

Table 1 Effects of growth conditions on cell wall mass, chitin, mannan, β -glucans, β -1,6-glucan and on the sensitivity of whole cells to zymolyase

Growth condition	Growth rate (μ_{\max} h ⁻¹)	Cell wall* [dry mass (%)]	Chitin [wall mass (%)]	Mannan [cell mass (μ g mg ⁻¹)]	Total β -glucan [cell mass (μ g mg ⁻¹)]	β -1,6-glucan/total glucan (%)	Zymolyase sensitivity (MLR) ($\times 10^{-2}$ min)
YPD	0.42	24.5 \pm 2.5	6.2 \pm 0.55	93.3 \pm 3.2	127.4 \pm 3.2	18 \pm 3.0	0.28
YNB	0.35	21.2 \pm 2.4	3.0 \pm 0.17	89.5 \pm 3.5	72.6 \pm 4.1	18 \pm 2.5	0.32
CF	0.36	20.4 \pm 2.8	2.4 \pm 0.23	86.5 \pm 1.7	71.4 \pm 3.3	15 \pm 2.0	0.68
Glucose	0.36	18.3 \pm 2.0	5.2 \pm 0.32	92.7 \pm 2.7	62.5 \pm 2.9	14 \pm 2.5	0.75
Mannose	0.33	14.2 \pm 1.8	4.3 \pm 0.17	59.7 \pm 1.7	64.3 \pm 1.7	14 \pm 2.2	0.66
Sucrose	0.39	15.2 \pm 1.8	4.8 \pm 0.32	53.6 \pm 2.8	62.7 \pm 3.1	13 \pm 3.6	0.68
Maltose	0.31	14.5 \pm 2.0	4.2 \pm 0.09	54.7 \pm 3.2	50.6 \pm 1.8	16 \pm 2.7	0.35
Galactose	0.23	16.4 \pm 2.0	4.7 \pm 0.25	45.3 \pm 2.6	78.2 \pm 2.3	19 \pm 3.2	0.15
Ethanol	0.13	10.8 \pm 1.5	6.4 \pm 0.35	57.8 \pm 2.6	38.7 \pm 3.4	21 \pm 2.4	0.03
pH 3	0.22	17.9 \pm 3.0	6.9 \pm 0.4	62.1 \pm 2.1	60.4 \pm 2.6	15 \pm 2.0	0.49
pH 4	0.32	18.9 \pm 2.0	7.1 \pm 0.4	57.6 \pm 1.5	80.8 \pm 3.6	17 \pm 3.0	0.62
pH 5	0.36	20.5 \pm 2.0	5.5 \pm 0.6	92.7 \pm 2.7	66.5 \pm 2.9	14 \pm 2.0	0.75
pH 6	0.29	14.1 \pm 1.6	6.4 \pm 1.4	54.2 \pm 3.4	58.4 \pm 3.2	12 \pm 1.5	0.86
22°C	0.19	12.4 \pm 2.1	5.2 \pm 0.5	41.6 \pm 1.3	60.1 \pm 3.1	10 \pm 2.0	0.85
30°C	0.36	18.3 \pm 2.6	5.5 \pm 0.2	94.5 \pm 2.7	68.5 \pm 4.5	14 \pm 2.0	0.75
37°C	0.44	15.5 \pm 2.0	7.9 \pm 0.9	47.5 \pm 1.3	88.9 \pm 4.9	20 \pm 2.0	0.59
$pO_2 \sim 0\%$	0.33	14.2 \pm 2.1	1.4 \pm 0.5	94.8 \pm 1.5	60.1 \pm 3.1	nd	nd
$pO_2 > 50\%$	0.44	18.6 \pm 2.0	5.2 \pm 0.3	92.7 \pm 2.7	62.5 \pm 2.9	nd	nd

Yeast cells were cultivated in controlled batch-fermentor in, unless otherwise stated, CF media (cell factory). Other media were YPD (10 g l⁻¹ yeast extract, 20 g l⁻¹ bacto-peptone and 20 g l⁻¹ glucose), YNB (1.7 g l⁻¹ yeast nitrogen without amino acid and ammonium, 5 g l⁻¹ ammonium sulphate, 20 g l⁻¹ glucose) and CF (see 'Material and methods'). Unless otherwise stated (see column 1), the pH was kept constant at 5.0, temperature at 30°C and aeration at $pO_2 \sim 50\%$ saturation in the medium. The zymolyase sensitivity was carried out as described in 'Material and methods'. The values reported are the mean \pm S.E.M. from four independent experiments, and for each experiment, three samples were taken for cell wall analysis.

*Cell wall content was determined by the phenol-sulphuric methods as described in 'Material and methods'. MLR, maximal lysis rate; nd, not determined.