

ORIGINAL ARTICLE

The fungal strain and inoculation method mediate the endophytic activity of *Beauveria bassiana* and its impact on the growth of cucumber plants and the population of *Liriomyza sativae*

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SUPPLEMENTARY MATERIAL

The authors are fully responsible for both the content and the formal aspects of the supplementary material. No editorial adjustments were made.

Table S1. Temperature and relative humidity (RH) during the assessment of the effects of *Beauveria bassiana* application on biochemical and plant growth parameters of cucumber plants under greenhouse conditions

Exp.	Temperature [°C]				RH [%]			
	min		max		min		max	
	average	range	average	range	average	range	average	range
1	23.7	20.1–27.2	30.3	27.9–34.2	33.9	20–49	68.6	53–81
2	24.5	20.4–26.7	45.5	40.9–49.6	12.5	20–30	80.3	74–87

Data represent an average and range of 35 days information

Table S2. ANOVA parameters for main effects and associated interactions for the effects of *Beauveria bassiana* application (strains BS195 and BNE20) using different methods under greenhouse conditions on biochemical parameters and colonization of cucumber plants, 30 dpi (Tukey's HSD test after two-way ANOVA)

Source	Experiment 1						Experiment 2						
	treatment (df=2)		application method (df=1)		treatment application method (df=2)		treatment (df=2)		application method (df=1)		treatment application method (df=2)		
	F	P	F	P	F	P	F	P	F	P	F	P	
Biochemical parameters	Chl a	0.72	0.495	5.49	0.0277	0.18	0.84	0.06	0.94	1.42	0.25	0.46	0.64
	Chl b	3.48	0.0469	1.14	0.295	0.497	0.61	0.74	0.49	1.08	0.31	0.33	0.72
	Tot_ChI	2.21	0.13	4.69	0.04	0.02	0.98	0.32	0.73	1.84	0.19	0.5	0.61
	Car	0.198	0.82	4.83	0.0379	1.16	0.33	0.4	0.67	0.25	0.62	0.19	0.83
	SA	0.36	0.7	0.52	0.48	3.61	0.04	2.55	0.099	0.19	0.67	1.12	0.34
	TPC	7.03	0.004	0.23	0.64	1.22	0.31	9.67	0.0008	1.58	0.22	1.59	0.22
Colonization rate [%]	Stems	81.31	≤0.0001	86.91	≤0.0001	23.83	≤0.0001	14.48	0.0001	28.96	≤0.0001	7.71	0.0026
	Leaves	43.05	≤0.0001	31.74	≤0.0001	7.96	0.002	35.38	≤0.0001	64.18	≤0.0001	16.18	≤0.0001
	Roots	91.68	≤0.0001	273.79	≤0.0001	70.42	≤0.0001	36.91	≤0.0001	75.99	≤0.0001	20.63	≤0.0001

Chl a – chlorophyll a; Chl b – chlorophyll b; Tot_ChI – total chlorophyll; Car – carotenoid; TPC – total phenolic content; SA – salicylic acid

Table S3. ANOVA parameters for main effects and associated interactions for the effects of *Beauveria bassiana* application (strains BS195 and BNE20) using different methods under greenhouse conditions on growth parameters of cucumber, 36 dpi (Tukey's HSD test after two-way ANOVA)

Source	Experiment 1						Experiment 2					
	treatment (df=2)		application method (df=1)		treatment application method (df=2)		treatment (df=2)		application method (df=1)		treatment application method (df=2)	
	F	P	F	P	F	P	F	P	F	P	F	P
Plant height	7.88	0.0007	11.78	0.0009	0.76	0.469	1.199	0.31	1.1	0.297	3.1	0.05
Root length	5.04	0.0086	3.34	0.07	1.59	0.2105	3.15	0.048	1.64	0.2	0.46	0.63
Number of leaves	8.52	0.0004	2.09	0.1519	2.17	0.12	11.001	0.0001	34.62	≤0.0001	4.66	0.01
Number of flowers	1.94	0.15	5.899	0.017	0.83	0.44	0.28	0.76	0.64	0.43	0.09	0.92
Number of fruits	3.22	0.045	0.13	0.715	1.86	0.16	0.55	0.58	1.4	0.24	0.17	0.85
Fresh shoot weight	0.97	0.38	12.81	0.0006	3.03	0.05	3.82	0.0259	0.12	0.74	3.61	0.03

Table S3. ANOVA parameters for main effects and associated interactions for the effects of *Beauveria bassiana* application (strains BS195 and BNE20) using different methods under greenhouse conditions on growth parameters of cucumber, 36 dpi (Tukey's HSD test after two-way ANOVA) – continuation

Source	Experiment 1						Experiment 2					
	treatment (df = 2)		application method (df = 1)		treatment application method (df = 2)		treatment (df = 2)		application method (df = 1)		treatment application method (df = 2)	
	F	P	F	P	F	P	F	P	F	P	F	P
Dry shoot weight	8.38	0.0005	10.69	0.0016	1.13	0.33	3.15	0.048	0.28	0.599	2.08	0.13
DMC	23.62	≤0.0001	0.897	0.35	20.82	≤0.0001	5.09	0.008	6.63	0.12	7.02	0.0015
Fresh root weight	18.79	≤0.0001	0.003	0.96	0.99	0.38	0.83	0.44	0.14	0.71	2.12	0.13
Dry root weight	1.21	0.3	7.67	0.0069	0.73	0.49	0.54	0.59	0.83	0.37	1.82	0.17
Leaf area	0.05	0.95	3.91	0.05	6.497	0.002	3.97	0.02	21.63	≤0.0001	7.52	0.001
LAR	3.67	0.0296	2.26	0.14	1.02	0.37	0.86	0.43	21.01	≤0.0001	4.45	0.0145

DMC – the dry matter content; LAR – Leaf area ratio

Table S4. ANOVA parameters for main effects and associated interactions for the effects of *Beauveria bassiana* application (strains BS195 and BNE20) using different methods on plant colonization and *Liriomyza sativae* population 35 and 51 days post-insect-release (Tukey's HSD test after two-way ANOVA)

Source	Treatment (BS195, BNE20, and control)			Application method (rs, fs1, and fs2)			Treatment application method		
	df	F	P	df	F	P	df	F	P
Leaf colonization	2	7.42	0.002	2	9.45	0.0005	4	2.52	0.0578
Stem colonization	2	12.18	≤0.0001	2	15.59	≤0.0001	4	4.34	0.0057
Root colonization	2	7.69	0.0017	2	22.46	≤0.0001	4	6.31	0.0006
35 days after insect release									
Incidence	2	3.36	0.0395	2	1.18	0.31	4	0.23	0.92
Infestation	2	29.47	≤0.0001	2	4.97	0.009	4	2.92	0.026
Severity	2	36.73	≤0.0001	2	2.78	0.068	4	3.62	0.009
Number of pupa	2	134.098	≤0.0001	2	5.7	0.0048	4	9.84	≤0.0001
Adult emergence	2	11.87	≤0.0001	2	14.75	≤0.0001	4	5.25	0.0008
51 days after insect release									
Incidence	2	3.52	0.03	2	0.14	0.869	4	0.98	0.42
Infestation	2	37.67	≤0.0001	2	86.34	≤0.0001	4	35.98	≤0.0001
Severity	2	20.53	≤0.0001	2	4.04	0.02	4	3.13	0.019
Number of pupae	2	87.03	≤0.0001	2	6.004	0.0037	4	1.99	0.104
Adult emergence	2	69.07	≤0.0001	2	6.23	0.003	4	2.08	0.09