.54	1	(Porru et al., 2018)

pH.2, pepsin 0.0133g/L, 2.5 h, 37°C, buffer: NaCl (2.05 g/L), KH2PO4 (0.60 g/ L), CaCl2 (0.11 g/L) and KCl (0.37 g/L)

Table S2. The survivability of selected yeast strains undergo in-vitro intestinal conditions

Genus	Species	Sources	Survival	Minimum	Maximum	Count	Reference
Aureobasidium	*Aureobasidium pullulans*	Greek black olives	0	0	0	1	(S Bonatsou et al., 2015)
		table olive fermentation	40.85	0	91.4	6	(Stamatoula Bonatsou et al., 2018)
Candida	*Candida adriatica*	Olive Oil	7.26	6.92	7.59	2	(Zullo & Ciafardini, 2019)
	Candida boidinii	fermented black olive	12.82	3.53	22.1	2	(Porru et al., 2018)
		fermented Portugalian table olives	18.17	18.17	18.17	1	(Oliveira et al., 2017)
		table olive fermentation	60.47	0	81.6	6	(Stamatoula Bonatsou et al., 2018)
	Candida diddensiae	fermented black olive	31.63	24.76	38.49	2	(Porru et al., 2018)
		Olive Oil	0.45	0.28	0.62	2	(Zullo & Ciafardini, 2019)
		table olive fermentation	66.67	65.4	69	3	(Stamatoula Bonatsou et al., 2018)
	Candida molendinolei	table olive fermentation	62.63	51	89.8	7	(Stamatoula Bonatsou et al., 2018)
	Candida naeodendra	table olive fermentation	35.85	0	71.7	2	(Stamatoula Bonatsou et al., 2018)
	Candida norvegica	fermented Portugalian table olives	125.75	125.75	125.75	1	(Oliveira et al., 2017)
	Candida silvae	Greek black olives	60.22	60.22	60.22	1	(S Bonatsou et al., 2015)
	Candida tropicalis	fermented Portugalian table olives	58.76	56.11	61.41	2	(Oliveira et al., 2017)
Citeromyces	*Citeromyces matrinensis*	table olive fermentation	55.3	55.3	55.3	1	(Stamatoula Bonatsou et al., 2018)
Cystofilobasidium	*Cystofilobasidium bisporidii*	table olive fermentation	87.5	87.5	87.5	1	(Stamatoula Bonatsou et al., 2018)
Debaryomyces	*Debaryomyces hansenii*	fermented Portugalian table olives	97.74	97.74	97.74	1	(Oliveira et al., 2017)
		Greek black olives	0.08	0.08	0.08	1	(S Bonatsou et al., 2015)
Metschnikowia	*Metschnikowia pulcherrima*	Greek black olives	12.1	12.1	12.1	1	(S Bonatsou et al., 2015)
		table olive fermentation	89.4	87.7	91.2	3	(Stamatoula Bonatsou et al., 2018)
Nakazawaea	*Nakazawaea molendini-olei*	fermented black olive	0.02	0.02	0.02	1	(Porru et al., 2018)
		Olive Oil	0.28	0.25	0.31	2	(Zullo & Ciafardini, 2019)
	Nakazawaea wickerhamii	Olive Oil	2.34	2.34	2.34	1	(Zullo & Ciafardini, 2019)
Pichia	*Pichia guilliermondii*	fermented Portugalian table olives	68.91	68.91	68.91	1	(Oliveira et al., 2017)
		Greek black olives	63.8	63.8	63.8	1	(S Bonatsou et al., 2015)
		table olive fermentation	81.85	81.2	82.5	2	(Stamatoula Bonatsou et al., 2018)
	Pichia kluyveri	Greek black olives	40.84	40.84	40.84	1	(S Bonatsou et al., 2015)
		table olive fermentation	72.25	64.4	80.1	2	(Stamatoula Bonatsou et al., 2018)
	Pichia manshurica	fermented Portugalian table olives	11.05	11.05	11.05	1	(Oliveira et al., 2017)
		Greek black olives	57.28	57.28	57.28	1	(S Bonatsou et al., 2015)

		table olive fermentation	79.87	78.4	82.5	3	(Stamatoula Bonatsou et al., 2018)
	Pichia membranifaciens	Greek black olives	11.29	11.29	11.29	1	(S Bonatsou et al., 2015)
Rhodotorula	*Rhodotorula diobovatum*	Greek black olives	3.83	3.83	3.83	1	(S Bonatsou et al., 2015)
	Rhodotorula glutinis	table olive fermentation	70.6	62.4	76.8	3	(Stamatoula Bonatsou et al., 2018)
	Rhodotorula mucilaginosa	Greek black olives	53.38	53.38	53.38	1	(S Bonatsou et al., 2015)
		table olive fermentation	71.1	71.1	71.1	1	(Stamatoula Bonatsou et al., 2018)
Saccharomyces	*Saccharomyces boulardii*	fermented black olive	10.99	10.99	10.99	1	(Porru et al., 2018)
		fermented Portugalian table olives	99.79	99.79	99.79	1	(Oliveira et al., 2017)
		Olive Oil	6.92	6.92	6.92	1	(Zullo & Ciafardini, 2019)
	Saccharomyces cerevisiae	fermented black olive	46.6	46.6	46.6	1	(Porru et al., 2018)
		fermented Portugalian table olives	94.29	12.61	175.98	2	(Oliveira et al., 2017)
		Greek black olives	64.28	64.28	64.28	1	(S Bonatsou et al., 2015)
		table olive fermentation	54.42	6.7	90.9	6	(Stamatoula Bonatsou et al., 2018)
Wickerhamomyces	*Wickerhamomyces anomalus*	fermented black olive	5.28	5.28	5.28	1	(Porru et al., 2018)
		Greek black olives	13.39	13.39	13.39	1	(S Bonatsou et al., 2015)
		Olive Oil	0.21	0.08	0.35	2	(Zullo & Ciafardini, 2019)
Yamadazyma	*Yamadazyma terventina*	Olive Oil	1.93	1.41	2.45	2	(Zullo & Ciafardini, 2019)
Zygoascus	*Zygoascus hellenicus*	table olive fermentation	72.4	65.1	86.5	3	(Stamatoula Bonatsou et al., 2018)
Zygosaccharomyces	*Zygosaccharomyces mrakii*	fermented black olive	0.1	0.1	0.1	1	(Porru et al., 2018)

pH 8.0, pancreatin 0.1 g/L, bile salts 3.0g/L, 3.5h, 37°C) Buffer:50.81 g/L of sodium phosphate dibasic heptahydrate and 8.5 g/L of NaCl

Table S3. Evaluated of NIC (non-inhibitory concentration) and MIC (minimum inhibitory concentration) values (g/L) measured under salt (NaCl) for the yeast strains

Genus	Species	Source	NaCl%	pH	Time	Temp.	NIC (g/L) mean	Minimum	Maximum	MIC (g/L)mean	Minimum	Maximum	Count	Reference
Aureobasidium	*Aureobasidium pullulans*	cv. Kalamata table olive fermentation	0-250 g/L	3.5	12h for 7days	Not mentined	24.6	0	42.4	115.5	0	207.2	6	(Stamatoula Bonatsou et al., 2018)
				5	12h for 7days	Not mentined	49.98	41.8	71.2	162.97	110.6	191.5	6	(Stamatoula Bonatsou et al., 2018)
				6.5	12h for 7days	Not mentined	49.58	17.4	69.4	131.5	94.7	168.6	6	(Stamatoula Bonatsou et al., 2018)
		Greek black olives	0-250 g/L	Not mentined	2h	Not mentined	44.47	44.47	44.47	127.09	127.09	127.09	1	(S Bonatsou et al., 2015)
Candida	*Candida boidinii*	cv. Kalamata table olive fermentation	0-250 g/L	3.5	12h for 7days	Not mentined	52.85	26.8	74.9	103.8	89.8	117.3	6	(Stamatoula Bonatsou et al., 2018)
				5	12h for 7days	Not mentined	73.07	54.7	82.3	120.62	103.9	168.5	6	(Stamatoula Bonatsou et al., 2018)
				6.5	12h for 7days	Not mentined	70.22	58.8	82.1	113	88.6	130.2	6	(Stamatoula Bonatsou et al., 2018)
		fermented black olive	0-180 g/L	4.5	7days	28	68.48	68.48	68.48	110.11	110.11	110.11	1	(Porru et al., 2018)
	Candida diddensiae	cv. Kalamata table olive fermentation	0-250 g/L	3.5	12h for 7days	Not mentined	48.77	0	92.4	81.37	0	155.2	3	(Stamatoula Bonatsou et al., 2018)
				5	12h for 7days	Not mentined	24.97	0	74.9	32.7	0	98.1	3	(Stamatoula Bonatsou et al., 2018)
				6.5	12h for 7days	Not mentined	19	0	57	29.53	0	88.6	3	(Stamatoula Bonatsou

													et al., 2018)
		fermented black olive	0-180 g/L	4.5	7days	28	79.13	64.58	93.67	119.54	98.95	140.12	2 (Porru et al., 2018)
	Candida molendinolei	cv. Kalamata table olive fermentation	0-250 g/L	3.5	12h for 7days	Not mentined	47.11	38.8	52.7	127.57	123.4	140.9	7 (Stamatoula Bonatsou et al., 2018)
				5	12h for 7days	Not mentined	76.94	61.1	92.6	134.14	125.5	163.8	7 (Stamatoula Bonatsou et al., 2018)
				6.5	12h for 7days	Not mentined	59.31	38.3	98.1	128	113.3	154.7	7 (Stamatoula Bonatsou et al., 2018)
	Candida naeodendra	cv. Kalamata table olive fermentation	0-250 g/L	3.5	12h for 7days	Not mentined	49.7	24.3	75.1	512.35	117.7	907	2 (Stamatoula Bonatsou et al., 2018)
				5	12h for 7days	Not mentined	60.65	41.3	80	158.8	112.6	205	2 (Stamatoula Bonatsou et al., 2018)
				6.5	12h for 7days	Not mentined	81	76.6	85.4	111.85	101.3	122.4	2 (Stamatoula Bonatsou et al., 2018)
	Candida silvae	Greek black olives	0-250 g/L	Not mentined	2h	Not mentined	45.82	45.82	45.82	134.66	134.66	134.66	1 (S Bonatsou et al., 2015)
	Saccharomyces boidinii	fermented black olive	0-180 g/L	4.5	7days	28	80.94	80.94	80.94	115.43	115.43	115.43	1 (Porru et al., 2018)
Citeromyces	*Citeromyces matrinensis*	cv. Kalamata table olive fermentation	0-250 g/L	3.5	12h for 7days	Not mentined	43.4	43.4	43.4	129.8	129.8	129.8	1 (Stamatoula Bonatsou et al., 2018)
				5	12h for 7days	Not mentined	0	0	0	0	0	0	1 (Stamatoula Bonatsou et al., 2018)
				6.5	12h for 7days	Not mentined	0	0	0	0	0	0	1 (Stamatoula Bonatsou

													et al., 2018)
Cystofilobasidium	*Cystofilobasidium bisporidii*	cv. Kalamata table olive fermentation	0-250 g/L	3.5	12h for 7days	Not mentined	17	17	17	88.8	88.8	88.8	1 (Stamatoula Bonatsou et al., 2018)
				5	12h for 7days	Not mentined	7.1	7.1	7.1	165.9	165.9	165.9	1 (Stamatoula Bonatsou et al., 2018)
				6.5	12h for 7days	Not mentined	4.8	4.8	4.8	205.3	205.3	205.3	1 (Stamatoula Bonatsou et al., 2018)
Debaryomyces	*Debaryomyces hansenii*	Greek black olives	0-250 g/L	Not mentined	2h	Not mentined	50.22	50.22	50.22	153.59	153.59	153.59	1 (S Bonatsou et al., 2015)
Metschnikowia	*Metschnikowia pulcherrima*	cv. Kalamata table olive fermentation	0-250 g/L	3.5	12h for 7days	Not mentined	22.73	0	43.7	66.47	0	130.3	3 (Stamatoula Bonatsou et al., 2018)
				5	12h for 7days	Not mentined	40.2	26.4	58.1	142.3	98.4	195.7	3 (Stamatoula Bonatsou et al., 2018)
				6.5	12h for 7days	Not mentined	20.7	0	34.2	76.43	0	133.4	3 (Stamatoula Bonatsou et al., 2018)
		Greek black olives	0-250 g/L	Not mentined	2h	Not mentined	61.08	61.08	61.08	176.65	176.65	176.65	1 (S Bonatsou et al., 2015)
Nakazawaea	*Nakazawaea molendini-olei*	fermented black olive	0-180 g/L	4.5	7days	28	67.2	67.2	67.2	118.92	118.92	118.92	1 (Porru et al., 2018)
Pichia	*Pichia guilliermondii*	cv. Kalamata table olive fermentation	0-250 g/L	3.5	12h for 7days	Not mentined	24.2	0	48.4	82.85	0	165.7	2 (Stamatoula Bonatsou et al., 2018)
				5	12h for 7days	Not mentined	81.55	75.8	87.3	207.5	204.8	210.2	2 (Stamatoula Bonatsou et al., 2018)
				6.5	12h for 7days	Not mentined	62.45	61.7	63.2	226.85	174.8	278.9	2 (Stamatoula

		Greek black olives	0-250 g/L	Not mentined	2h	Not mentined	109.93	109.93	109.93	261.6	261.6	261.6	1	Bonatsou et al., 2018) (S Bonatsou et al., 2015)
	Pichia kluyveri	cv. Kalamata table olive fermentation	0-250 g/L	3.5	12h for 7days	Not mentined	86.5	70.9	102.1	156.05	149.4	162.7	2	(Stamatoula Bonatsou et al., 2018)
				5	12h for 7days	Not mentined	0	0	0	0	0	0	2	(Stamatoula Bonatsou et al., 2018)
				6.5	12h for 7days	Not mentined	0	0	0	0	0	0	2	(Stamatoula Bonatsou et al., 2018)
		Greek black olives	0-250 g/L	Not mentined	2h	Not mentined	84.69	84.69	84.69	209.66	209.66	209.66	1	(S Bonatsou et al., 2015)
	Pichia manshurica	cv. Kalamata table olive fermentation	0-250 g/L	3.5	12h for 7days	Not mentined	48.5	39.9	62	159.57	149.9	178.3	3	(Stamatoula Bonatsou et al., 2018)
				5	12h for 7days	Not mentined	60.67	50.2	70.5	134.37	128.4	144.5	3	(Stamatoula Bonatsou et al., 2018)
				6.5	12h for 7days	Not mentined	70	64	80.6	125.93	115.2	143.3	3	(Stamatoula Bonatsou et al., 2018)
		Greek black olives	0-250 g/L	Not mentined	2h	Not mentined	71.16	71.16	71.16	152.13	152.13	152.13	1	(S Bonatsou et al., 2015)
	Pichia membranifaciens	Greek black olives	0-250 g/L	Not mentined	2h	Not mentined	20.15	20.15	20.15	154.41	154.41	154.41	1	(S Bonatsou et al., 2015)
Rhodotorula	*Rhodotorula diobovatum*	Greek black olives	0-250 g/L	Not mentined	2h	Not mentined	49.97	49.97	49.97	123.7	123.7	123.7	1	(S Bonatsou et al., 2015)

	Rhodotorula glutinis	cv. Kalamata table olive fermentation	0-250 g/L	3.5	12h for 7days	Not mentined	27.1	16.9	35.9	99.33	80.2	116.7	3	(Stamatoula Bonatsou et al., 2018)
				5	12h for 7days	Not mentined	26.73	14.3	41.3	131.8	74.8	183.4	3	(Stamatoula Bonatsou et al., 2018)
				6.5	12h for 7days	Not mentined	30.7	11.7	49.9	211.47	99.6	404.2	3	(Stamatoula Bonatsou et al., 2018)
	Rhodotorula mucilaginosa	cv. Kalamata table olive fermentation	0-250 g/L	3.5	12h for 7days	Not mentined	52.4	52.4	52.4	95.6	95.6	95.6	1	(Stamatoula Bonatsou et al., 2018)
				5	12h for 7days	Not mentined	52.2	52.2	52.2	122.6	122.6	122.6	1	(Stamatoula Bonatsou et al., 2018)
				6.5	12h for 7days	Not mentined	62.5	62.5	62.5	119.1	119.1	119.1	1	(Stamatoula Bonatsou et al., 2018)
		Greek black olives	0-250 g/L	Not mentined	2h	Not mentined	58.26	58.26	58.26	266.02	266.02	266.02	1	(S Bonatsou et al., 2015)
Saccharomyces	*Saccharomyces boulardii*	fermented black olive	0-180 g/L	4.5	7days	28	24.54	24.54	24.54	86.39	86.39	86.39	1	(Porru et al., 2018)
	Saccharomyces cerevisiae	cv. Kalamata table olive fermentation	0-250 g/L	3.5	12h for 7days	Not mentined	35.5	21.8	45.9	146.73	119	200	6	(Stamatoula Bonatsou et al., 2018)
				5	12h for 7days	Not mentined	60.37	41.1	85.3	174.83	139.1	195.2	6	(Stamatoula Bonatsou et al., 2018)
				6.5	12h for 7days	Not mentined	40.03	0	67.1	143.8	0	214.9	6	(Stamatoula Bonatsou et al., 2018)
		fermented black olive	0-180 g/L	4.5	7days	28	24.82	24.82	24.82	86.29	86.29	86.29	1	(Porru et al., 2018)

		Greek black olives	0-250 g/L	Not mentined	2h	Not mentined	86.3	86.3	86.3	274.44	274.44	274.44	1	(S Bonatsou et al., 2015)
Wickerhamomyces	*Wickerhamomyces anomalus*	fermented black olive	0-180 g/L	4.5	7days	28	114.8	114.8	114.8	171.47	171.47	171.47	1	(Porru et al., 2018)
		Greek black olives	0-250 g/L	Not mentined	2h	Not mentined	47.27	47.27	47.27	163.18	163.18	163.18	1	(S Bonatsou et al., 2015)
Zygoascus	*Zygoascus hellenicus*	cv. Kalamata table olive fermentation	0-250 g/L	3.5	12h for 7days	Not mentined	76.53	37.7	96.4	125.23	115.4	143.2	3	(Stamatoula Bonatsou et al., 2018)
				5	12h for 7days	Not mentined	81.23	68.8	93.7	147.13	146.6	147.9	3	(Stamatoula Bonatsou et al., 2018)
				6.5	12h for 7days	Not mentined	54.43	28.3	78.3	129.63	112.9	157.9	3	(Stamatoula Bonatsou et al., 2018)
Zygosaccharomyces	*Zygosaccharomyces mrakii*	fermented black olive	0-180 g/L	4.5	7days	28	40.55	40.55	40.55	96.74	96.74	96.74	1	(Porru et al., 2018)

Media for all: YM broth

Table S4. The percentage auto-aggregation capacity of the selected yeast strains, incubated at 37C and measured at different time intervals

Genus	Species	Source	Time	Media	Mean	Autoag. minimum	Maximum	Count	Reference
Aureobasidium	*Aureobasidium pullulans*	cv. Kalamata table olive fermentation	24h	PBS	91.25	84	95	4	(Stamatoula Bonatsou et al., 2018)
			2h	PBS	84.75	76	94	4	(Stamatoula Bonatsou et al., 2018)
			4h	PBS	84	80	88	4	(Stamatoula Bonatsou et al., 2018)
Candida	*Candida adriatica*	Olive Oil	4h	Sodium Phosphate buffer	21	10	32	2	(Zullo & Ciafardini, 2019)
	Candida boidinii	cv. Kalamata table olive fermentation	24h	PBS	93.5	90	96	4	(Stamatoula Bonatsou et al., 2018)
			2h	PBS	77	58	90	4	(Stamatoula Bonatsou et al., 2018)
			4h	PBS	74.25	57	84	4	(Stamatoula Bonatsou et al., 2018)
		fermented Portugalian table olives	24h	0.9%NaCl salin solution	50.97	25.36	76.58	2	(Oliveira et al., 2017)
			2h	0.9%NaCl salin solution	17.48	8.96	26	2	(Oliveira et al., 2017)
			4h	0.9%NaCl salin solution	28	14	42	2	(Oliveira et al., 2017)
	Candida Caribbica	pineapple peel	24h	PBS	99	99	99	2	(Amorim et al., 2018)
	Candida diddensiae	cv. Kalamata table olive fermentation	24h	PBS	92	92	92	2	(Stamatoula Bonatsou et al., 2018)
			2h	PBS	60	60	60	2	(Stamatoula Bonatsou et al., 2018)
			4h	PBS	64	64	64	2	(Stamatoula Bonatsou et al., 2018)
		Olive Oil	4h	Sodium Phosphate buffer	35.5	23	48	2	(Zullo & Ciafardini, 2019)
	Candida Lusitaniae	pineapple peel	24h	PBS	96	96	96	3	(Amorim et al., 2018)
			2h	PBS	4	0	7	3	(Amorim, Piccoli, and Duarte 2018)
			4h	PBS	40.67	38	43	3	(Amorim et al., 2018)
	Candida molendinolei	cv. Kalamata table olive fermentation	24h	PBS	92.67	90	96	3	(Stamatoula Bonatsou et al., 2018)
			2h	PBS	42.33	22	75	3	(Stamatoula Bonatsou et al., 2018)
			4h	PBS	48.33	30	78	3	(Stamatoula Bonatsou et al., 2018)
	Candida naeodendra	cv. Kalamata table olive fermentation	24h	PBS	94	94	94	1	(Stamatoula Bonatsou et al., 2018)
			2h	PBS	83	83	83	1	(Stamatoula Bonatsou et al., 2018)
			4h	PBS	79	79	79	1	(Stamatoula Bonatsou et al., 2018)
	Candida norvegica	fermented Portugalian table olives	24h	0.9%NaCl salin solution	83	83	83	1	(Oliveira et al., 2017)
			2h	0.9%NaCl salin solution	38.27	38.27	38.27	1	(Oliveira et al., 2017)
			4h	0.9%NaCl salin solution	59	59	59	1	(Oliveira et al., 2017)
	Candida orthopsilosis	fermented food, cocoa fermentation, and kefi	5h	PBS	87.5	87	88	2	(Menezes et al., 2020)

	Candida pararugosa	food origin	30min	0.9%NaCl salin solution	63	63	63	1	(Fernandez-Pacheco Rodríguez et al., 2018
	Candida quercitrusa	fermented food, cocoa fermentation, and kefi	5h	PBS	96	96	96	1	(Menezes et al., 2020)
	Candida sake	food origin	30min	0.9%NaCl salin solution	16	16	16	1	(Fernandez-Pacheco Rodríguez et al., 2018
	Candida tropicalis	fermented Portugalian table olives	24h	0.9%NaCl salin solution	86.16	78.37	93.94	2	(Oliveira et al., 2017)
			2h	0.9%NaCl salin solution	70.5	66	75	2	(Oliveira et al., 2017)
			4h	0.9%NaCl salin solution	74.42	71.29	77.54	2	(Oliveira et al., 2017)
	Candida vini	food origin	30min	0.9%NaCl salin solution	42	42	42	1	(Fernandez-Pacheco Rodríguez et al., 2018
Cystofilobasidium	*Cystofilobasidium bisporidii*	cv. Kalamata table olive fermentation	24h	PBS	90	90	90	1	(Stamatoula Bonatsou et al., 2018)
			2h	PBS	37	37	37	1	(Stamatoula Bonatsou et al., 2018)
			4h	PBS	36	36	36	1	(Stamatoula Bonatsou et al., 2018)
Debaryomyce	*Debaryomyces hansenii*	fermented Portugalian table olives	24h	0.9%NaCl salin solution	34.37	34.37	34.37	1	(Oliveira et al., 2017)
			2h	0.9%NaCl salin solution	31	31	31	1	(Oliveira et al., 2017)
			4h	0.9%NaCl salin solution	30.83	30.83	30.83	1	(Oliveira et al., 2017)
Galactomyces	*Galactomyces reessii*	fermented Portugalian table olives	24h	0.9%NaCl salin solution	45.33	31	70.5	3	(Oliveira et al., 2017)
			2h	0.9%NaCl salin solution	28.44	22.01	34.86	2	(Oliveira et al., 2017)
			4h	0.9%NaCl salin solution	29.21	29.21	29.21	1	(Oliveira et al., 2017)
Hanseniaspora	*Hanseniaspora opuntiae*	fermented food, cocoa fermentation, and kefi	5h	PBS	66	66	66	1	(Menezes et al., 2020)
	Hanseniaspora osmophila	food origin	30min	0.9%NaCl salin solution	48	32	64	2	(Fernandez-Pacheco Rodríguez et al., 2018
	Hanseniaspora uvarum	fermented food, cocoa fermentation, and kefi	5h	PBS	85	84	86	2	(Menezes et al., 2020)
Kluyveromyces	*Kluyveromyces lactis*	traditional kefir grains	2h	PBS	35	35	35	1	(Gut et al., 2019)
	Kluyveromyces marxianus	fermented food, cocoa fermentation, and kefi	5h	PBS	83	76	90	2	(Menezes et al., 2020)
	Kluyveromyces thermotolerans	food origin	30min	0.9%NaCl salin solution	28.5	14	43	2	(Fernandez-Pacheco Rodríguez et al., 2018
Metschnikowia	*Metschnikowia pulcherrima*	cv. Kalamata table olive fermentation	24h	PBS	90	85	94	3	(Stamatoula Bonatsou et al., 2018)
			2h	PBS	62.33	28	80	3	(Stamatoula Bonatsou et al., 2018)
			4h	PBS	66	31	84	3	(Stamatoula Bonatsou et al., 2018)
		food origin	30min	0.9%NaCl salin solution	13	13	13	1	(Fernandez-Pacheco Rodríguez et al., 2018
Meyerozyma	*Meyerozyma Caribbica*	pineapple peel	2h	PBS	14.5	14	15	2	(Amorim et al., 2018)
			4h	PBS	40.5	36	45	2	(Amorim et al., 2018)
Nakazawaea	*Nakazawaea molendini-olei*	Olive Oil	4h	Sodium Phosphate buffer	18	8	28	2	(Zullo & Ciafardini, 2019)
	Nakazawaea wickerhamii	Olive Oil	4h	Sodium Phosphate buffer	18	18	18	1	(Zullo & Ciafardini, 2019)
Ogataea	*Ogataea polymorpha*	food origin	30min	0.9%NaCl salin solution	4	4	4	1	(Fernandez-Pacheco Rodríguez et al., 2018

Pichia	*Pichia membranifaciens*	fermented Portugalian table olives	24h	0.9%NaCl salin solution	76.6	76.13	77.08	2	(Oliveira et al., 2017)
	Pichia anomala	food origin	30min	0.9%NaCl salin solution	19.5	11	28	2	(Fernandez-Pacheco Rodríguez et al., 2018
	Pichia caribbica	food origin	30min	0.9%NaCl salin solution	7	7	7	1	(Fernandez-Pacheco Rodríguez et al., 2018
	Pichia galeiforms	food origin	30min	0.9%NaCl salin solution	12	12	12	1	(Fernandez-Pacheco Rodríguez et al., 2018
	Pichia guilliermondii	fermented food, cocoa fermentation, and kefi	5h	PBS	83	83	83	1	(Menezes et al., 2020)
		fermented Portugalian table olives	24h	0.9%NaCl salin solution	73.66	73.66	73.66	1	(Oliveira et al., 2017)
			2h	0.9%NaCl salin solution	25	25	25	1	(Oliveira et al., 2017)
			4h	0.9%NaCl salin solution	30.66	30.66	30.66	1	(Oliveira et al., 2017)
	Pichia kluyveri	cv. Kalamata table olive fermentation	24h	PBS	90	88	92	2	(Stamatoula Bonatsou et al., 2018)
			2h	PBS	45	41	49	2	(Stamatoula Bonatsou et al., 2018)
			4h	PBS	53	48	58	2	(Stamatoula Bonatsou et al., 2018)
		fermented food, cocoa fermentation, and kefi	5h	PBS	92	92	92	1	(Menezes et al., 2020)
		food origin	30min	0.9%NaCl salin solution	30	30	30	1	(Fernandez-Pacheco Rodríguez et al., 2018
	Pichia kudriavzevii	food origin	30min	0.9%NaCl salin solution	16.5	5	28	2	(Fernandez-Pacheco Rodríguez et al., 2018
	Pichia manshurica	cv. Kalamata table olive fermentation	24h	PBS	91	89	92	3	(Stamatoula Bonatsou et al., 2018)
			2h	PBS	77	61	88	3	(Stamatoula Bonatsou et al., 2018)
			4h	PBS	75	55	89	3	(Stamatoula Bonatsou et al., 2018)
		fermented Portugalian table olives	24h	0.9%NaCl salin solution	76.86	76.86	76.86	1	(Oliveira et al., 2017)
			2h	0.9%NaCl salin solution	13	13	13	1	(Oliveira et al., 2017)
			4h	0.9%NaCl salin solution	24.75	24.75	24.75	1	(Oliveira et al., 2017)
	Pichia membranifaciens	fermented food, cocoa fermentation, and kefi	5h	PBS	93	93	93	1	(Menezes et al., 2020)
		fermented Portugalian table olives	2h	0.9%NaCl salin solution	51.58	48.16	55	2	(Oliveira et al., 2017)
			4h	0.9%NaCl salin solution	56.5	47	66	2	(Oliveira et al., 2017)
		food origin	30min	0.9%NaCl salin solution	41	41	41	1	(Fernandez-Pacheco Rodríguez et al., 2018
Rhodotorula	*Rhodotorula glutinis*	cv. Kalamata table olive fermentation	24h	PBS	91.67	87	96	3	(Stamatoula Bonatsou et al., 2018)
			2h	PBS	50	38	62	3	(Stamatoula Bonatsou et al., 2018)
			4h	PBS	66	46	80	3	(Stamatoula Bonatsou et al., 2018)
		fermented Portugalian table olives	24h	0.9%NaCl salin solution	23.67	23.67	23.67	1	(Oliveira et al., 2017)
			2h	0.9%NaCl salin solution	2.86	2.86	2.86	1	(Oliveira et al., 2017)
			4h	0.9%NaCl salin solution	5.12	5.12	5.12	1	(Oliveira et al., 2017)

	Rhodotorula graminis	fermented Portugalian table olives	24h	0.9%NaCl salin solution	20.11	20.11	20.11	1	(Oliveira et al., 2017)
			2h	0.9%NaCl salin solution	3.35	3.35	3.35	1	(Oliveira et al., 2017)
			4h	0.9%NaCl salin solution	4	4	4	1	(Oliveira et al., 2017)
	Rhodotorula mucilaginosa	cv. Kalamata table olive fermentation	24h	PBS	90	90	90	1	(Stamatoula Bonatsou et al., 2018)
			2h	PBS	74	74	74	1	(Stamatoula Bonatsou et al., 2018)
			4h	PBS	74	74	74	1	(Stamatoula Bonatsou et al., 2018)
Saccharomyces	*Saccharomyces boulardii*	fermented food, cocoa fermentation, and kefi	5h	PBS	96	96	96	1	(Menezes et al., 2020)
		fermented Portugalian table olives	24h	0.9%NaCl salin solution	55.9	34.75	77.05	2	(Oliveira et al., 2017)
			2h	0.9%NaCl salin solution	25.5	25.5	25.5	1	(Oliveira et al., 2017)
		Olive Oil	4h	Sodium Phosphate buffer	43	43	43	1	(Zullo & Ciafardini, 2019)
		traditional kefir grains	2h	PBS	37	31	43	2	(Gut et al., 2019)
	Saccharomyces cerevisiae	cv. Kalamata table olive fermentation	24h	PBS	95.25	94	96	4	(Stamatoula Bonatsou et al., 2018)
			2h	PBS	84.75	72	90	4	(Stamatoula Bonatsou et al., 2018)
			4h	PBS	82.5	67	91	4	(Stamatoula Bonatsou et al., 2018)
		fermented food, cocoa fermentation, and kefi	5h	PBS	94.07	68	99	14	(Menezes et al., 2020)
		fermented Portugalian table olives	24h	0.9%NaCl salin solution	83.02	74.33	91.71	2	(Oliveira et al., 2017)
			2h	0.9%NaCl salin solution	56.99	54	59.97	2	(Oliveira et al., 2017)
			4h	0.9%NaCl salin solution	71.62	71.23	72	2	(Oliveira et al., 2017)
		food origin	30min	0.9%NaCl salin solution	20	20	20	1	(Fernandez-Pacheco Rodríguez et al., 2018
	Saccharomyces cerevisiae var. boulardii	food origin	30min	0.9%NaCl salin solution	19	19	19	1	(Fernandez-Pacheco Rodríguez et al., 2018
		pineapple peel	24h	PBS	96	96	96	1	(Amorim et al., 2018)
			2h	PBS	3	3	3	1	(Amorim et al., 2018)
			4h	PBS	44	44	44	1	(Amorim et al., 2018)
	Saccharomyces unisporus	traditional kefir grains	2h	PBS	43	43	43	1	(Gut et al., 2019)
	Saccharomycescerevisiae	fermented food, cocoa fermentation, and kefi	5h	PBS	96	96	96	1	(Menezes et al., 2020)
Torulaspora	*Torulaspora delbrueckii*	food origin	30min	0.9%NaCl salin solution	19	19	19	1	(Fernandez-Pacheco Rodríguez et al., 2018
Wickerhamomyces	*Wickerhamomyces anomalus*	Olive Oil	4h	Sodium Phosphate buffer	30	28	32	2	(Zullo & Ciafardini, 2019)
Yamadazyma	*Yamadazyma terventina*	Olive Oil	4h	Sodium Phosphate buffer	31.5	30	33	2	(Zullo & Ciafardini, 2019)
Zygoascus	*Zygoascus hellenicus*	cv. Kalamata table olive fermentation	24h	PBS	90.67	88	92	3	(Stamatoula Bonatsou et al., 2018)
			2h	PBS	43	25	65	3	(Stamatoula Bonatsou et al., 2018)
			4h	PBS	51	36	70	3	(Stamatoula Bonatsou et al., 2018)

Zygosaccharomyces	*Zygosaccharomyces bailii*	food origin	30min	0.9%NaCl salin solution	35	35	35	1	(Fernandez-Pacheco Rodríguez et al., 2018
	Zygosaccharomyces fermentati	food origin	30min	0.9%NaCl salin solution	13	4	26	3	(Fernandez-Pacheco Rodríguez et al., 2018

Table S5. The percentage of hydrophobicity capacity of the selected yeast strains, incubated at 37C and measured at different time intervals.

							Hexadecane				Xylene				Tolene			
Genus	**Species**	**Source**	**Time**	**Temp**	**Media**	**Reference**	Mean	Minimum	Maximum	Count	Mean	Minimum	Maximum	Count	Mean	Minimum	Maximum	Count
Candida	Candida adriatica	Olive Oil	1h	not mentioned	PBS	(Zullo & Ciafardini, 2019)	37.5	19.5	55.5	2	.	.	.	2	.	.	.	2
	Candida diddensiae	Olive Oil	1h	not mentioned	PBS	(Zullo & Ciafardini, 2019)	29	16.5	41.5	2	.	.	.	2	.	.	.	2
	Candida Lusitaniae	pineapple peel	30 min	37	PBS	(Amorim et al., 2018)	91.9	91.9	91.9	1	99.66	99.66	99.66	1	.	.	.	1
	Candida orthopsilosis	Brazilian indigenous fermented food, cocoa fermentation, and kefir	1h	37	Phosphate Buffer	(Menezes et al., 2020)	98.9	97.8	100	2	.	.	.	2	.	.	.	2
	Candida pararugosa	food origin	1h	37	KNO3 solution	(Fernandez-Pacheco Rodríguez et al., 2018	51.09	51.09	51.09	1	.	.	.	1	25.87	25.87	25.87	1
	Candida quercitrusa	Brazilian indigenous fermented food, cocoa fermentation, and kefir	1h	37	Phosphate Buffer	(Menezes et al., 2020)	98.9	98.9	98.9	1	.	.	.	1	.	.	.	1
	Candida sake	food origin	1h	37	KNO3 solution	(Fernandez-Pacheco Rodríguez et al., 2018	6.64	6.64	6.64	1	.	.	.	1	13.35	13.35	13.35	1
	Candida vini	food origin	1h	37	KNO3 solution	(Fernandez-Pacheco Rodríguez et al., 2018	30.81	30.81	30.81	1	.	.	.	1	33.09	33.09	33.09	1
Hanseniaspora	Hanseniaspora opuntiae	Brazilian indigenous fermented food, cocoa fermentation, and kefir	1h	37	Phosphate Buffer	(Menezes et al., 2020)	98.7	98.7	98.7	1	.	.	.	1	.	.	.	1
	Hanseniaspora osmophila	food origin	1h	37	KNO3 solution	(Fernandez-Pacheco Rodríguez et al., 2018	32.02	31.51	32.52	2	.	.	.	2	30.22	27.64	32.8	2
	Hanseniaspora uvarum	Brazilian indigenous fermented food, cocoa fermentation, and kefir	1h	37	Phosphate Buffer	(Menezes et al., 2020)	98	97.5	98.5	2	.	.	.	2	.	.	.	2
Kluyveromyces	Kluyveromyces lactis	traditional kefir grains	1h	37	PBS	(Gut et al., 2019)	88.75	88.75	88.75	1	.	.	.	1	.	.	.	1
	Kluyveromyces marxianus	Brazilian indigenous fermented food, cocoa fermentation, and kefir	1h	37	Phosphate Buffer	(Menezes et al., 2020)	99.45	98.9	100	2	.	.	.	2	.	.	.	2
	Kluyveromyces thermotolerans	food origin	1h	37	KNO3 solution	(Fernandez-Pacheco Rodríguez et al., 2018	20.77	10.41	31.12	2	.	.	.	2	14.46	3.67	25.25	2
Metschnikowia	Metschnikowia pulcherrima	food origin	1h	37	KNO3 solution	(Fernandez-Pacheco Rodríguez et al., 2018	15.22	15.22	15.22	1	.	.	.	1	15.05	15.05	15.05	1
Meyerozyma	Meyerozyma Caribbica	pineapple peel	30 min	37	PBS	(Amorim et al., 2018)	68.2	46.3	90.1	2	64.13	28.7	99.55	2	.	.	.	2
Nakazawaea	Nakazawaea molendini-olei	Olive Oil	1h	not mentioned	PBS	(Zullo & Ciafardini, 2019)	0	0	0	2	.	.	.	2	.	.	.	2
	Nakazawaea wickerhamii	Olive Oil	1h	not mentioned	PBS	(Zullo & Ciafardini, 2019)	0	0	0	1	.	.	.	1	.	.	.	1
Ogataea	Ogataea polymorpha	food origin	1h	37	KNO3 solution	(Fernandez-Pacheco Rodríguez et al., 2018	10.55	10.55	10.55	1	.	.	.	1	5.44	5.44	5.44	1
Pichia	Pichia anomala	food origin	1h	37	KNO3 solution	(Fernandez-Pacheco Rodríguez et al., 2018	27.16	23.84	30.47	2	.	.	.	2	31.71	31.45	31.97	2
	Pichia caribbica	food origin	1h	37	KNO3 solution	(Fernandez-Pacheco Rodríguez et al., 2018	3.16	3.16	3.16	1	.	.	.	1	10.76	10.76	10.76	1

	Pichia galeiforms	food origin	1h	37	KNO3 solution	(Fernandez-Pacheco Rodríguez et al., 2018	21.49	21.49	21.49	1	.	.	.	1	29.6	29.6	29.6	1
	Pichia guilliermondii	Brazilian indigenous fermented food, cocoa fermentation, and kefir	1h	37	Phosphate Buffer	(Menezes et al., 2020)	94.9	94.9	94.9	1	.	.	.	1	.	.	.	1
	Pichia kluyveri	Brazilian indigenous fermented food, cocoa fermentation, and kefir	1h	37	Phosphate Buffer	(Menezes et al., 2020)	99.3	99.3	99.3	1	.	.	.	1	.	.	.	1
		food origin	1h	37	KNO3 solution	(Fernandez-Pacheco Rodríguez et al., 2018	37.9	37.9	37.9	1	.	.	.	1	10.55	10.55	10.55	1
	Pichia kudriavzevii	food origin	1h	37	KNO3 solution	(Fernandez-Pacheco Rodríguez et al., 2018	27.54	22.09	32.99	2	.	.	.	2	11.13	11.03	11.22	2
	Pichia membranifaciens	Brazilian indigenous fermented food, cocoa fermentation, and kefir	1h	37	Phosphate Buffer	(Menezes et al., 2020)	99.7	99.7	99.7	1	.	.	.	1	.	.	.	1
		food origin	1h	37	KNO3 solution	(Fernandez-Pacheco Rodríguez et al., 2018	33.04	33.04	33.04	1	.	.	.	1	15.66	15.66	15.66	1
Saccharomyces	Saccharomyces boulardii	Brazilian indigenous fermented food, cocoa fermentation, and kefir	1h	37	Phosphate Buffer	(Menezes et al., 2020)	99.4	99.4	99.4	1	.	.	.	1	.	.	.	1
		Olive Oil	1h	not mentioned	PBS	(Zullo & Ciafardini, 2019)	26	26	26	1	.	.	.	1	.	.	.	1
		traditional kefir grains	1h	37	PBS	(Gut et al., 2019)	18.38	15.58	21.18	2	.	.	.	2	.	.	.	2
	Saccharomyces cerevisiae	Brazilian indigenous fermented food, cocoa fermentation, and kefir	1h	37	Phosphate Buffer	(Menezes et al., 2020)	99.52	96.5	100	15	.	.	.	15	.	.	.	15
		food origin	1h	37	KNO3 solution	(Fernandez-Pacheco Rodríguez et al., 2018	38.74	38.74	38.74	1	.	.	.	1	26.68	26.68	26.68	1
	Saccharomyces cerevisiae var. boulardii	food origin	1h	37	KNO3 solution	(Fernandez-Pacheco Rodríguez et al., 2018	37.15	37.15	37.15	1	.	.	.	1	32.41	32.41	32.41	1
	Saccharomyces unisporus	traditional kefir grains	1h	37	PBS	(Gut et al., 2019)	30	30	30	1	.	.	.	1	.	.	.	1
Torulaspora	Torulaspora delbrueckii	food origin	1h	37	KNO3 solution	(Fernandez-Pacheco Rodríguez et al., 2018	37.41	37.41	37.41	1	.	.	.	1	19.34	19.34	19.34	1
Wickerhamomyces	Wickerhamomyces anomalus	Olive Oil	1h	not mentioned	PBS	(Zullo & Ciafardini, 2019)	22.25	20.5	24	2	.	.	.	2	.	.	.	2
Yamadazyma	Yamadazyma terventina	Olive Oil	1h	not mentioned	PBS	(Zullo & Ciafardini, 2019)	41.5	37.5	45.5	2	.	.	.	2	.	.	.	2
Zygosaccharomyces	Zygosaccharomyces bailii	food origin	1h	37	KNO3 solution	(Fernandez-Pacheco Rodríguez et al., 2018	54.16	54.16	54.16	1	.	.	.	1	35.11	35.11	35.11	1
	Zygosaccharomyces fermentati	food origin	1h	37	KNO3 solution	(Fernandez-Pacheco Rodríguez et al., 2018	9.59	8.18	10.33	3	.	.	.	3	6.47	3.12	8.28	3