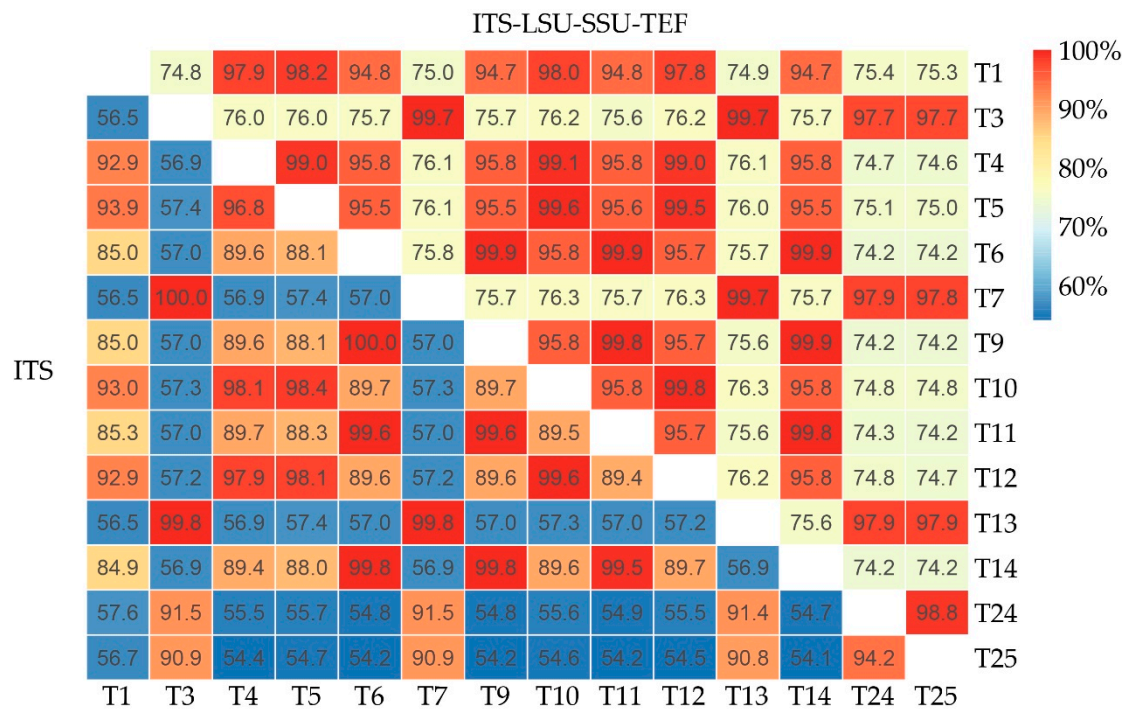
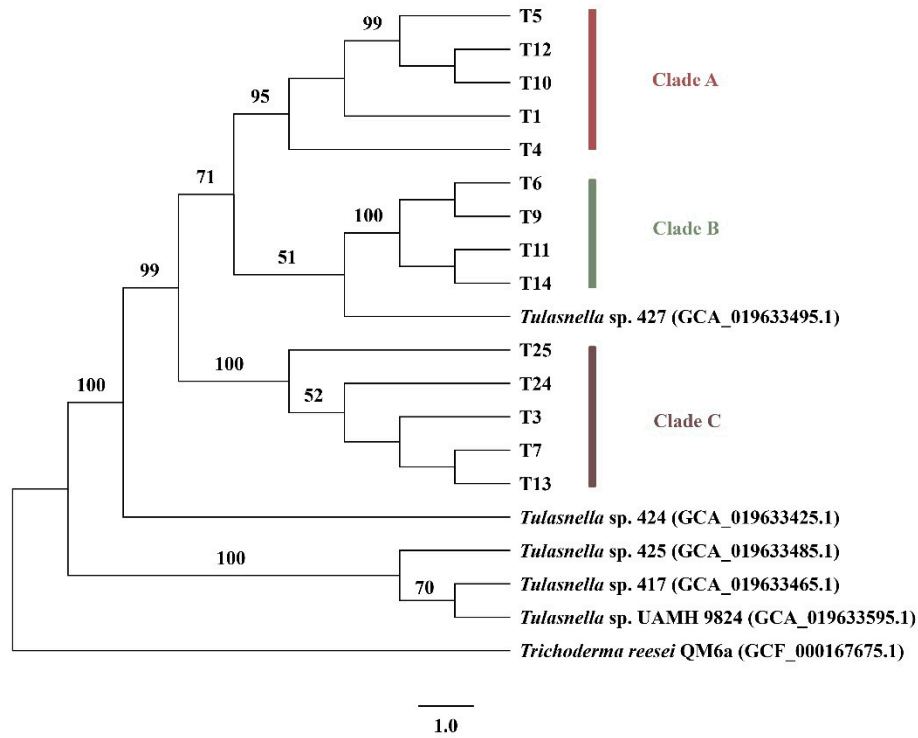


# Correlations between the phylogenetic relationship of 14 *Tulasnella* strains and their promotion effect on *Dendrobium crepidatum* protocorm

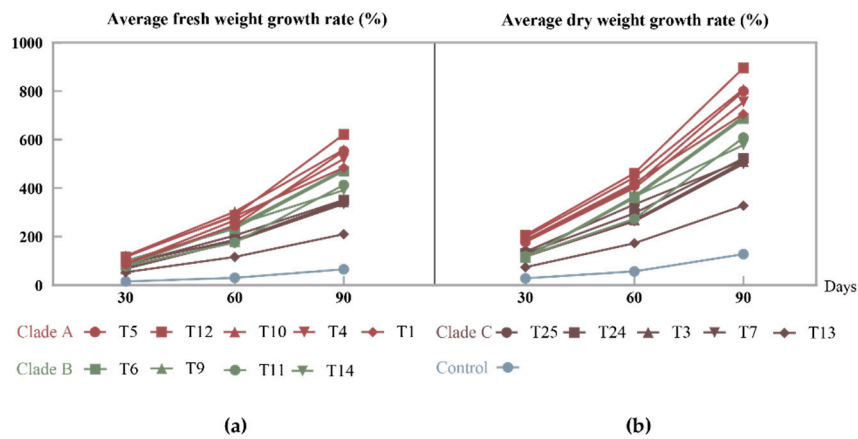
Jiayi Zhao, Zhenjian Li, Siyu Wang, Fu Yang, Lubin Li, Lei Liu\*



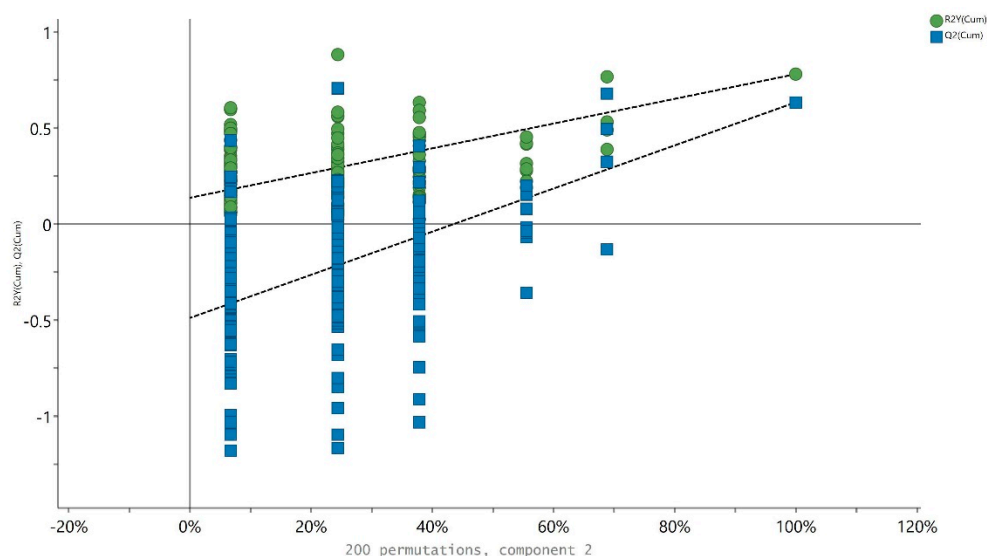
**Figure S1.** Sequence consistency across different strains. The ITS sequence identity (%) (lower left) and ITS-LSU-SSU-TEF combined sequences identity (%) (upper right)



**Figure S2.** Maximum likelihood trees of ITS-LSU-SSU-TEF concatenated sequences of *Tulasnella* sp. The genome sequences of *Trichoderma reesei* was used as an outgroup. Only bootstrap values (based on 1000 replications)  $\geq 50$  is shown. Scale, 1.0 nt substitutions per site.



**Figure S3.** Average fresh weight growth rate and dry weight growth rate of symbionts on Days 30, 60 and 90 of symbiosis. (a) Variation trend of average fresh weight growth rate on the 30, 60 and 90th days of symbiosis. (b) Variation trend of average dry weight growth rate on the 30, 60 and 90th days of symbiosis.



**Figure S4.** 200 permutation tests of the OPLS-DA model.

**Table S1.** Primer sequence

Gene name	Primer name	5'-3'
small ribosomal subunit	SSU- Forward	CGCGGTAATTCCAGCTCCACGA
small ribosomal subunit	SSU- Reverse	GGGCGGTGTGTACAAAGGGCA
translation elongation factor 1 $\alpha$	TEF- Forward	CACGCCCTTCTTGCCTTCACC
translation elongation factor 1 $\alpha$	TEF- Reverse	TGTCACGGACGGCGAAACGAC

**Table S2** Blast results of mycorrhizal fungi ITS sequences in the GenBank database

Isolate No.	Blast result of ITS sequence	Accession No.	Similarity (%)	Coverage (%)
T1	<i>Tulasnella</i> sp. clone DP4	MK239045.1	99	100
T3	Uncultured <i>Tulasnella</i> clone 5-12-6	HM230648.1	99.84	99
T4	<i>Tulasnella calospora</i> isolate Pv-PC-1-1	GU166421.1	99.2	99
T5	<i>Tulasnella calospora</i> strain TG1	MN607233.1	99.35	99
T6	<i>Tulasnella calospora</i> isolate Chunxin-25 CG15X3	EF393631	99	99.52
T7	Uncultured <i>Tulasnella</i> clone 5-12-6	HM230648.1	99.84	99
T9	<i>Tulasnella calospora</i> isolate Chunxin-25 CG15X3	EF393631	99	99.52

T10	Uncultured <i>Tulasnella</i> clone 9tu-9	HM230649.1	99.05	99
T11	<i>Tulasnella calospora</i> isolate Chunxin-25 CG15X3	EF393631.1	99.68	99
T12	Uncultured <i>Tulasnella</i> clone 9tu-9	HM230649.1	99.21	99
T13	Uncultured <i>Tulasnella</i> clone 5-12-6	HM230648.1	99.67	99
T14	<i>Tulasnella calospora</i> isolate Chunxin-25 CG15X3	EF393631	99	99.52
T24	Uncultured <i>Tulasnella</i> clone 5-12-6	HM230648.1	98.08	97
T25	Uncultured <i>Tulasnella</i> clone 5-12-6	HM230648.1	96.89	97

**Table S3.** The average fresh weight growth rate of protocorms on Days 30, 60 and 90 of symbiosis.

Isolate	30 days	60 days	90 days
T1	120.67±5.03% <sup>a</sup>	285.02±13.53% <sup>b</sup>	484.55±9.52% <sup>d</sup>
T3	67.02±5.01% <sup>d</sup>	180.67±9.02% <sup>f</sup>	342.72±19.07% <sup>f</sup>
T4	88.33±7.10% <sup>c</sup>	267.02±11.53% <sup>c</sup>	520.44±19.54% <sup>c</sup>
T5	88.67±8.08% <sup>c</sup>	246.01±8.54% <sup>d</sup>	552.94±19.26% <sup>bc</sup>
T6	101.02±4.58% <sup>b</sup>	233.02±9.54% <sup>d</sup>	470.82±22.17% <sup>d</sup>
T7	71.01±5.02% <sup>d</sup>	181.67±10.41% <sup>f</sup>	335.38±23.37% <sup>f</sup>
T9	81.67±5.51% <sup>cd</sup>	242.01±10.02% <sup>d</sup>	478.03±20.82% <sup>d</sup>
T10	120.67±8.51% <sup>a</sup>	303.03±8.54% <sup>a</sup>	559.07±19.35% <sup>b</sup>
T11	78.67±5.03% <sup>cd</sup>	176.01±10.54% <sup>f</sup>	413.60±20.60% <sup>e</sup>
T12	116.67±7.02% <sup>a</sup>	288.02±7.55% <sup>ab</sup>	622.16±19.06% <sup>a</sup>
T13	54.01±4.58% <sup>e</sup>	116.33±8.08% <sup>g</sup>	210.28±18.78% <sup>g</sup>
T14	79.67±4.93% <sup>cd</sup>	247.67±11.72% <sup>cd</sup>	392.08±17.79% <sup>e</sup>
T24	83.67±9.61% <sup>c</sup>	205.01±8.02% <sup>e</sup>	351.85±20.34% <sup>f</sup>
T25	88.33±8.02% <sup>c</sup>	187.02±8.54% <sup>f</sup>	345.79±17.44% <sup>f</sup>
Control	15.33±5.51% <sup>f</sup>	30.67±5.03% <sup>h</sup>	65.26±28.74% <sup>h</sup>

**Table S4.** Average dry weight growth rate of protocorms on Days 30, 60 and 90 of symbiosis.

Isolate	30 days	60 days	90 days
T1	186.67±8.08% <sup>b</sup>	421.02±9.64% <sup>b</sup>	705.70±13.11% <sup>d</sup>
T3	117.67±5.86% <sup>cd</sup>	268.67±12.90% <sup>f</sup>	510.21±26.28% <sup>f</sup>
T4	177.33±11.59% <sup>b</sup>	401.02±16.09% <sup>b</sup>	755.16±26.93% <sup>c</sup>
T5	179.01±12.12% <sup>b</sup>	411.03±14.73% <sup>b</sup>	799.96±26.55% <sup>bc</sup>
T6	114.33±12.58% <sup>cd</sup>	360.01±14.80% <sup>c</sup>	686.77±30.55% <sup>d</sup>
T7	119.01±8.02% <sup>cd</sup>	263.67±13.01% <sup>f</sup>	500.09±32.21% <sup>f</sup>

T9	115.67±11.68% <sup>cd</sup>	368.02±10.58% <sup>c</sup>	696.72±28.68% <sup>d</sup>
T10	198.00±11.53% <sup>ab</sup>	445.01±12.53% <sup>a</sup>	808.41±26.67% <sup>b</sup>
T11	119.67±10.69% <sup>d</sup>	273.03±12.49% <sup>f</sup>	607.91±28.39% <sup>e</sup>
T12	206.00±10.15% <sup>a</sup>	462.67±13.32% <sup>a</sup>	895.37±26.27% <sup>a</sup>
T13	74.33±8.62% <sup>e</sup>	173.02±11.53% <sup>g</sup>	327.67±25.88% <sup>g</sup>
T14	115.01±10.54% <sup>cd</sup>	365.67±10.50% <sup>c</sup>	578.25±24.52% <sup>e</sup>
T24	130.02±11.14% <sup>cd</sup>	297.00±15.40% <sup>e</sup>	522.80±28.03% <sup>f</sup>
T25	137.33±4.73% <sup>c</sup>	332.67±14.57% <sup>d</sup>	514.44±24.03% <sup>f</sup>
Control	28.33±4.73% <sup>f</sup>	57.01±7.94% <sup>h</sup>	127.79±39.62% <sup>h</sup>

---

**Table S5.** Average growth parameters of protocorms on Day 90 of symbiosis.

Isolate	Average plant height (mm)	Average stem diameter (mm)	Average root length (mm)	Average root number	Relative leaf area (mm <sup>2</sup> )	Average leaf number
T1	7.87±0.32 <sup>b</sup>	2.13±0.19 <sup>b</sup>	9.10±0.76 <sup>c</sup>	1.78±0.19 <sup>bc</sup>	4.72±0.43 <sup>bc</sup>	4.00±0.00 <sup>bc</sup>
T3	6.47±0.35 <sup>d</sup>	1.90±0.09 <sup>c</sup>	3.20±0.49 <sup>g</sup>	1.22±0.19 <sup>d</sup>	2.33±0.27 <sup>ef</sup>	3.67±0.33 <sup>cd</sup>
T4	7.96±0.39 <sup>b</sup>	2.26±0.04 <sup>ab</sup>	9.41±0.37 <sup>c</sup>	1.89±0.19 <sup>b</sup>	5.37±0.49 <sup>b</sup>	4.00±0.00 <sup>bc</sup>
T5	8.50±0.27 <sup>a</sup>	2.35±0.05 <sup>ab</sup>	8.97±0.67 <sup>c</sup>	1.56±0.19 <sup>c</sup>	4.47±0.37 <sup>c</sup>	4.33±0.00 <sup>b</sup>
T6	7.13±0.15 <sup>c</sup>	2.09±0.17 <sup>bc</sup>	5.10±0.63 <sup>ef</sup>	1.22±0.19 <sup>d</sup>	4.21±0.23 <sup>cd</sup>	4.00±0.33 <sup>bc</sup>
T7	6.23±0.31 <sup>d</sup>	1.90±0.10 <sup>c</sup>	3.70±0.45 <sup>g</sup>	1.22±0.19 <sup>d</sup>	2.00±0.35 <sup>f</sup>	3.67±0.00 <sup>cd</sup>
T9	7.12±0.29 <sup>c</sup>	2.01±0.12 <sup>bc</sup>	5.72±0.51 <sup>e</sup>	1.44±0.19 <sup>cd</sup>	4.40±0.27 <sup>c</sup>	4.00±0.00 <sup>bc</sup>
T10	8.52±0.37 <sup>a</sup>	2.35±0.11 <sup>ab</sup>	11.34±0.72 <sup>b</sup>	2.11±0.19 <sup>ab</sup>	7.48±0.74 <sup>a</sup>	4.67±0.33 <sup>ab</sup>
T11	7.81±0.27 <sup>b</sup>	2.11±0.09 <sup>bc</sup>	5.19±0.65 <sup>ef</sup>	1.22±0.19 <sup>d</sup>	3.67±0.14 <sup>d</sup>	4.00±0.00 <sup>bc</sup>
T12	8.68±0.16 <sup>a</sup>	2.39±0.05 <sup>a</sup>	15.14±0.46 <sup>a</sup>	2.22±0.19 <sup>a</sup>	7.26±0.72 <sup>a</sup>	5.00±0.33 <sup>a</sup>
T13	5.55±0.37 <sup>e</sup>	1.89±0.04 <sup>e</sup>	2.97±0.28 <sup>g</sup>	0.89±0.19 <sup>e</sup>	2.45±0.16 <sup>f</sup>	3.33±0.33 <sup>d</sup>
T14	7.80±0.26 <sup>b</sup>	2.09±0.16 <sup>bc</sup>	7.16±0.73 <sup>d</sup>	1.44±0.19 <sup>cd</sup>	3.52±0.40 <sup>de</sup>	4.00±0.00 <sup>bc</sup>
T24	7.09±0.57 <sup>c</sup>	2.01±0.09 <sup>bc</sup>	4.07±0.42 <sup>fg</sup>	0.89±0.19 <sup>e</sup>	2.52±0.27 <sup>ef</sup>	3.89±0.38 <sup>c</sup>
T25	6.67±0.21 <sup>cd</sup>	2.00±0.11 <sup>bc</sup>	4.73±0.62 <sup>f</sup>	0.89±0.19 <sup>e</sup>	2.98±0.25 <sup>e</sup>	3.67±0.33 <sup>cd</sup>
Control	4.76±0.37 <sup>f</sup>	1.58±0.06 <sup>d</sup>	1.98±0.35 <sup>h</sup>	0.56±0.19 <sup>h</sup>	2.01±0.21 <sup>f</sup>	2.67±0.33 <sup>e</sup>