

Functional genetic diversity and plant growth promoting potential of polyphosphate accumulating bacteria in soil

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Running title: Diversity of phosphate accumulating bacteria in soil

Supplementary Table 1. Sampling site and GenBank accession number of phosphate accumulating bacteria

S.N.	Strains	Sampling Location	Identification	Accession number			
				<i>16S rRNA</i>	<i>rpoB</i>	<i>ppk</i>	<i>ppx</i>
1	SS NBRI 1	Deokhera, India	<i>Pseudomonas</i> sp.	MT629836	MT947903	MT947952	MT948001
2	SS NBRI 2		<i>Pseudomonas</i> sp.	MT629837	MT947904	MT947953	MT948002
3	SS NBRI 3	Deokhera, India	<i>Pseudomonas koreensis</i>	MT629838	MT947905	MT947954	MT948003
4	SS NBRI 4	Deokhera, India	<i>Pseudomonas koreensis</i>	MT629839	MT947906	MT947955	MT948004
5	SS NBRI 5	Deokhera, India	<i>Pseudomonas</i> sp.	MT629840	MT947907	MT947956	MT948005
6	SS NBRI 6	Deokhera, India	<i>Pseudomonas</i> sp.	MT629841	MT947908	MT947957	MT948006
7	SS NBRI 7	Deokhera, India	<i>Pseudomonas</i> sp.	MT629842	MT947909	MT947958	MT948007
8	SS NBRI 8	Deokhera, India	<i>Pseudomonas koreensis</i>	MT629843	MT947910	MT947959	MT948008
9	SS NBRI 9	Deokhera, India	<i>Pseudomonas</i> sp.	MT629844	MT947911	MT947960	MT948009
10	SS NBRI 10	Deokhera, India	<i>Pseudomonas</i> sp.	MT629845	MT947912	MT947961	MT948010
11	SS NBRI 11	Deokhera, India	<i>Pseudomonas</i> sp.	MT629846	MT947913	MT947962	MT948011
12	SS NBRI 12	Deokhera, India	<i>Pseudomonas koreensis</i>	MT629847	MT947914	MT947963	MT948012
13	SS NBRI 13	Deokhera, India	<i>Pseudomonas</i> sp.	MT629848	MT947915	MT947964	MT948013
14	SS NBRI 14	Deokhera, India	<i>Pseudomonas koreensis</i>	MT629849	MT947916	MT947965	MT948014
15	SS NBRI 15	Deokhera, India	<i>Pseudomonas</i> sp.	MT629850	MT947917	MT947966	MT948015
16	SS NBRI 16	Deokhera, India	<i>Pseudomonas koreensis</i>	MT629851	MT947918	MT947967	MT948016

17	SS NBRI 17		<i>Pseudomonas koreensis</i>	MT629852	MT947919	MT947968	MT948017
18	SS NBRI 18	Deokhera, India	<i>Pseudomonas</i> sp.	MT629853	MT947920	MT947969	MT948018
19	SS NBRI 19	Deokhera, India	<i>Pseudomonas koreensis</i>	MT629854	MT947921	MT947970	MT948019
20	SS NBRI 20	Gujarat, India	<i>Pseudomonas stutzeri</i>	MT629855	MT947922	MT947971	MT948020
21	SS NBRI 22	Gujarat, India	<i>Pseudomonas stutzeri</i>	MT629856	MT947923	MT947972	MT948021
22	SS NBRI 23	Punjab, India	<i>Pseudomonas alcaliphila</i>	MT629857	MT947924	MT947973	MT948022
23	SS NBRI 24	Punjab, India	<i>Pseudomonas mendocina</i>	MT629858	MT947925	MT947974	MT948023
24	SS NBRI 25	Punjab, India	<i>Pseudomonas alcaliphila</i>	MT629859	MT947926	MT947975	MT948024
25	SS NBRI 26	Punjab, India	<i>Pseudomonas</i> sp.	MT629860	MT947927	MT947976	MT948025
26	SS NBRI 27	Punjab, India	<i>Pseudomonas stutzeri</i>	MT629861	MT947928	MT947977	MT948026
27	SS NBRI 29	Punjab, India	<i>Pseudomonas alcaliphila</i>	MT629862	MT947929	MT947978	MT948027
28	SS NBRI 32	Punjab, India	<i>Pseudomonas</i> sp.	MT629863	MT947930	MT947979	MT948028
29	SS NBRI 33	Bulandshahr, India	<i>Pseudomonas alcaliphila</i>	MT629864	MT947931	MT947980	MT948029
30	SS NBRI 34	Bulandshahr, India	<i>Pseudomonas mendocina</i>	MT629865	MT947932	MT947981	MT948030
31	SS NBRI 35	Bulandshahr, India	<i>Pseudomonas alcaliphila</i>	MT629866	MT947933	MT947982	MT948031
32	SS NBRI 36	Bulandshahr, India	<i>Pseudomonas alcaliphila</i>	MT629867	MT947934	MT947983	MT948032
33	SS NBRI 37	Bulandshahr, India	<i>Pseudomonas mendocina</i>	MT629868	MT947935	MT947984	MT948033
34	SS NBRI 38	Bulandshahr, India	<i>Pseudomonas alcaliphila</i>	MT629869	MT947936	MT947985	MT948034
35	SS NBRI 39	Bulandshahr, India	<i>Pseudomonas mendocina</i>	MT629870	MT947937	MT947986	MT948035

36	SS NBRI 40	Bulandshahr, India	<i>Pseudomonas alcaliphila</i>	MT629871	MT947938	MT947987	MT948036
37	SS NBRI 41		<i>Pseudomonas alcaliphila</i>	MT629872	MT947939	MT947988	MT948037
38	SS NBRI 42	Bulandshahr, India	<i>Pseudomonas alcaliphila</i>	MT629873	MT947940	MT947989	MT948038
39	SS NBRI 43		<i>Pseudomonas alcaliphila</i>	MT629874	MT947941	MT947990	MT948039
40	SS NBRI 45	Bulandshahr, India	<i>Pseudomonas alcaliphila</i>	MT629875	MT947942	MT947991	MT948040
41	SS NBRI 47		<i>Pseudomonas mendocina</i>	MT629876	MT947943	MT947992	MT948041
42	SS NBRI 48	Bulandshahr, India	<i>Pseudomonas mendocina</i>	MT629877	MT947944	MT947993	MT948042
43	SS NBRI 49		<i>Pseudomonas</i> sp.	MT629878	MT947945	MT947994	MT948043
44	SS NBRI 50	Bulandshahr, India	<i>Pseudomonas mendocina</i>	MT629879	MT947946	MT947995	MT948044
45	SS NBRI 51		<i>Pseudomonas mendocina</i>	MT629880	MT947947	MT947996	MT948045
46	SS NBRI 52	Punjab, India	<i>Pseudomonas</i> sp.	MT629881	MT947948	MT947997	MT948046
47	SS NBRI 53		<i>Pseudomonas alcaliphila</i>	MT629882	MT947949	MT947998	MT948047
48	SS NBRI 54	Punjab, India	<i>Pseudomonas</i> sp.	MT629883	MT947950	MT947999	MT948048
49	SS NBRI 55		<i>Enterobacter cloacace</i>	MT629884	MT947951	MT948000	MT948049
50	NBRIRA	Shillong, India	<i>Pseudomonas putida</i>	MTCC5279	MT982439	MT982437	MT982438

Supplemenatry Table 2.

	Auxin production (µg/ml)	Phosphate solubilisation (µg/ml)	Siderophore Production (zone in cm)	Alkaline Phosphatase (µM of pNP produced)	Acidic Phosphatase (µM of pNP produced)	Biofilm production
NBRI RA	55.68±0.10	41.50±3.34	0±0.00	5.53±0.42	10.53±1.27	1.30±0.10
SS NBRI 1	39.55±1.11	22.00±0.09	0.4±0.002	4.30±0.47	7.71±0.26	0.94±0.06
SS NBRI 2	47.74±0.14	15.89±0.55	1.1±0.004	7.76±0.31	17.07±3.88	2.30±0.28
SS NBRI 3	50.33±0.14	11.53±0.42	0.5±0.01	1.91±0.42	8.77±0.37	1.95±0.08
SS NBRI 4	44.34±0.45	26.42±3.08	0±0.00	4.84±2.07	15.10±0.46	2.35±0.17
SS NBRI 5	49.56±0.14	17.77±0.03	0.7±0.002	1.06±0.42	6.86±.26	2.37±0.10
SS NBRI 7	43.43±0.66	15.21±1.04	0.7±0.002	25.69±3.14	5.16±0.15	2.05±0.12
SS NBRI 8	56.52±0.45	15.99±0.00	0.8±0.006	6.65±3.56	15.53±1.50	1.64±0.21
SS NBRI 9	48.19±0.03	10.36±0.09	1±0.00	9.25±3.93	6.75±1.75	1.53±0.62
SS NBRI 10	45.04±0.52	11.79±0.16	1±0.00	3.13±0.05	7.34±0.10	3.23±0.18
SS NBRI 11	46.69±0.91	13.42±0.87	0.6±0.001	2.23±0.10	7.44±0.00	1.22±0.06
SS NBRI 12	49.56±0.14	17.06±0.29	0.8±0.005	7.66±1.27	26.28±4.36	1.12±0.12
SS NBRI 13	52.92±0.35	17.58±4.97	0.7±0.003	0.15±0.05	6.43±0.37	0.85±0.09
SS NBRI 14	57.15±0.59	16.34±0.74	1±0.00	1.43±0.26	6.06±0.10	2.05±0.06
SS NBRI 15	45.81±0.45	2.27±0.19	0.7±0.003	4.46±0	5.69±0.69	2.20±0.18
SS NBRI 16	51.34±0.17	15.86±0.78	0.8±0.005	3.45±0.69	4.68±0.10	2.14±0.17

SS NBRI 17	51.38±0.14	12.64±0.09	0.9±0.001	1.91±0.63	19.57±2.02	1.26±0.09
SS NBRI 18	41.54±0.73	3.47±0.22	0.7±0.007	4.41±0.05	13.77±1.01	2.75±0.05
SS NBRI 19	59.92±0.98	17.42±0.39	0.5±0.003	8.45±0.37	46.70±1.17	1.63±0.19
SS NBRI 20	33.53±0.35	42.86±0.09	0.3±0.004	3.67±0.05	3.51±0.63	0.98±0.22
SS NBRI 22	30.87±0.21	4.06±0.03	0.3±0.004	3.08±0.10	4.46±0.10	1.10±0.21
SS NBRI 23	43.54±0.14	10.40±0.32	0±0.00	9.46±0.53	41.81±0.63	2.13±0.26
SS NBRI 24	52.18±0.38	3.41±0.290.	0±0.00	7.92±0.05	38.83±0.00	1.98±0.13
SS NBRI 25	38.88±0.38	2.66±0.39	0±0.00	4.52±0.05	21.12±0.15	1.38±0.11
SS NBRI 26	33.88±0.98	3.64±0.06	0±0.00	7.71±0.05	22.66±0.53	2.34±0.17
SS NBRI 27	43.54±0.14	4.68±0.19	0±0.00	6.96±0.26	20.16±0.79	1.99±0.29
SS NBRI 29	47.32±0.00	3.31±0.19	0.5±0.00	4.57±0.21	13.72±0.10	1.47±0.38
SS NBRI 32	33.46±0.28	27.235±0.19	0.5±0.00	1.06±0.00	7.34±0.00	1.37±0.068
SS NBRI 33	29.96±0.14	18.85±0.06	0±0.00	31.70±0.63	38.78±0.58	1.13±0.056
SS NBRI 34	21.21±0.14	11.765±0.65	1±0.00	39.84±0.37	40.32±2.12	1.05±0.089
SS NBRI 35	21±0.28	3.86±0.55	0±0.00	15.21±0.31	91.82±3.61	1.26±0.17
SS NBRI 36	31.36±0.07	21.61±0.22	0.4±0.00	37.45±1.70	273.07±3.03	2.08±0.12
SS NBRI 37	20.23±0.14	18.26±0.97	0.6±0.00	10.69±0.05	58.41±3.08	1.53±0.13
SS NBRI 38	31.99±1.05	17.25±0.29	0.4±0.00	46.55±3.99	69.90±0.74	1.64±0.086
SS NBRI 39	21.21±0.14	17.84±0.35	1±0.006	38.78±.05	38.67±0.58	1.017±0.17
SS NBRI 40	26.74±0.21	6.63±3.9	0.1±0.00	7.71±0.26	27.82±3.67	2.29±0.18
SS NBRI 41	27.825±0.38	4.12±0.61	0±0.00	9.15±0.63	57.61±1.11	0.81±0.05

SS NBRI 42	31.92±1.54	4.35±0.39	0±0.00	9.20±0.47	62.08±0.58	2.87±0.19
SS NBRI 43	28.805±0.24	3.70±0.06	0.2±0.00	15.21±0.31	50.00±1.48	1.57±0.05
SS NBRI 45	36.89±4.27	3.99±0.13	0.3±0.001	8.88±0.15	27.23±1.80	2.17±0.04
SS NBRI 47	21.245±0.24	3.18±0.06	0±0.00	17.76±0.10	43.51±4.25	1.49±0.07
SS NBRI 48	19.005±0.59	2.47±0.35	0.8±0.004	27.66±1.48	65.91±1.22	1.26±0.11
SS NBRI 49	35.385±0.10	3.47±0.29	0.5±0.00	18.62±0.10	45.75±1.48	1.18±0.23
SS NBRI 50	27.23±0.49	5.88±0.0	0.8±0.003	14.09±1.33	65.38±2.07	1.31±0.05
SS NBRI 51	26.14±0.73	0.71±0.74	0±0.00	4.68±.042	40.21±2.13	0.73±0.04
SS NBRI 53	56.73±0.03	3.80±0.91	0.2±0.00	16.91±0.10	29.20±3.88	1.15±0.006
SS NBRI 55	40.04±0.00	30.48±0.34	0±0.00	5.21±0.53	17.60±1.86	0.31±0.041

Supplementary Table 3. Growth of phosphate accumulating bacteria in 1M salt

S.No.	Strains	1 Day	2 Day	3 Day	5 Day	7 Day	10 Day
1	SSNBRI 1	+++	+++	+++	+++	+++	+++
2	SSNBRI 2	+++	+++	+++	+++	+++	+++
3	SSNBRI 3	+++	+++	+++	+++	+++	+++
4	SSNBRI 4	+++	+++	+++	+++	+++	+++
5	SSNBRI 5	+++	+++	+++	+++	+++	+++
6	SSNBRI 6	+++	+++	+++	+++	+++	+++
7	SSNBRI 7	+++	+++	+++	+++	+++	+++
8	SSNBRI 8	+++	+++	+++	+++	+++	+++
9	SSNBRI 9	+++	+++	+++	+++	+++	+++
10	SSNBRI 10	+++	+++	+++	+++	+++	+++
11	SSNBRI 11	+++	+++	+++	+++	+++	+++
12	SSNBRI 12	+++	+++	+++	+++	+++	+++
13	SSNBRI 13	+++	+++	+++	+++	+++	+++
14	SSNBRI 14	+++	+++	+++	+++	+++	+++
15	SSNBRI 15	+++	+++	+++	+++	+++	+++
16	SSNBRI 16	+++	+++	+++	+++	+++	+++
17	SSNBRI 17	+++	+++	+++	+++	+++	+++
18	SSNBRI 18	+++	+++	+++	+++	+++	+++
19	SSNBRI 19	+++	+++	+++	+++	+++	+++
20	SSNBRI 20	+++	+++	+++	+++	+++	+++
21	SSNBRI 22	+++	+++	+++	+++	+++	+++
22	SSNBRI 23	+++	+++	+++	+++	+++	+++
23	SSNBRI 24	+++	+++	+++	+++	+++	+++
24	SSNBRI 25	+++	+++	+++	+++	+++	+++
25	SSNBRI 26	+++	+++	+++	+++	+++	+++
26	SSNBRI 27	+++	+++	+++	+++	+++	+++
27	SSNBRI 29	+++	+++	+++	+++	+++	+++

28	SSNBRI 32	+++	+++	+++	+++	+++	+++
29	SSNBRI 33	+++	+++	+++	+++	+++	+++
30	SSNBRI 34	+++	+++	+++	+++	+++	+++
31	SSNBRI 35	+++	+++	+++	+++	+++	+++
32	SSNBRI 36	+++	+++	+++	+++	+++	+++
33	SSNBRI 37	+++	+++	+++	+++	+++	++
34	SSNBRI 38	+++	+++	+++	+++	+++	+++
35	SSNBRI 39	+++	+++	+++	+++	+++	++
36	SSNBRI 40	+++	+++	+++	+++	+++	+++
37	SSNBRI 42	+++	+++	+++	+++	+++	+++
38	SSNBRI 43	+++	+++	+++	+++	+++	+++
39	SSNBRI 45	+++	+++	+++	+++	+++	+++
40	SSNBRI 47	+++	+++	+++	+++	+++	+++
41	SSNBRI 48	+++	+++	+++	+++	+++	+++
42	SSNBRI 49	+++	+++	+++	+++	+++	+++
43	SSNBRI 50	+++	+++	+++	+++	++	+++
44	SSNBRI 51	+++	+++	+++	+++	+++	+++
45	SSNBRI 53	+++	+++	+++	+++	+++	+++
46	SSNBRI 55	+++	+++	+++	+++	+++	+++

+++ : Excellent growth; ++ : Good growth; + : Fair growth

Supplementary Table 4. Growth of phosphate accumulating bacteria at 45 °C temperature

S.No.	Strains	1 Day	2 Day	3 Day	5 Day	7 Day	10 Day
1	SSNBRI 1	+++	+++	+++	+++	+++	+++
2	SSNBRI 2	+++	+++	+++	+++	+++	+++
3	SSNBRI 3	+++	+++	+++	+++	+++	+++
4	SSNBRI 4	+++	+++	+++	+++	+++	+++
5	SSNBRI 5	+++	+++	+++	+++	+++	+++
6	SSNBRI 6	+++	+++	+++	+++	+++	+++
7	SSNBRI 7	+++	+++	+++	+++	+++	+++
8	SSNBRI 8	+++	+++	+++	+++	+++	+++
9	SSNBRI 9	+++	+++	+++	+++	+++	+++
10	SSNBRI 10	+++	+++	+++	+++	+++	+++
11	SSNBRI 11	+++	+++	+++	+++	+++	+++
12	SSNBRI 12	+++	+++	+++	+++	+++	+++
13	SSNBRI 13	+++	+++	+++	+++	+++	+++
14	SSNBRI 14	+++	+++	+++	+++	+++	+++
15	SSNBRI 15	+++	+++	+++	+++	+++	+++
16	SSNBRI 16	+++	+++	+++	+++	+++	+++
17	SSNBRI 17	+++	+++	+++	+++	+++	+++
18	SSNBRI 18	+++	+++	+++	+++	+++	+++
19	SSNBRI 19	+++	+++	+++	+++	+++	+++
20	SSNBRI 20	+++	+++	+++	+++	+++	+++
21	SSNBRI 22	+++	+++	+++	+++	+++	+++
22	SSNBRI 23	+++	+++	+++	+++	+++	+++
23	SSNBRI 24	+++	+++	+++	+++	+++	+++
24	SSNBRI 25	+++	+++	+++	+++	+++	+++
25	SSNBRI 26	+++	+++	+++	+++	+++	+++
26	SSNBRI 27	+++	+++	+++	+++	+++	+++
27	SSNBRI 29	+++	+++	+++	+++	+++	+++

28	SSNBRI 32	+++	+++	+++	+++	+++	+++
29	SSNBRI 33	+++	+++	+++	+++	+++	+++
30	SSNBRI 34	+++	+++	+++	+++	+++	+++
31	SSNBRI 35	+++	+++	+++	+++	+++	+++
32	SSNBRI 36	+++	+++	+++	+++	+++	+++
33	SSNBRI 37	+++	+++	+++	+++	+++	++
34	SSNBRI 38	+++	+++	+++	+++	+++	+++
35	SSNBRI 39	+++	+++	+++	+++	+++	++
36	SSNBRI 40	+++	+++	+++	+++	+++	+++
37	SSNBRI 42	+++	+++	+++	+++	+++	+++
38	SSNBRI 43	+++	+++	+++	+++	+++	+++
39	SSNBRI 45	+++	+++	+++	+++	+++	+++
40	SSNBRI 47	+++	+++	+++	+++	+++	+++
41	SSNBRI 48	+++	+++	+++	+++	+++	+++
42	SSNBRI 49	+++	+++	+++	+++	+++	+++
43	SSNBRI 50	+++	+++	+++	+++	++	+++
44	SSNBRI 51	+++	+++	+++	+++	+++	+++
45	SSNBRI 53	+++	+++	+++	+++	+++	+++
46	SSNBRI 55	+++	+++	+++	+++	+++	+++

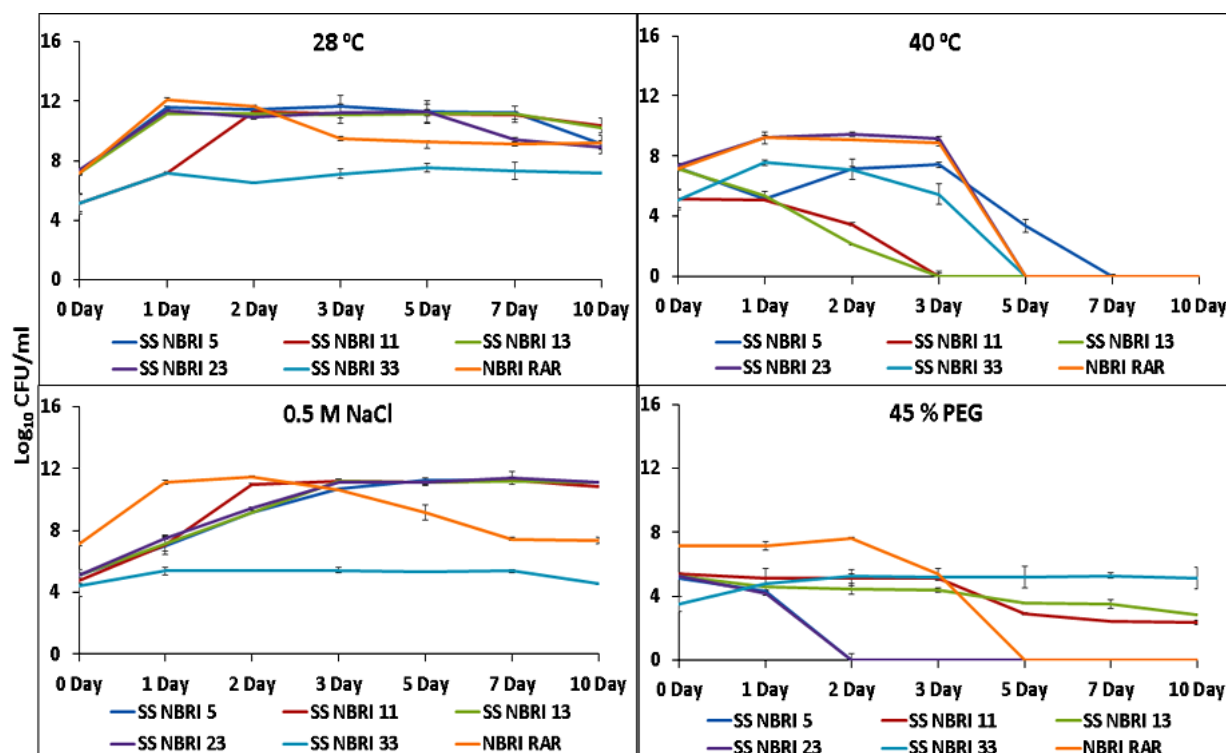
+++ : Excellent growth; ++ : Good growth; + : Fair growth

Supplementary Table 5. Growth of phosphate accumulating bacteria under 45% PEG simulated drought stress

S.No.	Strains	1 Day	2 Day	3 Day	5 Day	7 Day	10 Day
1	SSNBRI 1	+	+	-	-	-	-
2	SSNBRI 2	+	-	-	-	-	-
3	SSNBRI 3	-	-	-	-	-	-
4	SSNBRI 4	-	-	-	-	-	-
5	SSNBRI 5	+++	+++	+++	+++	++	++
6	SSNBRI 6	+	-	-	-	-	-
7	SSNBRI 7	-	-	-	-	-	-
8	SSNBRI 8	-	-	-	-	-	-
9	SSNBRI 9	+	-	-	-	-	-
10	SSNBRI 10	-	-	-	-	-	-
11	SSNBRI 11	+++	+++	+++	+++	++	+++
12	SSNBRI 12	-	-	-	-	-	-
13	SSNBRI 13	+++	+++	+++	++	++	++
14	SSNBRI 14	-	-	-	-	-	-
15	SSNBRI 15	-	-	-	-	-	-
16	SSNBRI 16	-	-	-	-	-	-
17	SSNBRI 17	-	-	-	-	-	-
18	SSNBRI 18	-	-	-	-	-	-
19	SSNBRI 19	-	-	-	-	-	-
20	SSNBRI 20	-	-	-	-	-	-
21	SSNBRI 22	-	-	-	-	-	-
22	SSNBRI 23	+++	+++	+++	++	++	++
23	SSNBRI 24	+	-	-	-	-	-
24	SSNBRI 25	+	-	-	-	-	-
25	SSNBRI 26	+	-	-	-	-	-
26	SSNBRI 27	+	-	-	-	-	-

27	SSNBRI 29	-	-	-	-	-	-
28	SSNBRI 32	-	-	-	-	-	-
29	SSNBRI 33	+++	+++	+++	+++	++	++
30	SSNBRI 34	-	-	-	-	-	-
31	SSNBRI 35	-	-	-	-	-	-
32	SSNBRI 36	-	-	-	-	-	-
33	SSNBRI 37	-	-	-	-	-	-
34	SSNBRI 38	-	-	-	-	-	-
35	SSNBRI 39	-	-	-	-	-	-
36	SSNBRI 40	-	-	-	-	-	-
37	SSNBRI 42	-	-	-	-	-	-
38	SSNBRI 43	-	-	-	-	-	-
39	SSNBRI 45	-	-	-	-	-	-
40	SSNBRI 47	-	-	-	-	-	-
41	SSNBRI 48	-	-	-	-	-	-
42	SSNBRI 49	-	-	-	-	-	-
43	SSNBRI 50	-	-	-	-	-	-
44	SSNBRI 51	-	-	-	-	-	-
45	SSNBRI 53	-	-	-	-	-	-
46	SSNBRI 55	-	-	-	-	-	-
47	NBRI RAR						

+++ : Excellent growth; ++ : Good growth; + : Fair growth; - : no growth



Supplementary Fig. 1. Growth of phosphate accumulating bacteria under abiotic stress conditions of temperature (40 °C), salinity (0.5 M NaCl) and drought (45% PEG).