Supplementary

Microbial transformation of total saponins extracted from *Panax notoginseng* flower by the fungus *Talaromyces flavus*

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Table S1. Validation data of HPLC quantitative method for eight minor saponins

standards	regression eq	*r*	Linearity (mg/mL)	LOD (mg/mL)	LOQ (mg/mL)	Precision RSD (%)	Stability RSD (%)	Repeatability RSD (%)	recovery rate (%)
Gyp-17	Y=9824113*X+24687	0.9998	0.0044-0.24	0.00053	0.0016	0.11	2.77	1.36	96.31
C-Mc_1	Y=12987927*X+31141	0.9999	0.0043-0.24	0.00041	0.0013	0.26	2.89	1.52	97.81
C-Mx_1	Y=8744665*X+45778	0.9999	0.0081-0.48	0.00066	0.002	0.18	1.33	1.16	95.25
F_2	Y=22365147*X-6636	0.9998	0.008-0.056	0.00022	0.00066	0.14	2.93	2.31	95.19
Rg_3	Y=11515042*X+1689	0.9999	0.00078-0.41	0.00023	0.00072	1.22	1.65	0.94	97.39
20(*R*)-Rg_3	Y=3418661*X-176	0.9997	0.00149-0.43	0.00046	0.00146	0.69	1.92	1.05	97.21
Rk_1	Y=7055292*X+7988	0.9999	0.00151-0.13	0.00048	0.00139	0.61	2.72	2.51	95.22
Rg_5	Y=33902133*X+1878	0.9998	0.00075-0.58	0.00014	0.00048	0.04	1.38	1.29	98.75

Table S2. Validation data of HPLC quantitative method for five saponins

standards	regression eq	*r*	Linearity (mg/mL)	LOD (mg/mL)	LOQ (mg/mL)	precision RSD (%)	Stability RSD (%)	Repeatability RSD (%)	Recovery rate (%)
Rb_1	Y=6104777*X-27997	0.9991	0.08-0.056	0.00099	0.00301	1.96	1.31	0.70	96.43
Rc	Y=5609257*X-14364	0.9995	0.02-0.14	0.00192	0.00583	2.11	1.79	1.34	97.36
Rb_2	Y=7036320*X-25267	0.9995	0.032-0.224	0.00050	0.00151	1.91	2.82	1.93	98.74
Rb_3	Y = 6591124*X-15697	0.9963	0.02-0.14	0.00042	0.00129	1.96	1.50	1.39	95.77
Rd	Y=7692819*X-17251	0.9992	0.032-0.224	0.00021	0.00065	1.98	1.39	0.68	96.56

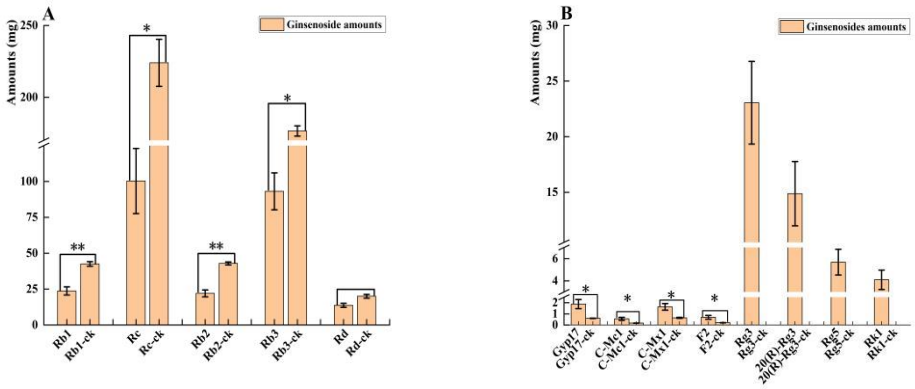

Figure S1. Statistical analysis results of transformation products of PNF saponins by *T. flavus*. (A) and (B): Statistical analysis results of major and minor ginsenosides in the transformation products of PNF saponins, -ck, substrate control, Significance analysis was performed by T test (*, P<0.05, **, P<0.01).

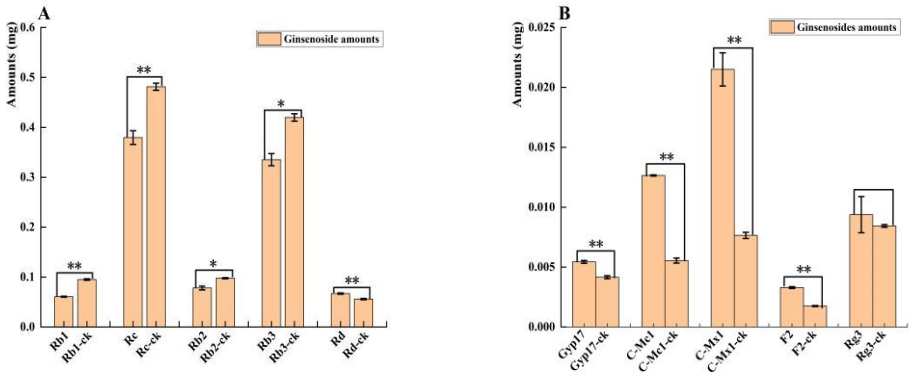

Figure S2. Statistical analysis results of transformation products of PNF saponins by extracellular crude enzymes; (A): Statistical analysis of main saponins in PNF; (B): Statistical analysis of minor saponins in PNF; -ck, substrate control; Significance analysis was performed by T test (*, $P<0.05$, **, $P<0.01$).

Table S3. Comparison of ginsenoside transformation levels in related literature

Comparative items	Substrates average transformation rate (%)						Products average production level (mg/g)					Notes
FI s (e, c, v, t) y	**Rg_1**	**Re**	**Rb_1**	**Rb_2**	**Rc**	**Rd**	**F_2**	**Rg_3**	**Rk_1**	**Rg_5**	**C-K**	**Other products types**
C. s (RGE, 333.3 g/L, 5 L, 7 d) 2011[28]	36.5	93.16	14.37	12.33	16.04	26.54	——	28.86	42.12	84.46	——	Rh_1, (*S*)-Rg_2, (R)-Rg_2
C. m (RGE, 333.3 g/L, 5 L, 7 d) 2011[28]	——	14.37	——	——	——	——	——	42.94	72.58	121.38	——	Rh_1, (*S*)-Rg_2, (R)-Rg_2
P. l (RGE, 333.3 g/L, 5 L, 7 d) 2011[28]	——	26.51	——	——	——	——	——	54.64	144.88	176.31	——	Rh_1, (*S*)-Rg_2, (R)-Rg_2
T. fu (RGE, 333.3 g/L, 5 L, 7 d) 2011[28]	22.91	35.53	35.16	32.94	36.48	48.02	——	21.09	9.53	47.48	——	Rh_1, (*S*)-Rg_2, (R)-Rg_2
I. o-36(RGE, 333.3 g/L, 5 L, 7 d) 2011[28]	17.44	33.44	32.48	30.61	34.00	45.17	——	23.88	19.89	61.93	——	Rh_1, (*S*)-Rg_2, (R)-Rg_2
I. o-47(RGE, 333.3 g/L, 5 L, 7 d) 2011[28]	——	30.02	22.72	19.22	23.32	36.69	——	29.03	65.22	89.20	——	Rh_1, (*S*)-Rg_2, (R)-Rg_2
G. f (RGE, 333.3 g/L, 5 L, 7 d) 2011[28]	30.42	38.34	0.45	——	1.36	——	——	43.17	72.34	124.55	——	Rh_1, (*S*)-Rg_2, (R)-Rg_2
L.e (RGE, 333.3 g/L, 5 L, 7 d) 2011[28]	44.18	40.62	37.09	34.25	37.42	49.73	——	22.09	31.60	61.77	——	Rh_1, (*S*)-Rg_2, (R)-Rg_2
S.ce (RGE, 30 g/L, —, 20 d) 2011[29]	28.18	66.11	100	100	100	——	——	——	——	——	——	——
S.ca (RGE, 30 g/L, —, 20 d) 2011[29]	35.08	56.01	100	100	100	——	——	——	——	——	——	——
P.sp. (GARE, 0.5 g/L, 1 L, 9 d) 2017[30]	74.29	——	47.06	——	——	100	——	——	——	——	506	——
R.o (GE, — g/L, — L, 14 d) 2020[31]	——	——	94.93	——	——	——	0.31	0.23	——	——	0.07	Rg_2, Rh_1, F_1
S.h (GE, 80 g/L, 0.5 L, 10 d) 2021[32]	100	——	100	70.87	82.21	40.51	——	——	——	——	29.13	APPT
T. fa (NRE, 0.18 g/L, 5 L, 21 d) this study	37.8	——	32.55	——	——	47.48	0.15	7.02	0.93	1.3	——	Gyp-XVII, Rk_3, Rh_4
Ranking in the same item	**(4/10)**		**(9/13)**			**(4/8)**	**(3/3)**	**(10/11)**	**(10/10)**	**(10/10)**		
T. fa (NFE, 0.14 g/L, 5 L, 21 d) this study	——	——	44.16	48.63	55.22	——	0.68	53.28	5.75	7.98	——	Gyp-XVII, C-Mc_1,
Ranking in the same item			**(6/13)**	**(4/9)**	**(4/10)**		**(2/3)**	**(2/11)**	**(9/10)**	**(9/10)**		C-Mx_1

FI, s (e, c, v, t) y: FI, Fermentation information; s, strains: *C.s*, *Cordyceps sisnensis*; *C.m*, *Cordyceps militaris*; *P.l*, *Phelllinus linteus*; *T.fu*, *Tremella fuciformis*; *I.o*-36, *Inonotus obliquus* 26136; *Io*-47, *Inonotus obliquus* 26147; *Gf*, *Grifola frondosa*; *Le*, *Lentus edodes*; *S.ce*, *Saccharomyces cerevisiae*; *S.ca*, *Saccharomyces carlsbergensis*; *P.sp.* , *Penicillium sp.* ; *R.o*, *Rhizopus oligosporus*; *S.h*, *Stereum hirsutum*; *T.fa*, *T. flavus*; e, extracts: RGE, red ginseng extracts; GE, ginseng extracts; NRE, notoginseng root extracts; NFE, notoginseng flower extracts; c,concentration; v, volume; t, time; y, year