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Supplementary Paper

Biochemical characterization of diverse endophytic bacteria isolated from the seed endosperm of wild relatives and cultivated varieties of papaya

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Supplementary Table 1 : Molecular identification and homology analysis of papaya endophytes based on 16S rRNA gene sequencing

Papaya endophyte	Closest match (Putative)	Homology (%)	Closest match Accession Number	GenBank Accession Number
EVCa1	*Enterobacter cloacae*	97.82	KU715841.1	MW811525.1
EVG2	*Enterobacter cancerogenus*	97.70	KT310079.1	MW811526.1
EVG3	*Siccibacter colletis*	98.81	MK241854.1	MW811527.1
EVG4	*Enterobacter sp.*	98.83	OM142547.1	MW811528.1
EVG5	*Enterobacter sp.*	97.37	MW478742.1	MW811529.1
EVCu6	*Bacillus sp.*	96.19	MG893120.1	MW811530.1
EVCu7	Paenibacillus illinoisensis	97.84	MN232118.1	MW811531.1
EVG8	Pantoea anthophila	93.70	JQ659458.1	MW811532.1
EAP9	Escherichia sp.	98.40	AP025751.1	MW811533.1
EAP10	Enterobacter cloacae	97.82	KU715841.1	MW811534.1
EAP11	Siccibacter colletis	94.48	CP074352.1	MW811535.1
EAP12	Microbacterium sp.	84.04	OR835785.1	MW811536.1
EAP13	Cellulosimicrobium cellulans	81.71	OP986032.1	MW811546.1
EAP14	Klebsiella pneumoniae	99.09	CP031795.1	MW811537.1
EVCu15	Bacillus subtilis	97.24	OQ423144.1	MW811538.1
EAP16	Leclercia sp.	97.69	CP046446.1	MW811539.1
EAS17	Enterobacter sp.	97.77	OP310031.1	MW811540.1
EAS18	Siccibacter colletis	97.21	CP074352.1	MW811541.1
EVCa19	Enterobacter sp.	95.26	MK318778.1	MW811542.1
EVCa20	Lelliottia jeotgali	94.35	OR352455.1	MW811543.1
EVCa21	Enterobacter hormaechei	98.19	CP079939.1	MW811544.1
EVCa22	Pseudomonas sp.	98.85	JQ627866.1	MW811545.1

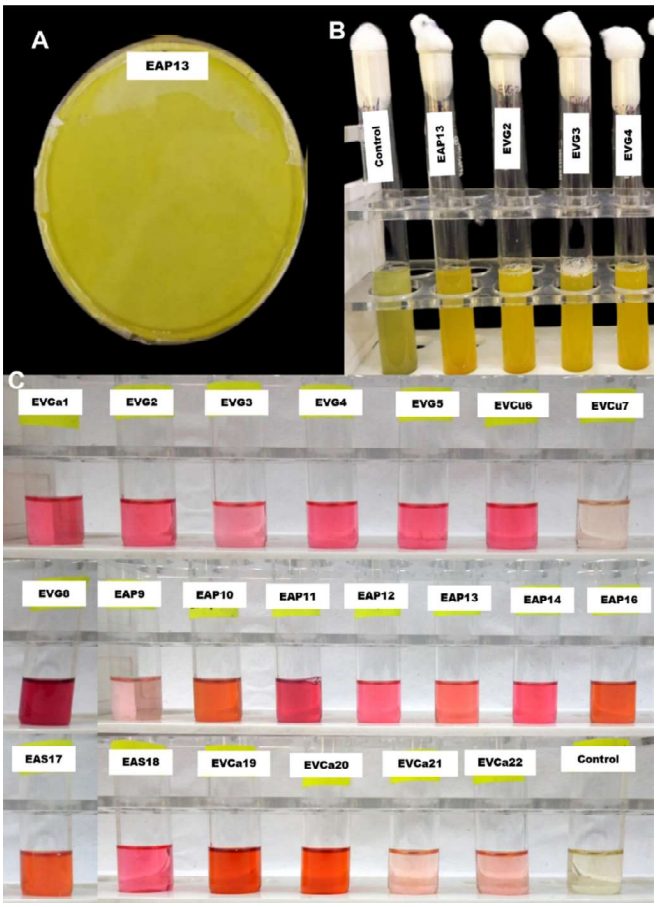
Supplementary Table 2 : IMVIC and Carbohydrate utilization test, for endophytes from seeds of wild relatives and cultivated varieties of papaya

Isolate	Indole test	Methyl Red test	Voges-Proskauer test	Citrate utilization test	Glucose	Adonitol	Arabinose	Lactose	Sorbitol	Mannitol	Rhamnose	Sucrose
EVCa1	-	-	-	-	-	-	-	-	-	-	-	-
EVG2	+	-	-	+	+	-	+	-	-	-	-	-
EVG3	+	-	-	+	+	-	+	-	-	+	-	+
EVG4	+	-	-	+	+	-	+	-	+	+	+	+
EVG5	+	-	-	-	+	-	+	+	+	+	+	+
EVCu6	+	-	+	-	-	-	-	-	-	-	-	-
EVCu7	+	-	-	-	+	-	+	+	-	+	-	+
EVG8	+	-	-	+	+	-	+	-	-	+	+	+
EAP9	+	-	+	-	+	-	-	-	+	+	+	+
EAP10	+	-	+	+	+	+	+	+	+	+	+	-
EAP11	+	-	-	+	+	-	+	+	-	+	+	-
EAP12	+	-	+	+	+	-	+	-	-	+	+	+
EAP13	+	-	+	-	+	-	+	+	-	-	-	+
EAP14	-	-	-	-	-	-	-	-	-	-	-	-
EVCu15	-	-	-	-	-	-	-	-	-	-	-	-
EAP16	+	-	-	-	+	+	+	+	+	+	+	+
EAS17	+	-	-	-	+	-	+	-	+	+	+	+
EAS18	+	-	-	+	+	-	+	+	-	+	+	-
EVCa19	+	-	-	-	+	-	+	-	-	+	+	+
EVCa20	+	-	-	-	+	-	+	-	-	+	+	-
EVCa21	+	-	+	+	+	-	+	+	+	+	+	+
EVCa22	+	+	+	+	+	-	-	-	-	-	-	-

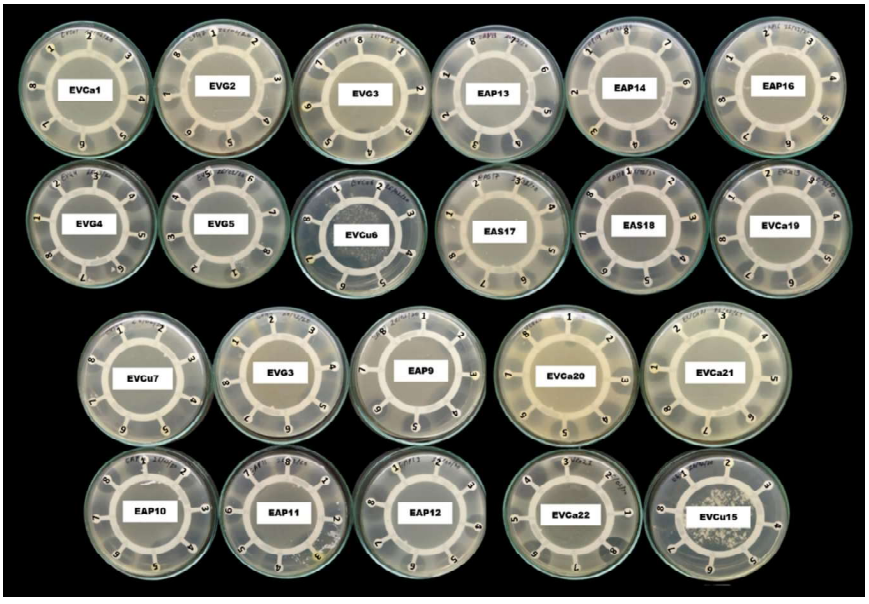
Supplementary Table 3: Observation of zone of clearance by P, Zn and ZnP solubilizers (papaya endophytes) after 48 h

Isolate	Zone of clearance by P-solubilizers (papaya endophytes) after 48 h			Zone of clearance by K-solubilizers (papaya endophytes) after 48 h			Zone of clearance by ZnO-solubilizers (papaya endophytes) after 48 h			Zone of clearance by ZnP-solubilizers (papaya endophytes) after 48 h		
	Colony diameter (cm)	Zone diameter (cm)	Zone of clearance (cm)	Colony diameter (cm)	Zone diameter (cm)	Zone of clearance (cm)	Colony diameter (cm)	Zone diameter (cm)	Zone of clearance (cm)	Colony diameter (cm)	Zone diameter (cm)	Zone of clearance (cm)
EVCa1	0.8^{b}	1.2^{bcd}	0.4^{cde}	0^{d}	0^{f}	0^{d}	0.8^{b}	1.4^{cd}	0.6^{bc}	0.9^{bc}	2.3^{b}	1.4^{bc}
EVG2	1.0^{a}	1.4^{b}	0.4^{cde}	0.6^{bc}	2.2^{cd}	1.6^{b}	0.7^{bc}	1.2^{de}	0.5^{bcd}	0.8^{c}	2.2^{bc}	1.4^{bc}
EVG3	0.4^{de}	0.7^{ef}	0.3^{def}	0^{d}	0^{f}	0^{d}	0^{f}	0^{h}	0^{f}	0^{g}	0^{j}	0^{h}
EVG4	0.5^{cd}	0.8^{def}	0.3^{def}	0^{d}	0^{f}	0^{d}	0.6^{c}	1.0^{efg}	0.4^{cde}	0.9^{bc}	1.6^{de}	0.7^{ef}
EVG5	1.0^{a}	1.2^{bcd}	0.2^{efg}	0^{d}	0^{f}	0^{d}	0.7^{bc}	1.2^{de}	0.5^{bcd}	0.6^{d}	1.2^{efg}	0.6^{efg}
EVCu6	0^{f}	0^{g}	0^{g}	0^{d}	0^{f}	0^{d}	0^{f}	0^{h}	0^{f}	0^{g}	0^{j}	0^{h}
EVCu7	0^{f}	0^{g}	0^{g}	0^{d}	0^{f}	0^{d}	0.4^{d}	0.7^{g}	0.3^{cdef}	0^{g}	0^{j}	0^{h}
EVG8	0.5^{cd}	1.5^{b}	1.0^{b}	0.5^{c}	1.9^{de}	1.4^{bc}	0.2^{e}	0.8^{fg}	0.6^{bc}	0^{g}	0^{j}	0^{h}
EAP9	0.5^{cd}	0.6^{ef}	0.1^{fg}	0^{d}	0^{f}	0^{d}	0^{f}	0^{h}	0^{f}	0^{g}	0^{j}	0^{h}
EAP10	0.5^{cd}	0.9^{cdef}	0.4^{cde}	0^{d}	0^{f}	0^{d}	0.4^{d}	0.9^{efg}	0.5^{bcd}	0.3^{f}	0.9^{ghi}	0.6^{efg}
EAP11	0.3^{e}	0.5^{f}	0.2^{efg}	0^{d}	0^{f}	0^{d}	0.7^{bc}	0.8^{fg}	0.1^{ef}	0.3^{f}	0.7^{hi}	0.4^{fg}
EAP12	1.0^{a}	1.3^{bc}	0.3^{def}	0.5^{c}	2.0^{de}	1.5^{b}	0.8^{a}	1.0^{efg}	0.2^{def}	0.6^{d}	1.4^{def}	0.8^{de}
EAP13	0^{f}	0^{g}	0^{g}	0^{d}	0^{f}	0^{d}	0^{f}	0^{h}	0^{f}	0^{g}	0^{j}	0^{h}
EAP14	0.6^{c}	2.0^{a}	1.4^{a}	0.6^{bc}	3.1^{ab}	2.5^{a}	1.0^{a}	2.6^{a}	1.6^{a}	1.4^{a}	4.3^{a}	2.9^{a}
EVCu15	0^{f}	0^{g}	0^{g}	0^{d}	0^{f}	0^{d}	0^{f}	0^{h}	0^{f}	0^{g}	0^{j}	0^{h}
EAP16	0^{f}	0^{g}	0^{g}	0^{d}	0^{f}	0^{d}	0.4^{d}	1.2^{de}	0.8^{b}	0.5^{de}	1.1^{fgh}	0.6^{efg}
EAS17	1.0^{a}	1.3^{bc}	0.3^{def}	0.5^{c}	1.9^{de}	1.4^{bc}	0.6^{c}	1.1^{def}	0.5^{bcd}	1.0^{b}	2.1^{bc}	1.1^{cd}
EAS18	0.4^{de}	0.9^{cdef}	0.5^{cd}	0.6^{bc}	1.6^{c}	1.0^{c}	0^{f}	0^{h}	0^{f}	0.3^{f}	0.6^{j}	0.3^{gh}
EVCa19	0^{f}	0^{g}	0^{g}	0.8^{a}	2.6^{bc}	1.8^{b}	0.6^{c}	1.0^{efg}	0.4^{cde}	0.3^{f}	0.9^{ghi}	0.6^{efg}
EVCa20	0.4^{de}	1.0^{cde}	0.6^{c}	0.7^{ab}	2.4^{cd}	1.7^{b}	0.6^{c}	1.0^{efg}	0.4^{cde}	0.3^{f}	0.7^{hi}	0.4^{fg}
EVCa21	0.6^{c}	1.9^{a}	1.3^{a}	0.8^{a}	3.2^{a}	2.4^{a}	0.3^{de}	1.7^{bc}	1.4^{a}	0.4^{ef}	1.8^{cd}	1.4^{bc}
EVCa22	0.4^{de}	0.8^{def}	0.4^{cde}	0^{d}	0^{f}	0^{d}	0.4^{d}	1.8^{b}	1.4^{a}	0.3^{f}	1.8^{cd}	1.5^{b}
SEm ±	0.009	0.059	0.025	0.004	0.095	0.064	0.004	0.054	0.036	0.005	0.068	0.042
CV (%)	20.652	29.681	43.232	25.127	32.502	36.305	15.903	26.260	41.145	18.256	24.280	30.605
CD (0.05)	0.153	0.400	0.262	0.105	0.508	0.415	0.109	0.381	0.314	0.122	0.429	0.336
CD (0.01)	0.204	0.534	0.350	0.141	0.679	0.555	0.146	0.509	0.419	0.162	0.572	0.449

Sem: standard error of mean, CV: coefficient of variation, CD: critical difference. The values in each column followed by different letters are significantly different (P<0.05). All zone of clearance measurements are mean values from three technical replicates. Statistical analysis was performed on these replicate measurements.



Supplementary Fig. 1 : (A) HCN, (B) Ammonia, (C) Auxin Production by all endophytes isolated from papaya



Supplementary Fig. 2: Antibiotic sensitivity test of endophytes isolated from papaya. 1: Chloramphenicol (C, 30µg); 2: Ampicillin (AMP, 10 µg); 3: Tetracycline (TE, 30 µg); 4: Gentamicin (GEN, 10 µg); 5: Streptomycin (S, 10 µg); 6: Kanamycin (K, 30 µg); 7: Co-Trimoxazole (CoT, 25 µg); 8: Amikacin (AK, 30 µg)