

ORIGINAL ARTICLE

Plant growth promotion of crops using phosphate solubilizing bacterial strains derived from insects

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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.

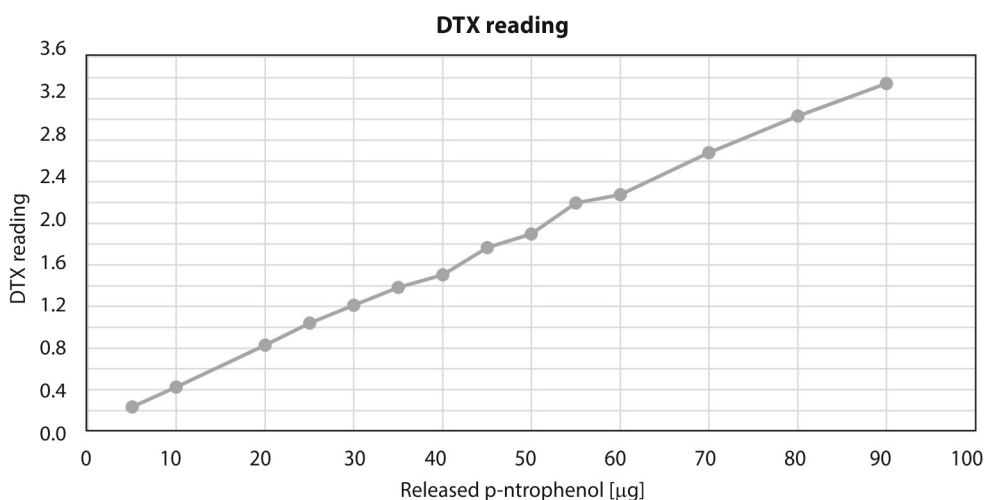


Fig. S1. Standard curve for determination of phosphatase activity

Table S1. The ability of tested bacteria to solubilize phosphorus on Pikovskaya medium before glycerol preservation in -80°C . Calculated PSI based on diameter of the bacterial colony growth and the halo. Given values of diameters are the average of eight replicates

No.	Isolate	ø halo zone [mm]	ø bacterial colony [mm]	Phosphate solubilizing index	Bacteria source	No.	Isolate	ø halo zone [mm]	ø bacterial colony [mm]	Phosphate solubilizing index	Bacteria source
1	Hi001	7.5	4.5	2.66	<i>H. illucens</i>	30	Dv021c	0	6.5	1	<i>D. virgifera</i>
2	Hi002	10	6.5	2.53	<i>H. illucens</i>	31	Dv022	14.5	12.5	2.16	<i>D. virgifera</i>
3	Hi003	7.5	5.5	2.36	<i>H. illucens</i>	32	Dv023	12	10.5	2.14	<i>D. virgifera</i>
4	Hi004	0	6.5	1	<i>H. illucens</i>	33	Dv024a	11.5	9.5	2.21	<i>D. virgifera</i>
5	Hi007	9.5	6.5	2.46	<i>H. illucens</i>	34	Dv024b	11.5	10	2.15	<i>D. virgifera</i>
6	Hi005	6.5	5	2.3	<i>H. illucens</i>	35	Dv025	12.5	12.5	2	<i>D. virgifera</i>
7	Hi006	6	4.5	2.33	<i>H. illucens</i>	36	Dv025a	12.5	11	2.13	<i>D. virgifera</i>
8	Hi008	7.5	6	2.25	<i>H. illucens</i>	37	Dv025b-1	0	9.5	1	<i>D. virgifera</i>
9	Hi009	6	5	2.2	<i>H. illucens</i>	38	Dv025b-2	11	8	2.37	<i>D. virgifera</i>
10	Hi010	6	4.5	2.33	<i>H. illucens</i>	39	Dv026A	13.5	13.5	2	<i>D. virgifera</i>
11	Hi011	14.5	14.5	2	<i>H. illucens</i>	40	Dv026B	11	8.5	2.29	<i>D. virgifera</i>
12	Hi012	6	4	2.5	<i>H. illucens</i>	41	Dv027	13.5	13.5	2	<i>D. virgifera</i>
13	Hi013	8	6.5	2.23	<i>H. illucens</i>	42	Dv029	13.5	13.5	2	<i>D. virgifera</i>
14	Hi014	11	9	2.22	<i>H. illucens</i>	43	Dv030b	13.5	13.5	2	<i>D. virgifera</i>
15	Hi015	7.5	5.5	2.36	<i>H. illucens</i>	44	Dv032b	12.5	6	3.08	<i>D. virgifera</i>
16	Hi016	7.5	6.5	2.15	<i>H. illucens</i>	45	Dv033	14	6	3.33	<i>D. virgifera</i>
17	Hi017	0	4.5	1	<i>H. illucens</i>	46	Dv034	10.5	10	2.05	<i>D. virgifera</i>
18	Hi018	7.5	6	2.25	<i>H. illucens</i>	47	Dv035	11	11	2	<i>D. virgifera</i>
19	Hi019	8	6.5	2.23	<i>H. illucens</i>	48	Dv036	11	11	2	<i>D. virgifera</i>
20	Hi020	0	8.5	1	<i>H. illucens</i>	49	Dv037	18	18	2	<i>D. virgifera</i>
21	Hi021	0	7	1	<i>H. illucens</i>	50	Dv038	9.5	3.5	3.71	<i>D. virgifera</i>
22	Hi022	6	3	3	<i>H. illucens</i>	51	Dv039	12	5	3.4	<i>D. virgifera</i>
23	Hi023	7	6	2.16	<i>H. illucens</i>	52	Dv040	0	8.5	1	<i>D. virgifera</i>
24	Dv004	12	10	2.2	<i>D. virgifera</i>	53	Dv041	0	8.5	1	<i>D. virgifera</i>
25	Dv006b	12	10	2.2	<i>D. virgifera</i>	54	Dv042	10.5	10.5	2	<i>D. virgifera</i>
26	Dv006c	15	13	2.15	<i>D. virgifera</i>	55	Dv043	16	6	3.66	<i>D. virgifera</i>
27	Dv012	12.5	4	4.12	<i>D. virgifera</i>	56	Dv044	10	10	2	<i>D. virgifera</i>
28	Dv016	13	9	2.44	<i>D. virgifera</i>	57	Dv045b	16.5	14.5	2.13	<i>D. virgifera</i>
29	Dv021b	12.5	12.5	2	<i>D. virgifera</i>	58	Dv048	15	11.5	2.3	<i>D. virgifera</i>

Table S1. The ability of tested bacteria to solubilize phosphorus on Pikovskaya medium before glycerol preservation in -80°C . Calculated PSI based on diameter of the bacterial colony growth and the halo. Given values of diameters are the average of eight replicates – continuation

No.	Isolate	\varnothing halo zone [mm]	\varnothing bacterial colony [mm]	Phosphate solubilizing index	Bacteria source	No.	Isolate	\varnothing halo zone [mm]	\varnothing bacterial colony [mm]	Phosphate solubilizing index	Bacteria source
59	Dv049	13.5	10	2.35	<i>D. virgifera</i>	104	Dv138a	18.5	7	3.64	<i>D. virgifera</i>
60	Dv049a	0	13.5	1	<i>D. virgifera</i>	105	Dv139a	17.5	10	2.75	<i>D. virgifera</i>
61	Dv050	16.5	16.5	2	<i>D. virgifera</i>	106	Dv140	12.5	10.5	2.19	<i>D. virgifera</i>
62	Dv056b	0	8	1	<i>D. virgifera</i>	107	Dv141	13	10.5	2.23	<i>D. virgifera</i>
63	Dv058	11.5	4	3.87	<i>D. virgifera</i>	108	OM002	11	9	2.22	<i>O. melanopus</i>
64	Dv060	0	8.5	1	<i>D. virgifera</i>	109	OM006A	14	12.5	2.12	<i>O. melanopus</i>
65	Dv061	17	7.5	3.26	<i>D. virgifera</i>	110	OM006B	14.5	13	2.11	<i>O. melanopus</i>
66	Dv063a	0	19.5	1	<i>D. virgifera</i>	111	OM011	14	11	2.27	<i>O. melanopus</i>
67	Dv068	21	20	2.05	<i>D. virgifera</i>	112	OM012	12	10.5	2.14	<i>O. melanopus</i>
68	Dv069	20.5	20.5	2	<i>D. virgifera</i>	113	OM016	14.5	9.5	2.52	<i>O. melanopus</i>
69	Dv070	14	12.5	2.12	<i>D. virgifera</i>	114	OM018	14.5	13	2.11	<i>O. melanopus</i>
70	Dv071	14	14	2	<i>D. virgifera</i>	115	OM019	15	13	2.15	<i>O. melanopus</i>
71	Dv072	14.5	12.5	2.16	<i>D. virgifera</i>	116	OM023	13.5	12.5	2.08	<i>O. melanopus</i>
72	Dv073	14.5	12.5	2.16	<i>D. virgifera</i>	117	On024	12.5	10.5	2.19	<i>O. nubilalis</i>
73	Dv092	0	12.5	1	<i>D. virgifera</i>	118	On026	13	11	2.18	<i>O. nubilalis</i>
74	Dv096	10	5	3	<i>D. virgifera</i>	119	On027	10	8	2.25	<i>O. nubilalis</i>
75	Dv097	11	4.5	4.33	<i>D. virgifera</i>	120	On030	0	3.5	1	<i>O. nubilalis</i>
76	Dv101	10	3	3.44	<i>D. virgifera</i>	121	On034	9.5	8	2.18	<i>O. nubilalis</i>
77	Dv102	9	4	3.25	<i>D. virgifera</i>	122	On037	14	12	2.16	<i>O. nubilalis</i>
78	Dv107	10	4.5	3.22	<i>D. virgifera</i>	123	Om001	12	3	5	<i>O. nubilalis</i>
79	Dv107a	8	3.5	3.28	<i>D. virgifera</i>	124	Om002	10	5	3	<i>O. melanopus</i>
80	Dv107b	13.5	11	2.22	<i>D. virgifera</i>	125	Om003	18	7	3.57	<i>O. melanopus</i>
81	Dv109	12.5	10	2.25	<i>D. virgifera</i>	126	Om004	15	8	2.87	<i>O. melanopus</i>
82	Dv111	14	12.5	2.12	<i>D. virgifera</i>	127	Om005	11.5	7	2.64	<i>O. melanopus</i>
83	Dv111a	12.5	11.5	2.08	<i>D. virgifera</i>	128	Om006	9	7.5	2.2	<i>O. melanopus</i>
84	Dv111b	10.5	9.5	2.1	<i>D. virgifera</i>	129	Om007	10	6	2.66	<i>O. melanopus</i>
85	Dv111c	0	12	1	<i>D. virgifera</i>	130	Om008	0	20	1	<i>O. melanopus</i>
86	Dv112	13.5	6	3.25	<i>D. virgifera</i>	131	Om009	10.5	3.5	4	<i>O. melanopus</i>
87	Dv113	14	13	2.07	<i>D. virgifera</i>	132	Om011	12	4.5	3.66	<i>O. melanopus</i>
88	Dv116	12.5	11.5	2.08	<i>D. virgifera</i>	133	Om012	10.5	4.5	3.33	<i>O. melanopus</i>
89	Dv117	16	5.5	3.9	<i>D. virgifera</i>	134	Om013	10.5	3.5	4	<i>O. melanopus</i>
90	Dv119	12	11	2.09	<i>D. virgifera</i>	135	Om014	9.5	3.5	3.71	<i>O. melanopus</i>
91	Dv120	13	5	3.6	<i>D. virgifera</i>	136	Om015	10	3	4.33	<i>O. melanopus</i>
92	Dv123	14	3.5	5	<i>D. virgifera</i>	137	Om016	17	9	2.88	<i>O. melanopus</i>
93	Dv124	0	10	1	<i>D. virgifera</i>	138	Om017	10	7.5	2.33	<i>O. melanopus</i>
94	Dv125	12.5	4	4.12	<i>D. virgifera</i>	139	Om019	10	6.5	2.53	<i>O. melanopus</i>
95	Dv126a	20.5	8.5	3.41	<i>D. virgifera</i>	140	Om020	9.5	6	2.58	<i>O. melanopus</i>
96	Dv126b	6.5	3	3.16	<i>D. virgifera</i>	141	Om021	11.5	6	2.91	<i>O. melanopus</i>
97	Dv127	0	13	1	<i>D. virgifera</i>	142	Om022	11	4.5	3.44	<i>O. melanopus</i>
98	Dv128	0	7	1	<i>D. virgifera</i>	143	Om024	16.5	10.5	2.57	<i>O. melanopus</i>
99	Dv129	5	5.5	1.9	<i>D. virgifera</i>	144	Om025	17.5	6.5	3.69	<i>O. melanopus</i>
100	Dv132	9.5	7.5	2.26	<i>D. virgifera</i>	145	Om026	11	4.5	3.44	<i>O. melanopus</i>
101	Dv133a	6	2.5	3.4	<i>D. virgifera</i>	146	Om027	0	12	1	<i>O. melanopus</i>
102	Dv135a	24.5	8.5	3.88	<i>D. virgifera</i>	147	Om028	10.5	8	2.31	<i>O. melanopus</i>
103	Dv137	23.5	9.5	3.47	<i>D. virgifera</i>	148	Om029	10	3	4.33	<i>O. melanopus</i>

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No.	Isolate	ø halo zone [mm]	ø bacterial colony [mm]	Phosphate solubilizing index	Bacteria source	No.	Isolate	ø halo zone [mm]	ø bacterial colony [mm]	Phosphate solubilizing index	Bacteria source
149	Om030	11	3	4.66	<i>O. melanopus</i>	161	Om042	8.5	5	2.7	<i>O. melanopus</i>
150	Om031	15	4	4.75	<i>O. melanopus</i>	162	Om043	11	4.5	3.44	<i>O. melanopus</i>
151	Om032	11	4.5	3.44	<i>O. melanopus</i>	163	Om044	9.5	5.5	2.72	<i>O. melanopus</i>
152	Om033	10.5	5.5	2.9	<i>O. melanopus</i>	164	Om045	12.5	4.5	3.77	<i>O. melanopus</i>
153	Om034	9	4	3.25	<i>O. melanopus</i>	165	Om046	11	3	4.66	<i>O. melanopus</i>
154	Om035	13	4.5	3.88	<i>O. melanopus</i>	166	14	13.5	11.5	1.85	<i>O. melanopus</i>
155	Om036	10.5	5.5	2.9	<i>O. melanopus</i>	167	27	13.5	6.5	1.48	<i>O. melanopus</i>
156	Om037	10	6	2.66	<i>O. melanopus</i>	168	67	12	8	1.66	<i>O. melanopus</i>
157	Om038	15.5	4.5	4.44	<i>O. melanopus</i>	169	90	9.5	4	3.8	<i>O. melanopus</i>
158	Om039	11.5	6.5	2.76	<i>O. melanopus</i>	170	96	9.5	4	3.8	<i>O. melanopus</i>
159	Om040	11	5	3.2	<i>O. melanopus</i>	171	106	5.5	4	1.72	<i>O. melanopus</i>
160	Om041	15.5	6.5	3.38	<i>O. melanopus</i>						

Table S2. Measurement of the color intensity of p-nitrophenol (p-NP) at 400 nm used for the purpose of determination of the standard curve of phosphatase activity

Released Phenol approximate value [μg]	DTX reading
5	0.235
10	0.423
20	0.829
25	1.039
30	1.212
35	1.384
40	1.505
45	1.769
50	1.898
55	2.197
60	2.275
70	2.681
80	3.034
90	3.344
100	overflow
200	overflow
2000	overflow