Table S1. Production of high-value products from spent brewer's yeast.

High-value product	Yeast strain	Process conditions	The aim of the research	Reference
β-glucan	*Saccharomyces uvarum*	1) Hot water treatment (water bath with mild agitation; 30% (w/w) cell suspension; pH 5.0; 3% w/v NaCl; T = 55 °C; t = 24 h) 2) Autolysis (T = 85 °C; t = 15 min; centrifuge, n = 4500 g, t = 10 min) 3) Sonication (20 kHz and 150 W in an ice bath; t = 2, 4 and 6 min; 10, 15 and 20% cell dilution) 4) Proteolysis (protamex enzyme; pH 7.5; T = 55 °C; t = 5 h) 5) Dialysis (distilled water; t = 8 h) 6) Lyophilization (frozen; T = −20 °C, dried under vacuum; T = −80 °C)	Production of β-glucan as protective agent of probiotic *Lactobacillus cultures* with potential application as a functional food ingredient.	[30]
	Saccharomyces carlsbergensis	1) Alkaline extraction (6% w/v NaOH; T = 90 °C; t = 2 h; centrifuge, n = 6000 rpm, T = 4 °C, t = 10 min) 2) β-glucan production (addition of 3% w/v molasses and 0.1% w/v diammonium sulfate (MDS) medium supplemented with 0.1 % w/v tannic acid).	Enhanced production of β-glucan with the addition of tannic acid for use in prebiotics and functional supplements.	[31]
	Saccharomyces pastorianus	1) Autolysis (T = 50 °C; t = 24 h) 2) Alkaline extraction (1.0 N NaOH; T = 80 ± 5 °C; t = 2 h) 3) Acid extraction (0.5 N CH_3COOH; T = 75 ± 5 °C; t = 1 h) 4) Lyophilized and milled	Improvement of bread nutritional and health properties using β-glucan rich extract in the baking process.	[32]
Mannoprotein	*Saccharomyces uvarum*	1) Hot water treatment (water bath with mild agitation; 30% (w/w) cell suspension; pH 5.0; 3% w/v NaCl; T = 55 °C; t = 24 h) 2) Autolysis (T = 85 °C; t = 15 min, centrifuge, n = 4500 g, t = 10 min) 3) Extraction (absolute ethanol 3:1; T = 4 °C; t = 18 h) 4) Precipitation (absolute ethanol; n = 4500 g; T = 10 °C; t = 5 min) 5) Dialysis (distilled water; t = 48 h) 6) Lyophilization	The use of mannoprotein as a substitute for xanthan gum in mayonnaise, with emulsifying and stabilizing properties.	[33]
	Saccharomyces uvarum	1) Autolysis (T = 55 °C; t = 24 h; n =120 rpm) 2) Hot water treatment (T = 121 °C; t = 4 h; centrifuge, n = 4500 g, t = 7 min) 3) Extraction (absolute ethanol 3:1; T = 4 °C; t = 18 h) 4) Precipitation (absolute ethanol; n = 4500 g; T = 10 °C; t = 5 min) 5) Lyophilization	The use of mannoprotein as an additive to French salad dressing for the purpose of emulsification and stabilization.	[34]

Protein	*Saccharomyces pastorianus*	1) Enzymatic hydrolysis (proteolytic enzymes: Brauzyn®, Alcalase™, Protamex™ and Flavourzyme™; *T* = 60 °C; pH 5.5; 10 % enzyme/substrate ratio; 100% substrate concentration)	Production and recovery of crude proteins and antioxidant components from SBY by enzymatic hydrolysis.	[28]
Hop acid	Unknown	1) Sonication (spent yeast paste: methanol-phosphoric acid; *T* = 25 °C; *t* = 18 min; vortexed *t* = 2 min) 2) Centrifuge (*n* = 4000 g; *t* = 5 min) 3) Dilution of supernatant (40 mL of water-phosphoric acid)	Production of hop acid with antioxidant, anti-inflammatory, anti-cancer and antibacterial activity as a functional food supplement.	[35]
Succinic acid	Unknown	1) Autolysis (*T* = 55 °C; *t* = 72; *n* = 120 rpm; centrifuge, *t* =15 min, *T* = 4 °C, *n* = 8000 rpm) 2) Enzymatic hydrolysis (Alcalase (Novozymes); *T* = 60 °C; *t* = 12 h; *n* = 200 rpm; centrifuge, *t* = 15 min, *T* = 4 °C, *n* = 8000 rpm) 3) Batch fermentation (*Actinobacillus succinogenes*; *T* = 37 °C; *n* = 200 rpm; CO_2 flow rate of 0.5 L/min	Production of succinic acid by *A. succinogenes*, with the addition of vitamins to improve production.	[36]
Glutamic acid	Unknown	1) Enzymatic hydrolysis (proteases from *Bacillus* SK II-5; SBY solution; *T* = 50 °C; *t* = 12 h; centrifuge, *t* = 10 min, *T* = 4 °C, *n* = 8000 rpm)	Production of monosodium glutamate and glutamic acid by enzymatic hydrolysis of SBY with proteases.	[37]
γ-aminobutyric acid (GABA)	*Saccharomyces cerevisiae*	1) Autolysis (7% dry SBY + sterile distilled water + monosodium glutamate (0.060 mol/L) + D-(+)-glucose monohydrate (0.266 mol/L)) 2) Acid-alakali hydrolysis (2N HCl or 2N NaOH; *T* = 37 °C; *t* = 72 h; *n* = 100 rpm) 3) Heating (*T* = 85 °C; *t* = 15 min)	Production of GABA in autolytically processed yeast extract.	[38]
5′-nucleotides	*Saccharomyces pastorianus*	1) Yeast disruption (phosphate buffer; pH 7) a) Physical method (*T* = 50 °C; *t* = 24 h) b) Mechanical method (0.6 mm glass beads; *T* = 4 °C; 10 times for 1 min on vortex) 2) RNA hydrolysis a) cell extract + acetic acid 3% + deionized water (*T* = 25 °C; *t* = 15 min) b) cell extract + 0.3 M KOH (*T* = 37 °C; *t* = 24 h; neutralization with 0.5 M $HClO_4$) c) cell extract + 0.3 M KOH (*T* = 60 °C; *t* = 24 h; neutralization with 0.5 M $HClO_4$)	Nucleotide extraction for the production of flavor enhancers such as 5'GMP and 5'AMP.	[39]

Table S2. Price ranges of various SBY products, accessed on 14 January 2023.

Product group	Product sales name	Price [USD t^{-1}]	Source
Feed	High Protein Inactive Dry Yeast / Animal Feed Yeast Price (min. order quantity 18 t)	61	[82]
	Manufacturer Supply Best Price Animal Feed Yeast Crude Protein 40%~55%;	320	[83]
	Affordable Yeast Powder 50% 60% Animal Feed Protein	250	[84]
	Average price	**210**	
β-glucan	Food Additives CAS 9012-72-0 Yeast Beta 1, 3 D Glucan Water Insoluble 70%	35.000	[85]
	Yeast Extract Powder Food Grade Beta Glucan Powder 80%	85.000	[86]
	Top Quality Yeast Beta-Glucan, Beta Glucan Yeast	40.000	[87]
		70.000	
	Yeast Cell Wall, Yeast Extract, Yeast Beta Glucan for Food and Feed (min. order quantity 12 t)	1.750	[88]
	Average price	**46.350**	
Mannoprotein	Winemaking Supplies Price List	225.000	[89]
	Mannofeel – carolinawinesupply	65.741	[90]
	Mannofeel-Winnica&Wino (exchange rate for Polish Zlot (PLN) to US dollar: 0,23)	822.760	[90]
	Angel MP60 Yeast Extract Mannoprotein for Wine Fermentation stability (min. order quantity 1t)	90.000	[91]
	Average price	**300.875**	
Chitin	Chem-Impex	72.218	[92]
	Biosynth Carbosynth	150.000	
	Sigma-Aldrich	349.000	
	Average price	**190.406**	
Glycogen	AK Scientific	3.078.000	[93]
	Biosynth Carbosynth (from oyster)	13.000.000	
	Matrix Scientific	3.990.000	
	Average price	**6.689.333**	

Table S3. Heat energy demand for extraction processes in relation to biogas primary energy supply per ton dry matter of SBY.

Yeast strain	Heat related process conditions	Temperature	Time	Ambient temperature	Temperature difference	Energy demand	Heat maitenance*	Heat demand total	Biogas energy supply of the residue	Share in extraction heat demand in primary biogas energy supply
		[°C]	[h]	[°C]	[°C]	[MJ t^{-1}]	[MJ]	[MJ]	[MJ]	
Saccharomyces uvarum	Hot bath	55	24	20	35	146	16.7	147	10.055	2%
	Autolysis	85	15	20	65	272	10.5	282		3%
	Proteolysis	55	5	20	35	146		146		2%
Saccharomyces carlsbergensis	Alkaline extraction	90	2	20	70	293		293		3%
Saccharomyces pastorianus	Autolysis	50	24	20	30	126	16.7	142		1%
	Alkaline extraction	82.5*	2	20	62.5	262		262		3%
	Acid extraction	77.5*	1	20	57.5	241		241		3%

* mean value

**assuming 1 °C loss each 6 hours