

Supplementary Information

1. Supplement: Elucidation of nutritional requirements

Table 1: anorganic impurities of calcium carbonate determined by ICP-OES analysis

element	content [mg/kg]
Al	123.8
Ba	3.99
Fe	114.8
Li	8.98
Mg	1800.0
Mn	67.9
Na	146.4
P	75.5
Pb	1.00
S	123.4
Se	4.99
Sr	166.7
Ti	5.66
V	2.00
Zn	1.00

2. Supplement: Analytical methods

Dry matter and ash content

Dry matter was determined according to DIN EN 12880 and the ash content was analyzed according to DIN EN 12879.

Total nitrogen

For the determination of the total nitrogen content, 150 mg sample was weighed into a Kjeldahl reaction tube and boiling stones, anti-foaming agent and a Kjeltab S (5 g K₂SO₄, 5 mg Se), as well as 10 mL 96% H₂SO₄ were added. The thermal degradation was performed in a Kjeldathrem from Gerhardt GmbH & Co. KG (Königswinter, Germany) with the following temperature gradient.

Table 2: Temperature gradient applied for thermal degradation

Temperature	Time
100 °C	30 min
200 °C	60 min
300 °C	60 min
420 °C	60 min
RT	30 min

The distillation and titration was carried out with a Vapodest from Gerhardt GmbH & Co. KG (Königswinter, Germany) using 33 % NaOH, 2 % B(OH)₃ and 0.05M H₂SO₄. The nitrogen amount was calculated with the following equation:

$$\%N = \frac{V_{\text{H}_2\text{SO}_4}[\text{mL}]}{m_{\text{sample}}[\text{g}] \cdot 1000} \cdot z \cdot c \cdot M(N) \cdot 100\%$$

$V_{\text{H}_2\text{SO}_4}$ = Titration volume of the volumetric standard solution in mL

m_{sample} = mass of the sample in g

z = stoichiometric coefficient, here $z = 2$

c = concentration of the volumetric standard solution, here $c_{\text{H}_2\text{SO}_4} = 0.05 \text{ mol/L}$

$M(N)$ = 14.007 g/mol

Colorimetric assays

Amino nitrogen was analyzed with ninhydrin according to MEBAK.¹

The total carbohydrate was determined with anthrone in 80% H₂SO₄ according to MEBAK.¹

The determination of reducing sugars was carried out with 3,5-dinitrosalicylic acid, described by Miller.²

Polyphenols and Flavonoids were analyzed in accordance with MEBAK.¹ Furthermore, for the determination of polyphenols the Folin-Ciocalteu method was used.³

The measurement was conducted on T80 UV/Vis-spectrophotometer from PG Instruments Ltd. (Leicester, UK).

Fatty acids

Fatty acids were derivatized to fatty acid methyl esters as described by Lewis *et al.*⁴ and analyzed by GC-MS on a GC-17A from Shimadzu (Kyoto, Japan) equipped with a Zebron™ ZB-WAX plus (60 m x 0.25 mm x 0.25 µm) column. The carrier gas was He with a flow rate of 1.4 mL/min. The temperature gradient started at 60 °C. It was heated up to 150 °C with 30 °C/min, and further up to 240 °C with 13 °C/min and hold for 30 min, then heat to 255 °C with 40 °C/min and hold for further 5 min.

Vitamins

Vitamins were analyzed with the following VitaFast®-Kits from R-Biopharm AG (Darmstadt, Germany):

VitaFast® Vitamin B1 (Thiamin), VitaFast® Vitamin B2 (Riboflavin) AOAC-RI 100902, VitaFast® Vitamin B3 (Niacin), VitaFast® Pantothensäure AOAC-RI 100904, VitaFast® Vitamin B6 (Pyridoxin), VitaFast® Vitamin B7 (Biotin) AOAC-RI 101001, VitaFast® Folsäure AOAC-RI 100903, VitaFast® Vitamin B12 (Cyanocobalamin) AOAC-RI 101002 und VitaFast® Inositol.

Carbohydrates

Carbohydrates were hydrolyzed in accordance to a method described by Sluiter *et al.*⁵ of the National Renewable Energy Laboratory (NREL) and the monomeric sugars were analyzed by high-performance anion-exchange chromatography (HPAEC) coupled with pulsed amperometric detection on a Dionex ICS-5000 system with a Dionex™ Carbopac PA20 (3 x 150 mm) column from Thermo scientific (Sunnyvale, USA). The gradient of the mobile phase is described in table 3, the flow rate was 0.3 mL/min at 30 °C.

Table 3: Solvent gradient for HPAEC-PAD measurement of carbohydrates

Zeit	A Water	B 10 mM NaOH	C 200 mM NaOH	D 25 mM NaOH + 1 M NaOAc
0-36 min	50 %	50 %	–	–
38 min	50 %	–	50 %	–
48 min	20 %	–	50 %	30 %
51 min	–	–	40 %	60 %
51,5 min	–	–	100 %	–
58 min	–	–	100 %	–
63 min	50 %	50 %	–	–
63-73 min	50 %	50 %	–	–

Inhibitors

The inhibitors were measured by high-performance liquid chromatography (HPLC) on a Dionex™ ICS-5000 system from Thermo scientific (Sunnyvale, USA) equipped with a Aminex® HPX-87H column (300 x 7.8 mm) from Bio-Rad (Hercules, USA), and a refraction index detector RI-101 from Shodex (Tokyo, Japan). The mobile phase was 5mM sulfuric acid with a flow rate of 0.7 mL/min (60 °C).

Soluble Ions

Soluble ions were measured by ion chromatography on a Dionex™ ICS-1000 system from Thermo scientific (Sunnyvale, USA). The parameters are described in table 4:

Table 4: Parameters for anion and cation analysis by IC

	Parameters Cations	Parameters Anions
precolumn	Dionex™ IonPac CG16 5 x 50 mm	Dionex™ IonPac AG11-HC, 4 x 50 mm
column	Dionex™ IonPac CS16 250 x 5 mm	Dionex™ IonPac AS11-HC, 250 x 4 mm
temperature	60 °C	RT
eluent	36 mM methylsulfonic acid	25 mM NaOH
flow rate	1 mL/min	1 mL/min
suppressor power	106 mA	62 mA
suppressor type	CSRS 300 4 mm	ASRS 300 4 mm

Trace elements

The samples were degraded in a Mars Xpress microwave from CEM (Kamp-Lintfort, Deutschland) prior to analysis by inductively coupled plasma atomic emission spectroscopy (ICP-OES). 500 mg sample were weighed into a vessel and 6 mL conc. HNO₃ Suprapur and 2 mL H₂O₂ Suprapur were added. The sample was heated up to 190 °C in 15 min and hold for further 15 min.

For ICP-OES analysis the degraded sample was diluted and measured with an iCAP 6300 Duo from Thermo Fisher Scientific, Inc. (Sunnyvale, USA). The used plasma parameters and integration times are described in table 5:

Table 5: Plasma and measurement parameters applied for trace element analysis by ICP-OES

	UV	Vis
plasma power	1350 W	1150 W
spray gas flow	0,5 L/min	0,65 L/min
stabilizing time	5 s	
integration time axial	55 s	25 s
integration time radial	45 s	20 s

References

- 1 Mitteleuropäische Brautechnische Analysenkommission MEBAK e.V., in: *Würze, Bier, Biermischgetränke: Methodensammlung der Mitteleuropäischen Brautechnischen Analysenkommission*, MEBAK, Freising-Weihenstephan, **2012**.
- 2 G. L. Miller, *Anal. Chem.*, 1959, **31**, 426–428.
- 3 V. L. Singleton, J. A. Rossi, *Am. J. Enol. Vitic.*, 1965, **16**, 144–158.
- 4 T. Lewis, P. D. Nichols, T. A. McMeekin, *J. Microbiol. Methods*, 2000, **43**, 107–116.
- 5 A. Sluiter, B. Hames, R. Ruiz, C. Scarlata, J. Sluiter, D. Templeton, D. Crocker, Determination of structural carbohydrates and lignin in biomass, Laboratory Analytical Procedure (LAP), Technical Report NREL, 2008.

3. Composition of nutrient sources

Merck Fermtech® yeast extract

General Data		
Dry matter	[%]	93.9
Total nitrogen (TN)	[%]	9.54 ± 0.04
Amino nitrogen (AN)	[%]	2.55 ± 0.01
Hydrolysis degree (AN/TN)	[%]	26.8 ± 0.01
Ash	[%]	30.6

Amino acids	free	total
[g/100 g]		
Alanine	2.17 ± 0.028	3.41 ± 0.022
Asparagine	0.77 ± 0.080	ND
Asparatic acid	0.96 ± 0.067	6.51 ± 0.048
Cystathionine	0.55 ± 0.094	ND
Glutamic acid	3.56 ± 0.543	8.31 ± 0.798
Glycine	0.47 ± 0.016	2.56 ± 0.039
Histidine	0.58 ± 0.080	1.42 ± 0.009
Isoleucine	1.41 ± 0.086	2.83 ± 0.052
Leucine	2.63 ± 0.082	4.17 ± 0.044
Lysine	0.89 ± 0.108	3.31 ± 0.269
Methionine	0.56 ± 0.022	0.88 ± 0.011
Phenylalanine	1.53 ± 0.044	2.53 ± 0.044
Proline	0.59 ± 0.013	2.67 ± 0.040
Serine	1.43 ± 0.085	2.91 ± 0.029
Threonine	1.12 ± 0.042	2.80 ± 0.025
Tryptophan	0.57 ± 0.043	ND
Tyrosine	0.66 ± 0.082	1.52 ± 0.021
Valine	1.86 ± 0.082	3.73 ± 0.117

Fatty acids	[mg/g]
(10:0)	1.212 ± 0.039
(18:0)	0.238 ± 0.108

Carbohydrates	[mg/g]
Total	27.3 ± 0.678
Reducing sugar	11.8 ± 1.176

Carbohydrates	free	total (NREL)
[mg/g]		
Rhamnose	ND	ND
Arabinose	0.71	3.59 ± 0.046
Galactose	ND	0.52 ± 0.036
Glucose	2.31	14.2 ± 0.103
Sucrose	ND	ND
Xylose	ND	ND
Mannose	ND	23.3 ± 0.041
Fructose	ND	ND

Inhibitors	free	total (NREL)
[mg/g]		
Formate	4.30	1.55 ± 0.023
Acetate	5.20	5.24 ± 0.068
Levulinic acid	0.14	1.71 ± 0.072
Hydroxymethylfurfural	ND	0.88 ± 0.154
Furfural	0.65	2.52 ± 0.338

Vitamins		
Thiamine · HCl	[mg/100 g]	10.7 ± 0.152
Riboflavin	[mg/100 g]	4.95 ± 0.061
Niacin	[mg/100 g]	98.4 ± 1.376
Ca-Pantothenate	[mg/100 g]	23.7 ± 1.131
Pyridoxine · HCl	[mg/100 g]	9.39 ± 0.295
Biotin	[µg/100 g]	183.5 ± 30.2
Folic acid	[mg/100 g]	5.83 ± 0.038
Cobalamin	[µg/100 g]	9.27 ± 0.115
Inositol	[mg/100 g]	583.3 ± 88.8

1. Anhang

Polyphenols	[mg/g]
with MEBAK	ND
with Folin-Ciocalteu	17.4 ± 0.678
Flavonoids	0.195 ± 0.006

Soluble ions	[mg/g]
Na ⁺	85.2 ± 0.135
NH ₄ ⁺	28.3 ± 0.161
K ⁺	26.3 ± 0.099
Mg ²⁺	0.981 ± 0.053
Ca ²⁺	ND
F ⁻	2.98 ± 0.024
Cl ⁻	115.9 ± 0.294
NO ₂ ⁻	2.38 ± 0.003
SO ₄ ²⁻	4.18 ± 0.006
NO ₃ ⁻	ND
Br ⁻	2.11 ± 0.003
PO ₄ ³⁻	55.1 ± 0.087

Trace elements, λ	[mg/kg]
Ag	328.068
Al	396.152
As	189.042
B	249.773
Ba	455.403
Be	234.861
Bi	223.061
Ca	422.673
Cd	214.438
Co	228.616
Cr	267.716
Cu	324.754
Fe	259.940
K	766.490
Li	670.784
Mg	280.270
Mn	293.930
Mo	202.030
Na	589.592
Ni	231.604
P	177.495
Pb	220.353
S	182.034
Sb	217.581
Se	203.985
Sr	407.771
Ti	337.280
Tl	190.856
V	292.464
W	239.709
Zn	206.200

Only CPT MP

General Data		
Dry matter	[%]	95.8
Total nitrogen (TN)	[%]	11.4 ± 0.23
Amino nitrogen (AN)	[%]	3.48 ± 0.18
Hydrolysis degree (AN/TN)	[%]	30.4 ± 0.96
Ash	[%]	17.5

Amino acids	free	total
[g/100 g]		
Alanine	3.87 ± 0.002	5.21 ± 0.060
Asparagine	0.97 ± 0.038	ND
Asparatic acid	1.61 ± 0.084	6.62 ± 0.190
Cystathionine	1.19 ± 0.008	ND
Glutamic acid	5.10 ± 0.302	9.06 ± 1.296
Glycine	0.67 ± 0.003	2.99 ± 0.017
Histidine	0.93 ± 0.003	0.68 ± 0.031
Isoleucine	1.57 ± 0.053	2.62 ± 0.010
Leucine	2.88 ± 0.037	4.25 ± 0.036
Lysine	2.16 ± 0.095	2.61 ± 0.005
Methionine	0.64 ± 0.004	0.82 ± 0.028
Phenylalanine	1.76 ± 0.003	2.49 ± 0.040
Proline	1.45 ± 0.020	3.31 ± 0.032
Serine	3.23 ± 0.298	4.20 ± 0.308
Threonine	1.35 ± 0.015	2.80 ± 0.093
Tryptophan	0.98 ± 0.006	ND
Tyrosine	0.86 ± 0.015	0.83 ± 0.005
Valine	2.39 ± 0.016	4.08 ± 0.029

Fatty acids	[mg/g]
(10:0)	4.50 ± 0.154
(18:0)	0.166 ± 0.022

Carbohydrates	[mg/g]
Total	40.3 ± 0.269
Reducing sugar	10.6 ± 0.209

Carbohydrates	free	total (NREL)
[mg/g]		
Rhamnose	ND	ND
Arabinose	0.67	1.02 ± 0.002
Galactose	ND	ND
Glucose	2.33	27.4 ± 0.142
Sucrose	ND	ND
Xylose	ND	ND
Mannose	ND	7.39 ± 0.027
Fructose	ND	ND

Inhibitors	free	total (NREL)
[mg/g]		
Formate	12.8	ND
Acetate	19.6	16.3 ± 0.204
Levulinic acid	ND	ND
Hydroxymethylfurfural	ND	0.72 ± 0.042
Furfural	0.47	0.96 ± 0.009

Vitamins		
Thiamine · HCl	[mg/100 g]	4.34 ± 0.432
Riboflavin	[mg/100 g]	4.25 ± 0.158
Niacin	[mg/100 g]	88.5 ± 0.716
Ca-Pantothenate	[mg/100 g]	29.6 ± 3.632
Pyridoxine · HCl	[mg/100 g]	12.0 ± 0.466
Biotin	[µg/100 g]	96.5 ± 25.6
Folic acid	[mg/100 g]	4.43 ± 0.045
Cobalamin	[µg/100 g]	8.80 ± 0.156
Inositol	[mg/100 g]	855.1 ± 321.1

2. Anhang

Polyphenols	[mg/g]
with MEBAK	ND
with Folin-Ciocalteu	18.8 ± 0.292
Flavonoids	0.031 ± 0.002

Soluble ions	[mg/g]
Na ⁺	5.04 ± 0.047
NH ₄ ⁺	ND
K ⁺	61.2 ± 0.301
Mg ²⁺	0.330 ± 0.001
Ca ²⁺	ND
F ⁻	7.44 ± 0.034
Cl ⁻	3.48 ± 0.029
NO ₂ ⁻	1.17 ± 0.013
SO ₄ ²⁻	1.63 ± 0.002
NO ₃ ⁻	2.94 ± 0.002
Br ⁻	2.13 ± 0.005
PO ₄ ³⁻	30.0 ± 0.193

Trace elements, λ	[mg/kg]
Ag	328.068
Al	396.152
As	189.042
B	249.773
Ba	455.403
Be	234.861
Bi	223.061
Ca	422.673
Cd	214.438
Co	228.616
Cr	267.716
Cu	324.754
Fe	259.940
K	766.490
Li	670.784
Mg	280.270
Mn	293.930
Mo	202.030
Na	589.592
Ni	231.604
P	177.495
Pb	220.353
S	182.034
Sb	217.581
Se	203.985
Sr	407.771
Ti	337.280
Tl	190.856
V	292.464
W	239.709
Zn	206.200

Only KAT

General Data		
Dry matter	[%]	90.5
Total nitrogen (TN)	[%]	11.6 ± 0.12
Amino nitrogen (AN)	[%]	3.94 ± 0.05
Hydrolysis degree (AN/TN)	[%]	38.0 ± 0.08
Ash	[%]	10.3

Amino acids	free	total
[g/100 g]		
Alanine	5.72 ± 0.034	5.56 ± 0.046
Asparagine	1.53 ± 0.093	ND
Asparatic acid	2.31 ± 0.052	5.79 ± 0.119
Cystathionine	1.19 ± 0.014	ND
Glutamic acid	4.78 ± 0.119	7.81 ± 0.376
Glycine	1.25 ± 0.013	2.46 ± 0.023
Histidine	1.12 ± 0.025	0.85 ± 0.045
Isoleucine	1.93 ± 0.055	2.16 ± 0.036
Leucine	3.46 ± 0.038	3.73 ± 0.027
Lysine	2.11 ± 0.150	2.53 ± 0.179
Methionine	0.70 ± 0.004	0.76 ± 0.007
Phenylalanine	2.03 ± 0.036	2.13 ± 0.031
Proline	2.03 ± 0.034	3.10 ± 0.021
Serine	4.49 ± 0.301	4.41 ± 0.075
Threonine	1.57 ± 0.055	2.21 ± 0.028
Tryptophan	1.04 ± 0.007	ND
Tyrosine	1.24 ± 0.037	0.87 ± 0.038
Valine	2.99 ± 0.074	3.54 ± 0.034

Fatty acids	[mg/g]
(10:0)	7.19 ± 0.317
(18:0)	0.118 ± 0.055

Carbohydrates	[mg/g]
Total	25.4 ± 0.375
Reducing sugar	13.1 ± 0.085

Carbohydrates	free	total (NREL)
[mg/g]		
Rhamnose	ND	ND
Arabinose	0.64	1.43 ± 0.043
Galactose	ND	ND
Glucose	2.27	7.78 ± 0.172
Sucrose	ND	ND
Xylose	ND	ND
Mannose	ND	19.9 ± 0.014
Fructose	ND	ND

Inhibitors	free	total (NREL)
[mg/g]		
Formate	14.1	ND
Acetate	16.6	13.7 ± 0.004
Levulinic acid	ND	ND
Hydroxymethylfurfural	ND	0.61 ± 0.008
Furfural	0.33	1.11 ± 0.004

Vitamins		
Thiamine · HCl	[mg/100 g]	ND
Riboflavin	[mg/100 g]	5.56 ± 0.063
Niacin	[mg/100 g]	85.8 ± 0.725
Ca-Pantothenate	[mg/100 g]	34.3 ± 0.642
Pyridoxine · HCl	[mg/100 g]	15.4 ± 0.505
Biotin	[µg/100 g]	122.3 ± 4.660
Folic acid	[mg/100 g]	6.58 ± 0.419
Cobalamin	[µg/100 g]	9.40 ± 0.380
Inositol	[g/100 g]	1.256 ± 0.452

3. Anhang

Polyphenols	[mg/g]
with MEBAK	0.059 ± 0.000
with Folin-Ciocalteu	24.4 ± 0.190
Flavonoids	0.310 ± 0.005

Soluble ions	[mg/g]
Na ⁺	2.10 ± 0.001
NH ₄ ⁺	7.75 ± 0.042
K ⁺	35.6 ± 0.030
Mg ²⁺	1.02 ± 0.062
Ca ²⁺	ND
F ⁻	8.81 ± 0.008
Cl ⁻	4.90 ± 0.026
NO ₂ ⁻	1.17 ± 0.001
SO ₄ ²⁻	2.65 ± 0.002
NO ₃ ⁻	ND
Br ⁻	2.12 ± 0.001
PO ₄ ³⁻	28.3 ± 0.052

Trace elements, λ	[mg/kg]
Ag	328.068
Al	396.152
As	189.042
B	249.773
Ba	455.403
Be	234.861
Bi	223.061
Ca	422.673
Cd	214.438
Co	228.616
Cr	267.716
Cu	324.754
Fe	259.940
K	766.490
Li	670.784
Mg	280.270
Mn	293.930
Mo	202.030
Na	589.592
Ni	231.604
P	177.495
Pb	220.353
S	182.034
Sb	217.581
Se	203.985
Sr	407.771
Ti	337.280
Tl	190.856
V	292.464
W	239.709
Zn	206.200

Lallemand FNI100

General Data		
Dry matter	[%]	93.5
Total nitrogen (TN)	[%]	10.2 ± 0.01
Amino nitrogen (AN)	[%]	3.32 ± 0.03
Hydrolysis degree (AN/TN)	[%]	32.4 ± 0.27
Ash	[%]	10.6

Amino acids	free	total
[g/100 g]		
Alanine	2.44 ± 0.026	3.24 ± 0.065
Asparagine	1.07 ± 0.012	ND
Asparatic acid	2.50 ± 0.028	7.71 ± 0.156
Cystathionine	ND	0.97 ± 0.014
Glutamic acid	3.94 ± 0.774	9.10 ± 0.457
Glycine	0.85 ± 0.031	2.40 ± 0.022
Histidine	1.01 ± 0.001	1.77 ± 0.046
Isoleucine	1.54 ± 0.001	2.49 ± 0.037
Leucine	3.08 ± 0.023	4.05 ± 0.006
Lysine	1.63 ± 0.026	4.59 ± 0.159
Methionine	0.69 ± 0.004	0.82 ± 0.019
Phenylalanine	1.90 ± 0.045	2.43 ± 0.030
Proline	0.88 ± 0.001	2.42 ± 0.013
Serine	2.37 ± 0.118	4.04 ± 0.150
Threonine	1.32 ± 0.024	3.01 ± 0.059
Tryptophan	1.03 ± 0.008	ND
Tyrosine	1.82 ± 0.067	1.88 ± 0.080
Valine	2.28 ± 0.006	3.42 ± 0.025

Fatty acids	[mg/g]
(10:0)	0.943 ± 0.011
(18:0)	ND

Carbohydrates	[mg/g]
Total	172.3 ± 2.404
Reducing sugar	47.5 ± 0.209

Carbohydrates	free	total (NREL)
[mg/g]		
Rhamnose	ND	ND
Arabinose	0.78	2.02 ± 0.010
Galactose	ND	0.73 ± 0.021
Glucose	10.9	92.0 ± 0.380
Sucrose	ND	ND
Xylose	ND	ND
Mannose	3.22	26.7 ± 0.044
Fructose	ND	ND

Inhibitors	free	total (NREL)
[mg/g]		
Formate	25.7	6.05 ± 0.019
Acetate	3.38	2.94 ± 0.141
Levulinic acid	0.13	4.16 ± 0.284
Hydroxymethylfurfural	ND	2.30 ± 0.155
Furfural	0.50	1.94 ± 0.071

Vitamins		
Thiamine · HCl	[mg/100 g]	9.59 ± 0.214
Riboflavin	[mg/100 g]	4.81 ± 0.043
Niacin	[mg/100 g]	51.1 ± 0.878
Ca-Pantothenate	[mg/100 g]	33.2 ± 1.010
Pyridoxine · HCl	[mg/100 g]	5.63 ± 0.467
Biotin	[µg/100 g]	91.4 ± 20.2
Folic acid	[mg/100 g]	10.4 ± 0.024
Cobalamin	[µg/100 g]	8.91 ± 0.155
Inositol	[mg/100 g]	960.3 ± 283.3

4. Anhang

Polyphenols	[mg/g]
with MEBAK	0.059 ± 0.000
with Folin-Ciocalteu	21.1 ± 0.590
Flavonoids	0.525 ± 0.013

Soluble ions	[mg/g]
Na ⁺	6.48 ± 0.008
NH ₄ ⁺	ND
K ⁺	35.4 ± 0.160
Mg ²⁺	1.50 ± 0.010
Ca ²⁺	ND
F ⁻	4.13 ± 0.005
Cl ⁻	1.77 ± 0.028
NO ₂ ⁻	1.17 ± 0.002
SO ₄ ²⁻	10.5 ± 0.010
NO ₃ ⁻	ND
Br ⁻	2.39 ± 0.005
PO ₄ ³⁻	22.3 ± 0.002

Trace elements, λ	[mg/kg]
Ag	328.068
Al	396.152
As	189.042
B	249.773
Ba	455.403
Be	234.861
Bi	223.061
Ca	422.673
Cd	214.438
Co	228.616
Cr	267.716
Cu	324.754
Fe	259.940
K	766.490
Li	670.784
Mg	280.270
Mn	293.930
Mo	202.030
Na	589.592
Ni	231.604
P	177.495
Pb	220.353
S	182.034
Sb	217.581
Se	203.985
Sr	407.771
Ti	337.280
Tl	190.856
V	292.464
W	239.709
Zn	206.200

Organotechnie yeast extract

General Data		
Dry matter	[%]	92.2
Total nitrogen (TN)	[%]	11.0 ± 0.06
Amino nitrogen (AN)	[%]	3.93 ± 0.03
Hydrolysis degree (AN/TN)	[%]	35.7 ± 0.08
Ash	[%]	13.8

Amino acids	free	total
[g/100 g]		
Alanine	3.54 ± 0.061	4.01 ± 0.036
Asparagine	1.61 ± 0.037	ND
Asparatic acid	2.61 ± 0.080	8.02 ± 0.149
Cystathionine	ND	ND
Glutamic acid	7.49 ± 0.868	10.9 ± 0.331
Glycine	1.27 ± 0.029	2.81 ± 0.045
Histidine	0.91 ± 0.071	2.16 ± 0.035
Isoleucine	2.26 ± 0.085	3.06 ± 0.022
Leucine	4.00 ± 0.057	5.05 ± 0.058
Lysine	1.91 ± 0.074	5.17 ± 0.317
Methionine	0.77 ± 0.012	1.04 ± 0.019
Phenylalanine	2.33 ± 0.044	2.98 ± 0.066
Proline	1.28 ± 0.034	2.92 ± 0.042
Serine	2.69 ± 0.056	3.88 ± 0.004
Threonine	2.14 ± 0.016	3.64 ± 0.030
Tryptophan	0.86 ± 0.029	ND
Tyrosine	0.66 ± 0.024	1.13 ± 0.023
Valine	2.90 ± 0.056	4.09 ± 0.023

Fatty acids	[mg/g]
(10:0)	2.55 ± 0.056
(18:0)	0.208 ± 0.022

Carbohydrates	[mg/g]
Total	87.0 ± 1.554
Reducing sugar	28.6 ± 0.057

Carbohydrates	free	total (NREL)
[mg/g]		
Rhamnose	ND	ND
Arabinose	0.79	3.78 ± 0.014
Galactose	ND	0.55 ± 0.035
Glucose	5.98	49.5 ± 0.138
Sucrose	ND	ND
Xylose	ND	ND
Mannose	0.98	13.6 ± 0.060
Fructose	ND	ND

Inhibitors	free	total (NREL)
[mg/g]		
Formate	9.30	3.21 ± 0.166
Acetate	6.71	4.93 ± 0.328
Levulinic acid	ND	5.10 ± 0.091
Hydroxymethylfurfural	ND	2.10 ± 0.100
Furfural	0.26	1.77 ± 0.141

Vitamins		
Thiamine · HCl	[mg/100 g]	Max.
Riboflavin	[mg/100 g]	8.46 ± 0.063
Niacin	[mg/100 g]	113.8 ± 2.612
Ca-Pantothenate	[mg/100 g]	Max.
Pyridoxine · HCl	[mg/100 g]	13.8 ± 0.053
Biotin	[µg/100 g]	Max.
Folic acid	[mg/100 g]	5.51 ± 0.033
Cobalamin	[µg/100 g]	10.5 ± 0.000
Inositol	[mg/100 g]	613.2 ± 290.8

Polyphenols	[mg/g]
with MEBAK	ND
with Folin-Ciocalteu	18.7 ± 0.244
Flavonoids	0.104 ± 0.005

Soluble ions	[mg/g]
Na ⁺	1.42 ± 0.013
NH ₄ ⁺	24.7 ± 0.427
K ⁺	55.8 ± 0.285
Mg ²⁺	ND
Ca ²⁺	ND
F ⁻	4.56 ± 0.030
Cl ⁻	1.56 ± 0.019
NO ₂ ⁻	2.53 ± 0.003
SO ₄ ²⁻	6.89 ± 0.017
NO ₃ ⁻	ND
Br ⁻	2.15 ± 0.003
PO ₄ ³⁻	22.5 ± 0.192

Trace elements, λ	[mg/kg]
Ag	328.068
Al	396.152
As	189.042
B	249.773
Ba	2.41 ± 0.105
Be	ND
Bi	ND
Ca	223.061
Cd	345.6 ± 13.11
Co	ND
Cr	214.438
Cu	228.616
Fe	1.27 ± 0.024
K	0.393 ± 0.043
Li	324.754
Mg	1.26 ± 0.038
Mn	259.940
Mo	47.7 ± 1.993
Na	766.490
Ni	59908.7 ± 64.26
P	0.113 ± 0.023
Pb	280.270
S	254.5 ± 7.932
Sb	1.21 ± 0.049
Se	ND
Sr	1280.6 ± 102.9
Ti	0.299 ± 0.026
Tl	10967.2 ± 1401.6
V	0.113 ± 0.016
W	6757.0 ± 281.1
Zn	ND
	4.48 ± 0.046
	0.296 ± 0.036
	ND
	ND
	ND
	88.1 ± 0.074

Leiber Fermentation H

General Data		
Dry matter	[%]	93.1
Total nitrogen (TN)	[%]	11.2 ± 0.13
Amino nitrogen (AN)	[%]	4.29 ± 0.04
Hydrolysis degree (AN/TN)	[%]	38.2 ± 0.09
Ash	[%]	10.3

Amino acids	free	total
[g/100 g]		
Alanine	3.72 ± 0.041	4.19 ± 0.130
Asparagine	1.41 ± 0.021	ND
Asparatic acid	2.89 ± 0.005	6.46 ± 0.075
Cystathionine	ND	ND
Glutamic acid	3.17 ± 0.095	6.28 ± 0.094
Glycine	1.64 ± 0.026	3.02 ± 0.028
Histidine	1.48 ± 0.001	0.93 ± 0.051
Isoleucine	2.22 ± 0.014	2.70 ± 0.023
Leucine	3.98 ± 0.043	4.48 ± 0.042
Lysine	2.67 ± 0.001	3.03 ± 0.188
Methionine	0.82 ± 0.028	1.01 ± 0.012
Phenylalanine	2.38 ± 0.028	2.76 ± 0.154
Proline	2.27 ± 0.019	3.16 ± 0.012
Serine	3.53 ± 0.056	3.93 ± 0.227
Threonine	2.08 ± 0.053	2.86 ± 0.139
Tryptophan	1.17 ± 0.017	ND
Tyrosine	2.32 ± 0.030	1.73 ± 0.121
Valine	3.19 ± 0.028	4.05 ± 0.030

Fatty acids	[mg/g]
(10:0)	3.44 ± 0.049
(18:0)	0.167 ± 0.064

Carbohydrates	[mg/g]
Total	78.3 ± 0.463
Reducing sugar	32.6 ± 0.417

Carbohydrates	free	total (NREL)
[mg/g]		
Rhamnose	ND	ND
Arabinose	0.79	2.42 ± 0.015
Galactose	ND	ND
Glucose	2.63	36.6 ± 2.340
Sucrose	ND	ND
Xylose	ND	ND
Mannose	ND	31.2 ± 0.163
Fructose	ND	ND

Inhibitors	free	total (NREL)
[mg/g]		
Formate	33.3	2.58 ± 3.645
Acetate	7.47	6.25 ± 0.615
Levulinic acid	ND	1.62 ± 1.189
Hydroxymethylfurfural	ND	1.24 ± 0.129
Furfural	0.20	2.07 ± 0.064

Vitamins		
Thiamine · HCl	[mg/100 g]	Max.
Riboflavin	[mg/100 g]	3.29 ± 0.064
Niacin	[mg/100 g]	101.6 ± 0.453
Ca-Pantothenate	[mg/100 g]	18.6 ± 0.102
Pyridoxine · HCl	[mg/100 g]	10.2 ± 0.020
Biotin	[µg/100 g]	166.4 ± 33.9
Folic acid	[mg/100 g]	2.64 ± 0.029
Cobalamin	[µg/100 g]	9.11 ± 0.192
Inositol	[mg/100 g]	148.7 ± 752.0

Polyphenols	[mg/g]
with MEBAK	1.96 ± 0.040
with Folin-Ciocalteu	28.5 ± 0.335
Flavonoids	0.612 ± 0.025

Soluble ions	[mg/g]
Na ⁺	3.08 ± 0.018
NH ₄ ⁺	2.21 ± 0.031
K ⁺	27.7 ± 0.093
Mg ²⁺	2.89 ± 0.044
Ca ²⁺	ND
F ⁻	5.98 ± 0.012
Cl ⁻	1.92 ± 0.049
NO ₂ ⁻	ND
SO ₄ ²⁻	2.13 ± 0.010
NO ₃ ⁻	ND
Br ⁻	2.50 ± 0.006
PO ₄ ³⁻	48.8 ± 0.243

Trace elements, λ	[mg/kg]
Ag	328.068
Al	396.152
As	189.042
B	249.773
Ba	455.403
Be	234.861
Bi	223.061
Ca	422.673
Cd	214.438
Co	228.616
Cr	267.716
Cu	324.754
Fe	259.940
K	766.490
Li	670.784
Mg	280.270
Mn	293.930
Mo	202.030
Na	589.592
Ni	231.604
P	177.495
Pb	220.353
S	182.034
Sb	217.581
Se	203.985
Sr	407.771
Ti	337.280
Tl	190.856
V	292.464
W	239.709
Zn	206.200

Soy peptone

General Data		
Dry matter	[%]	93.7
Total nitrogen (TN)	[%]	9.93 ± 0.20
Amino nitrogen (AN)	[%]	2.22 ± 0.03
Hydrolysis degree (AN/TN)	[%]	22.4 ± 0.15
Ash	[%]	14.3

Amino acids	free	total
[g/100 g]		
Alanine	1.04 ± 0.019	2.39 ± 0.071
Asparagine	0.75 ± 0.029	ND
Asparatic acid	0.69 ± 0.042	8.11 ± 0.037
Cystathionine	0.59 ± 0.012	ND
Glutamic acid	1.54 ± 0.116	10.0 ± 0.390
Glycine	0.97 ± 0.030	2.45 ± 0.025
Histidine	0.78 ± 0.025	1.99 ± 0.088
Isoleucine	0.38 ± 0.011	2.10 ± 0.073
Leucine	2.17 ± 0.030	4.13 ± 0.048
Lysine	1.40 ± 0.111	3.50 ± 0.061
Methionine	0.26 ± 0.012	0.64 ± 0.014
Phenylalanine	0.99 ± 0.037	2.62 ± 0.068
Proline	0.27 ± 0.010	3.11 ± 0.009
Serine	1.26 ± 0.066	3.61 ± 0.088
Threonine	0.68 ± 0.016	2.66 ± 0.041
Tryptophan	0.56 ± 0.013	ND
Tyrosine	0.75 ± 0.030	1.85 ± 0.064
Valine	0.61 ± 0.010	2.86 ± 0.084

Fatty acids	[mg/g]
(10:0)	0.351 ± 0.016
(18:0)	ND

Carbohydrates	[mg/g]
Total	113.4 ± 4.527
Reducing sugar	27.3 ± 0.516

Carbohydrates	free	total (NREL)
[mg/g]		
Rhamnose	ND	ND
Arabinose	0.77	4.51 ± 6.381
Galactose	0.19	31.8 ± 1.506
Glucose	3.18	33.0 ± 1.377
Sucrose	33.5	ND
Xylose	ND	ND
Mannose	ND	6.88 ± 1.056
Fructose	1.63	1.40 ± 0.003

Inhibitors	free	total (NREL)
[mg/g]		
Formate	4.65	8.42 ± 0.106
Acetate	53.1	52.8 ± 0.071
Levulinic acid	1.52	15.1 ± 0.180
Hydroxymethylfurfural	ND	4.88 ± 0.039
Furfural	0.88	0.89 ± 0.031

Vitamins		
Thiamine · HCl	[mg/100 g]	4.84 ± 0.000
Riboflavin	[mg/100 g]	2.63 ± 0.192
Niacin	[mg/100 g]	27.6 ± 0.690
Ca-Pantothenate	[mg/100 g]	14.7 ± 0.141
Pyridoxine · HCl	[mg/100 g]	2.78 ± 0.393
Biotin	[µg/100 g]	158.7 ± 3.580
Folic acid	[mg/100 g]	1.06 ± 0.195
Cobalamin	[µg/100 g]	9.48 ± 0.189
Inositol	[mg/100 g]	325.3 ± 46.1

Polyphenols	[mg/g]
with MEBAK	0.126 ± 0.000
with Folin-Ciocalteu	30.5 ± 0.897
Flavonoids	0.144 ± 0.003

Soluble ions	[mg/g]
Na ⁺	30.0 ± 0.141
NH ₄ ⁺	6.11 ± 5.023
K ⁺	33.6 ± 0.302
Mg ²⁺	0.984 ± 0.037
Ca ²⁺	ND
F ⁻	6.18 ± 0.031
Cl ⁻	3.14 ± 0.051
NO ₂ ⁻	1.07 ± 0.011
SO ₄ ²⁻	5.96 ± 0.024
NO ₃ ⁻	ND
Br ⁻	2.18 ± 0.000
PO ₄ ³⁻	6.55 ± 0.687

Trace elements, λ	[mg/kg]
Ag	328.068
Al	396.152
As	189.042
B	249.773
Ba	455.403
Be	234.861
Bi	223.061
Ca	422.673
Cd	214.438
Co	228.616
Cr	267.716
Cu	324.754
Fe	259.940
K	766.490
Li	670.784
Mg	280.270
Mn	293.930
Mo	202.030
Na	589.592
Ni	231.604
P	177.495
Pb	220.353
S	182.034
Sb	217.581
Se	203.985
Sr	407.771
Ti	337.280
Tl	190.856
V	292.464
W	239.709
Zn	206.200

Meat peptone

General Data		
Dry matter	[%]	95.0
Total nitrogen (TN)	[%]	12.4 ± 0.07
Amino nitrogen (AN)	[%]	3.17 ± 0.03
Hydrolysis degree (AN/TN)	[%]	25.5 ± 0.10
Ash	[%]	12.2

Amino acids	free	total
[g/100 g]		
Alanine	2.44 ± 0.032	4.54 ± 0.027
Asparagine	0.60 ± 0.006	ND
Asparatic acid	1.41 ± 0.023	6.65 ± 0.125
Cystathionine	ND	ND
Glutamic acid	2.76 ± 0.069	7.19 ± 0.010
Glycine	1.74 ± 0.030	7.26 ± 0.063
Histidine	0.75 ± 0.011	1.73 ± 0.004
Isoleucine	1.10 ± 0.017	1.94 ± 0.048
Leucine	2.91 ± 0.036	4.85 ± 0.039
Lysine	1.51 ± 0.023	3.78 ± 0.225
Methionine	0.67 ± 0.017	1.04 ± 0.014
Phenylalanine	1.44 ± 0.024	2.75 ± 0.020
Proline	0.94 ± 0.014	5.89 ± 0.035
Serine	1.15 ± 0.021	3.24 ± 0.070
Threonine	1.03 ± 0.021	2.92 ± 0.027
Tryptophan	0.68 ± 0.010	ND
Tyrosine	0.49 ± 0.006	1.20 ± 0.006
Valine	1.91 ± 0.024	3.90 ± 0.024

Fatty acids	[mg/g]
(10:0)	0.546 ± 0.006
(18:0)	0.083 ± 0.014

Carbohydrates	[mg/g]
Total	56.4 ± 0.883
Reducing sugar	32.2 ± 0.229

Carbohydrates	free	total (NREL)
[mg/g]		
Rhamnose	ND	ND
Arabinose	0.69	3.64 ± 0.043
Galactose	ND	3.47 ± 0.004
Glucose	3.43	33.2 ± 0.195
Sucrose	ND	ND
Xylose	ND	ND
Mannose	ND	4.34 ± 0.033
Fructose	ND	ND

Inhibitors	free	total (NREL)
[mg/g]		
Formate	9.40	2.27 ± 0.136
Acetate	2.40	4.63 ± 0.160
Levulinic acid	3.60	4.85 ± 0.056
Hydroxymethylfurfural	ND	1.08 ± 0.007
Furfural	0.69	0.29 ± 0.040

Vitamins		
Thiamine · HCl	[mg/100 g]	5.44 ± 0.275
Riboflavin	[mg/100 g]	3.11 ± 0.102
Niacin	[mg/100 g]	63.3 ± 2.175
Ca-Pantothenate	[mg/100 g]	21.5 ± 1.348
Pyridoxine · HCl	[mg/100 g]	5.04 ± 0.318
Biotin	[µg/100 g]	203.7 ± 10.1
Folic acid	[mg/100 g]	0.009 ± 0.021
Cobalamin	[µg/100 g]	51.8 ± 1.935
Inositol	[g/100 g]	1.216 ± 0.135

Polyphenols	[mg/g]
with MEBAK	ND
with Folin-Ciocalteu	18.5 ± 1.139
Flavonoids	0.189 ± 0.003

Soluble ions	[mg/g]
Na ⁺	27.6 ± 0.001
NH ₄ ⁺	ND
K ⁺	20.2 ± 0.061
Mg ²⁺	ND
Ca ²⁺	ND
F ⁻	3.90 ± 0.009
Cl ⁻	7.26 ± 0.003
NO ₂ ⁻	ND
SO ₄ ²⁻	23.4 ± 0.036
NO ₃ ⁻	ND
Br ⁻	2.44 ± 0.001
PO ₄ ³⁻	20.3 ± 0.158

Trace elements, λ	[mg/kg]
Ag	328.068
Al	396.152
As	189.042
B	249.773
Ba	455.403
Be	234.861
Bi	223.061
Ca	422.673
Cd	214.438
Co	228.616
Cr	267.716
Cu	324.754
Fe	259.940
K	766.490
Li	670.784
Mg	280.270
Mn	293.930
Mo	202.030
Na	589.592
Ni	231.604
P	177.495
Pb	220.353
S	182.034
Sb	217.581
Se	203.985
Sr	407.771
Ti	337.280
Tl	190.856
V	292.464
W	239.709
Zn	206.200

Wheat peptone

General Data		
Dry matter	[%]	92.5
Total nitrogen (TN)	[%]	13.2 ± 0.05
Amino nitrogen (AN)	[%]	1.47 ± 0.02
Hydrolysis degree (AN/TN)	[%]	11.1 ± 0.11
Ash	[%]	4.95

Amino acids	free	total
[g/100 g]		
Alanine	0.46 ± 0.005	1.86 ± 0.030
Asparagine	0.26 ± 0.010	ND
Asparatic acid	0.10 ± 0.014	3.13 ± 0.094
Cystathionine	ND	ND
Glutamic acid	0.56 ± 0.126	30.4 ± 0.134
Glycine	0.76 ± 0.010	2.92 ± 0.056
Histidine	0.61 ± 0.009	2.42 ± 0.093
Isoleucine	ND	2.12 ± 0.009
Leucine	1.76 ± 0.018	5.59 ± 0.083
Lysine	0.50 ± 0.020	1.71 ± 0.053
Methionine	0.29 ± 0.013	1.10 ± 0.050
Phenylalanine	0.50 ± 0.011	4.24 ± 0.130
Proline	0.04 ± 0.004	12.2 ± 0.259
Serine	1.14 ± 0.022	5.02 ± 0.130
Threonine	0.37 ± 0.006	2.40 ± 0.049
Tryptophan	0.42 ± 0.008	ND
Tyrosine	0.60 ± 0.014	2.76 ± 0.083
Valine	0.18 ± 0.006	3.16 ± 0.015

Fatty acids	[mg/g]
(10:0)	0.021 ± 0.011
(18:0)	0.260 ± 0.061

Carbohydrates	[mg/g]
Total	84.9 ± 1.037
Reducing sugar	65.7 ± 0.516

Carbohydrates	free	total (NREL)
[mg/g]		
Rhamnose	ND	ND
Arabinose	0.90	6.77 ± 0.030
Galactose	ND	2.60 ± 0.052
Glucose	4.80	52.4 ± 0.510
Sucrose	0.44	ND
Xylose	ND	ND
Mannose	ND	0.13 ± 0.028
Fructose	ND	ND

Inhibitors	free	total (NREL)
[mg/g]		
Formate	58.0	3.75 ± 0.002
Acetate	7.94	1.97 ± 0.153
Levulinic acid	33.0	5.99 ± 0.181
Hydroxymethylfurfural	ND	2.35 ± 0.041
Furfural	2.92	0.44 ± 0.034

Vitamins		
Thiamine · HCl	[mg/100 g]	4.03 ± 0.718
Riboflavin	[mg/100 g]	1.77 ± 0.088
Niacin	[mg/100 g]	ND
Ca-Pantothenate	[mg/100 g]	7.25 ± 0.081
Pyridoxine · HCl	[mg/100 g]	ND
Biotin	[µg/100 g]	30.7 ± 1.447
Folic acid	[mg/100 g]	ND
Cobalamin	[µg/100 g]	8.61 ± 0.275
Inositol	[mg/100 g]	558.3 ± 440.3

Polyphenols	[mg/g]
with MEBAK	0.353 ± 0.039
with Folin-Ciocalteu	28.1 ± 1.545
Flavonoids	0.046 ± 0.002

Soluble ions	[mg/g]
Na ⁺	16.7 ± 0.109
NH ₄ ⁺	42.4 ± 1.926
K ⁺	1.98 ± 0.008
Mg ²⁺	0.247 ± 0.033
Ca ²⁺	ND
F ⁻	6.60 ± 0.027
Cl ⁻	3.40 ± 0.014
NO ₂ ⁻	ND
SO ₄ ²⁻	6.13 ± 0.185
NO ₃ ⁻	ND
Br ⁻	2.19 ± 0.002
PO ₄ ³⁻	ND

Trace elements, λ	[mg/kg]
Ag	328.068
Al	396.152
As	189.042
B	249.773
Ba	455.403
Be	234.861
Bi	223.061
Ca	422.673
Cd	214.438
Co	228.616
Cr	267.716
Cu	324.754
Fe	259.940
K	766.490
Li	670.784
Mg	280.270
Mn	293.930
Mo	202.030
Na	589.592
Ni	231.604
P	177.495
Pb	220.353
S	182.034
Sb	217.581
Se	203.985
Sr	407.771
Ti	337.280
Tl	190.856
V	292.464
W	239.709
Zn	206.200

Peptone (casein)

General Data		
Dry matter	[%]	90.9
Total nitrogen (TN)	[%]	12.4 ± 0.03
Amino nitrogen (AN)	[%]	2.77 ± 0.05
Hydrolysis degree (AN/TN)	[%]	22.4 ± 0.35
Ash	[%]	8.20

Amino acids	free	total
[g/100 g]		
Alanine	0.43 ± 0.003	2.32 ± 0.016
Asparagine	0.39 ± 0.003	ND
Asparatic acid	0.15 ± 0.016	7.29 ± 0.177
Cystathionine	0.61 ± 0.011	ND
Glutamic acid	0.58 ± 0.025	18.1 ± 0.959
Glycine	0.14 ± 0.009	1.48 ± 0.019
Histidine	0.91 ± 0.017	2.93 ± 0.020
Isoleucine	0.96 ± 0.025	4.05 ± 0.061
Leucine	4.94 ± 0.072	8.24 ± 0.052
Lysine	4.83 ± 0.211	7.14 ± 0.003
Methionine	0.81 ± 0.007	2.24 ± 0.067
Phenylalanine	2.54 ± 0.055	4.21 ± 0.046
Proline	0.08 ± 0.002	10.4 ± 0.121
Serine	0.88 ± 0.020	5.50 ± 0.029
Threonine	0.85 ± 0.009	4.19 ± 0.013
Tryptophan	0.99 ± 0.019	ND
Tyrosine	2.49 ± 0.053	3.25 ± 0.073
Valine	1.49 ± 0.007	5.70 ± 0.025

Fatty acids	[mg/g]
(6:0)	0.213 ± 0.005
(10:0)	0.154 ± 0.005
(18:0)	0.063 ± 0.046

Carbohydrates	[mg/g]
Total	4.10 ± 0.082
Reducing sugar	12.6 ± 0.057

Carbohydrates	free	total (NREL)
[mg/g]		
Rhamnose	ND	ND
Arabinose	0.73	ND
Galactose	0.58	3.21 ± 0.045
Glucose	2.17	ND
Sucrose	ND	ND
Xylose	ND	ND
Mannose	ND	ND
Fructose	ND	ND

Inhibitors	free	total (NREL)
[mg/g]		
Formate	11.1	1.09 ± 0.054
Acetate	9.63	1.80 ± 0.157
Levulinic acid	0.58	ND
Hydroxymethylfurfural	ND	ND
Furfural	2.22	ND

Vitamins		
Thiamine · HCl	[mg/100 g]	8.25 ± 0.074
Riboflavin	[mg/100 g]	1.69 ± 0.095
Niacin	[mg/100 g]	69.6 ± 1.048
Ca-Pantothenate	[mg/100 g]	6.67 ± 0.201
Pyridoxine · HCl	[mg/100 g]	ND
Biotin	[µg/100 g]	28.6 ± 0.000
Folic acid	[mg/100 g]	ND
Cobalamin	[µg/100 g]	8.60 ± 0.118
Inositol	[mg/100 g]	454.2 ± 66.3

Polyphenols	[mg/g]
with MEBAK	ND
with Folin-Ciocalteu	30.4 ± 1.040
Flavonoids	ND

Soluble ions	[mg/g]
Na ⁺	27.8 ± 0.252
NH ₄ ⁺	20.9 ± 0.354
K ⁺	0.947 ± 0.001
Mg ²⁺	ND
Ca ²⁺	ND
F ⁻	4.40 ± 0.029
Cl ⁻	1.18 ± 0.010
NO ₂ ⁻	ND
SO ₄ ²⁻	2.78 ± 0.014
NO ₃ ⁻	2.98 ± 0.001
Br ⁻	2.10 ± 0.003
PO ₄ ³⁻	16.7 ± 0.092

Trace elements, λ	[mg/kg]
Ag	328.068
Al	396.152
As	189.042
B	249.773
Ba	455.403
Be	234.861
Bi	223.061
Ca	422.673
Cd	214.438
Co	228.616
Cr	267.716
Cu	324.754
Fe	259.940
K	766.490
Li	670.784
Mg	280.270
Mn	293.930
Mo	202.030
Na	589.592
Ni	231.604
P	177.495
Pb	220.353
S	182.034
Sb	217.581
Se	203.985
Sr	407.771
Ti	337.280
Tl	190.856
V	292.464
W	239.709
Zn	206.200

Hy-Soy®

General Data		
Dry matter	[%]	95.9
Total nitrogen (TN)	[%]	9.21 ± 0.04
Amino nitrogen (AN)	[%]	1.21 ± 0.03
Hydrolysis degree (AN/TN)	[%]	13.2 ± 0.27
Ash	[%]	15.8

Amino acids	free	total
[g/100 g]		
Alanine	0.27 ± 0.003	2.29 ± 0.008
Asparagine	0.27 ± 0.007	ND
Asparatic acid	0.32 ± 0.020	9.06 ± 0.199
Cystathionine	ND	ND
Glutamic acid	0.43 ± 0.003	13.0 ± 0.234
Glycine	0.29 ± 0.006	2.34 ± 0.029
Histidine	0.51 ± 0.003	2.00 ± 0.064
Isoleucine	ND	1.96 ± 0.058
Leucine	0.86 ± 0.002	4.10 ± 0.035
Lysine	0.68 ± 0.017	3.62 ± 0.142
Methionine	0.19 ± 0.003	0.58 ± 0.027
Phenylalanine	0.32 ± 0.004	2.36 ± 0.051
Proline	ND	3.24 ± 0.054
Serine	0.61 ± 0.032	3.97 ± 0.030
Threonine	0.20 ± 0.012	2.81 ± 0.029
Tryptophan	0.38 ± 0.007	ND
Tyrosine	0.33 ± 0.004	1.76 ± 0.041
Valine	0.06 ± 0.009	2.66 ± 0.044

Fatty acids	[mg/g]
(10:0)	ND
(18:0)	0.172 ± 0.061

Carbohydrates	[mg/g]
Total	177.8 ± 1.513
Reducing sugar	22.3 ± 0.115

Carbohydrates	free	total (NREL)
[mg/g]		
Rhamnose	ND	ND
Arabinose	0.72	ND
Galactose	0.19	53.0 ± 0.269
Glucose	3.55	54.5 ± 0.381
Sucrose	51.5	5.24 ± 7.411
Xylose	ND	ND
Mannose	ND	2.24 ± 0.072
Fructose	3.99	2.81 ± 0.010

Inhibitors	free	total (NREL)
[mg/g]		
Formate	0.99	13.1 ± 0.240
Acetate	3.37	3.35 ± 0.063
Levulinic acid	ND	29.1 ± 0.105
Hydroxymethylfurfural	ND	8.35 ± 0.211
Furfural	0.62	0.46 ± 0.099

Vitamins		
Thiamine · HCl	[mg/100 g]	3.34 ± 0.772
Riboflavin	[mg/100 g]	1.54 ± 0.015
Niacin	[mg/100 g]	ND
Ca-Pantothenate	[mg/100 g]	8.70 ± 0.357
Pyridoxine · HCl	[mg/100 g]	2.57 ± 0.620
Biotin	[µg/100 g]	62.2 ± 0.000
Folic acid	[mg/100 g]	0.279 ± 0.116
Cobalamin	[µg/100 g]	8.81 ± 0.156
Inositol	[mg/100 g]	3.34 ± 0.772

Polyphenols	[mg/g]
with MEBAK	0.194 ± 0.000
with Folin-Ciocalteu	19.1 ± 0.811
Flavonoids	0.089 ± 0.003

Soluble ions	[mg/g]
Na ⁺	33.3 ± 0.115
NH ₄ ⁺	11.6 ± 0.368
K ⁺	30.5 ± 0.037
Mg ²⁺	2.17 ± 0.010
Ca ²⁺	ND
F ⁻	1.76 ± 0.017
Cl ⁻	32.6 ± 0.182
NO ₂ ⁻	ND
SO ₄ ²⁻	3.24 ± 0.026
NO ₃ ⁻	ND
Br ⁻	2.16 ± 0.002
PO ₄ ³⁻	6.64 ± 0.009

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Ag	328.068
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Ba	455.403
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