Supplementary material

Conversion of soluble compounds in distillery wastewater into fungal biomass and metabolites using Australian *Ganoderma* isolates

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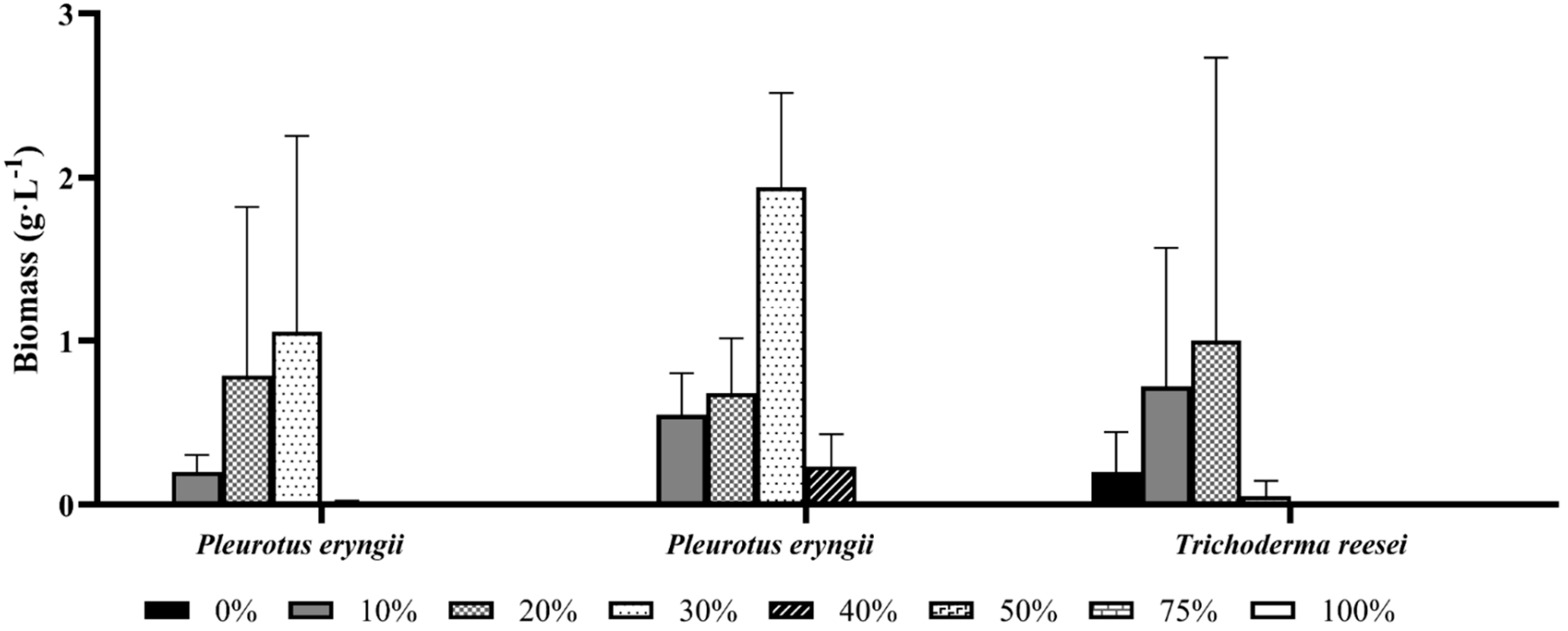


Figure S1. Preliminary assessment of biomass yields (g·L⁻¹) of two basidiomycete strains (*Pleurotus eryngii*), and an ascomycete (*Trichoderma reesei*) after 12 days of submerged cultivation in media with increasing concentrations of stillage (0-100%). Fungi were cultured at 25 °C in 24-well flasks shaking at 150 rpm. Biomass was collected in a sieve, rinsed with distilled water and oven-dried. Error bars represent standard deviations from triplicate cultures.

Table S1. Pearson correlation coefficients (r) for isolate G1 cultivated in 25% stillage at original pH over 12 days. Pairwise Pearson correlation coefficients (n = 4) between biomass, bioremediation indicators (soluble organic carbon, SOC; total phenolic content, TP; total nitrogen, TN), and metabolite production (β-glucan, soluble proteins (SP), crude proteins (CP), phenolics, lipids, 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulphonic acid (ABTS), and Ferric Reducing Antioxidant Power (FRAP)). Asterisks indicate significance levels (*p < 0.05, **p < 0.01, ***p < 0.001, ****p < 0.0001).

	Biomass	TOC	TP	TN	β-glucan	Lipids	ABTS	CP	SP	Phenolics	FRAP
Biomass	1.00	**0.97***	**0.99***	0.87	0.92	0.58	0.29	0.94	-0.67	-0.50	0.59
TOC		1.00	**0.96***	0.95	0.89	0.51	0.11	0.87	-0.82	-0.58	0.38
TP			1.00	0.83	0.85	0.69	0.37	**0.97***	-0.65	-0.39	0.61
TN				1.00	0.91	0.21	-0.20	0.67	-0.94	-0.80	0.13
β-glucan					1.00	0.23	-0.01	0.75	-0.73	-0.76	0.42
Lipids						1.00	0.85	0.81	-0.03	0.40	0.74
ABTS							1.00	0.59	0.45	0.66	0.88
CP								1.00	-0.44	-0.17	0.77
SP									1.00	0.83	0.20
Phenolics										1.00	0.25
FRAP											1.00

Table S2. Pearson correlation coefficients (r) for isolate G1 cultivated in nutrient medium (yeast extract, malt extract, peptone and glucose) over 12 days. Correlation matrix (n = 4) showing relationships among biomass and metabolite production (β-glucan, proteins, phenolics, lipids, 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulphonic acid (ABTS), and Ferric Reducing Antioxidant Power (FRAP)). Asterisks indicate significance levels (*p < 0.05, **p < 0.01, ***p < 0.001, ****p < 0.0001).

	Biomass	β-glucan	Lipids	ABTS	CP	SP	Phenolics	FRAP
Biomass	1	0.87	0.89	0.74	0.93	**0.98***	0.82	0.93
β-glucan		1	**0.97***	0.95	**0.98***	**0.95***	0.93	0.63
Lipids			1	0.85	0.94	0.94	0.82	0.68
ABTS				1	0.94	0.86	**0.98***	0.47
CP					1	**0.98***	**0.96***	0.74
SP						1	0.91	0.84
Phenolics							1	0.61
FRAP								1

Table S3. Pearson correlation coefficients (r) for isolate G2 cultivated in 25% stillage at original pH over 12 days. Pairwise Pearson correlation coefficients (n = 4) between biomass, bioremediation indicators (TOC, TP, TN reduction), and metabolite levels (β-glucan, proteins, phenolics, lipids, ABTS, FRAP). Asterisks indicate significance levels (*p < 0.05, **p < 0.01, ***p < 0.001, ****p < 0.0001).

	Biomass	TOC	TP	TN	β-glucan	Lipids	ABTS	CP	SP	Phenolics	FRAP
Biomass	1.00	0.82	0.81	0.71	0.83	0.14	-0.29	-0.47	-0.59	-0.65	0.92
TOC		1.00	**1.00*** **	**0.98***	0.89	0.68	0.30	0.11	-0.03	-0.66	0.92
TP			1.00	**0.99***	0.88	0.68	0.30	0.12	-0.02	-0.64	0.92
TN				1.00	0.81	0.80	0.42	0.28	0.12	-0.56	0.84
β-glucan					1.00	0.40	0.22	-0.17	-0.14	-0.93	**0.98***
Lipids						1.00	0.81	0.80	0.66	-0.17	0.37
ABTS							1.00	0.85	0.94	-0.21	0.08
CP								1.00	0.92	0.30	-0.24
SP									1.00	0.12	-0.27
Phenolics										1.00	-0.85
FRAP											1.00

Table S4. Pearson correlation coefficients (r) for isolate G2 cultivated in nutrient medium (yeast extract, malt extract, peptone and glucose) over 12 days. Correlation matrix (n = 4) showing relationships among biomass production, antioxidant capacity (ABTS, FRAP), and metabolite production. Asterisks indicate significance levels (*p < 0.05, **p < 0.01, ***p < 0.001, ****p < 0.0001).

	Biomass	β-glucan	Lipids	ABTS	CP	SP	Phenolics	FRAP
Biomass	1.00	0.90	0.80	0.78	0.72	0.89	0.94	**0.99***
β-glucan		1.00	0.62	0.44	0.36	0.82	0.78	0.95
Lipids			1.00	0.88	0.86	0.95	**0.96***	0.72
ABTS				1.00	**1.00****	0.75	0.89	0.67
CP					1.00	0.71	0.85	0.60
SP						1.00	**0.96***	0.85
Phenolics							1.00	0.88
FRAP								1.00

Table S5. Pearson correlation coefficients (r) for isolate G3 cultivated in 25% stillage at original pH over 12 days. Pairwise Pearson correlation coefficients (n = 4) between biomass, bioremediation indicators (TOC, TP, TN reduction), and metabolite levels (β-glucan, proteins, phenolics, lipids, ABTS, FRAP). Asterisks indicate significance levels (*p < 0.05, **p < 0.01, ***p < 0.001, ****p < 0.0001).

	Biomass	TOC	TP	TN	β-glucan	Lipids	ABTS	CP	SP	Phenolics	FRAP
Biomass	1.00	**1.00****	**0.98***	**0.99****	0.73	0.36	-0.57	0.20	-0.19	**-0.96***	0.77
TOC		1.00	**0.98***	**0.99****	0.76	0.30	-0.61	0.16	-0.24	**-0.98***	0.81
TP			1.00	**0.95***	0.70	0.17	-0.73	-0.01	-0.39	**-1.00****	0.76
TN				1.00	0.81	0.37	-0.52	0.26	-0.15	-0.95	0.84
β-glucan					1.00	0.05	-0.41	0.15	-0.24	-0.74	**1.00****
Lipids						1.00	0.51	0.93	0.83	-0.10	0.02
ABTS							1.00	0.69	0.90	0.76	-0.50
CP								1.00	0.91	0.06	0.09
SP									1.00	0.44	-0.31
Phenolics										1.00	-0.80
FRAP											1.00

Table S6. Pearson correlation coefficients (r) for isolate G3 cultivated in nutrient medium (yeast extract, malt extract, peptone and glucose) over 12 days. Correlation matrix (n = 4) showing relationships among biomass production, antioxidant capacity (ABTS, FRAP), and metabolite production. Asterisks indicate significance levels (*p < 0.05, **p < 0.01, ***p < 0.001, ****p < 0.0001).

	Biomass	β-glucan	Lipids	ABTS	CP	SP	Phenolics	FRAP
Biomass	1.00	**0.97***	0.74	0.57	0.45	0.82	0.74	**0.97***
β-glucan		1.00	0.85	0.74	0.60	0.93	0.88	0.88
Lipids			1.00	**0.95***	0.93	**0.97***	0.83	0.62
ABTS				1.00	**0.96***	0.93	0.87	0.39
CP					1.00	0.84	0.69	0.31
SP						1.00	0.94	0.68
Phenolics							1.00	0.55
FRAP								1.00