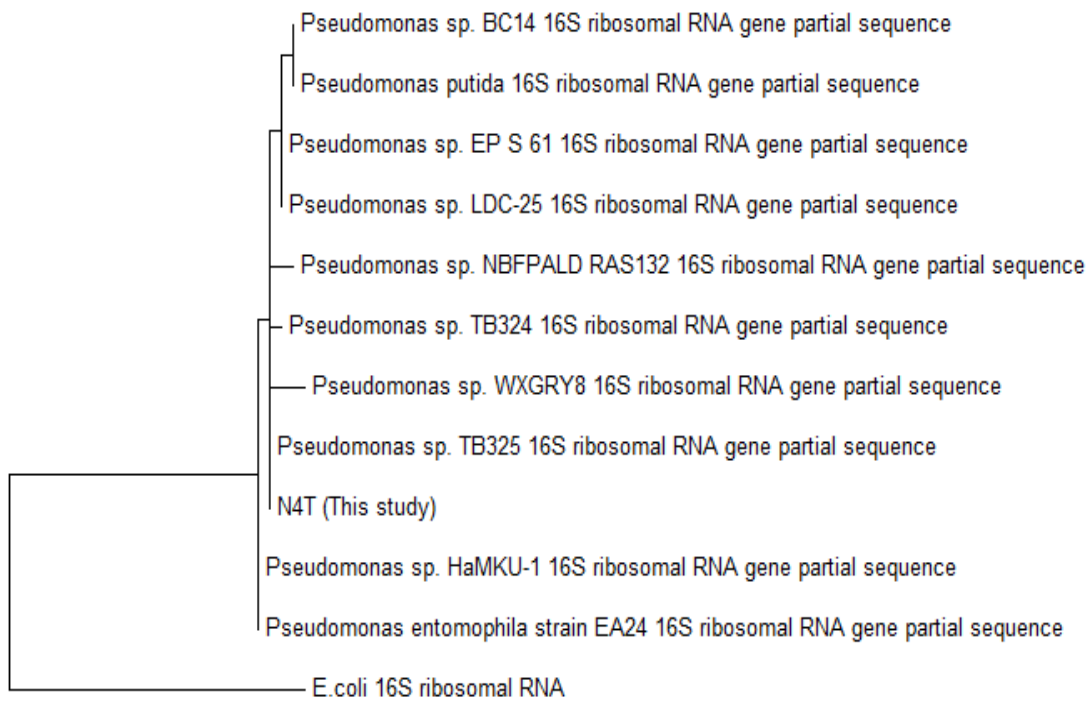


## Appendix I

### Phylogenetic tree construction of N4T strain using MEGA7 tool



5

Fig: Phylogenetic tree of N4T by neighbor joining method, indicating the genus belongs to *Pseudomonas* spp. The phylogenetic tree was constructed using MEGA 7 tool.

## Appendix II

### Association study of *P. putida* N4T and *Enterobacter* C10 with tomato seedling by GUS assay



**Seedlings inoculated with GUS  
N4T**



**Control**

Fig: The colonization of *P. putida* N4T in tomato seedling was confirmed by inoculating of N4T in the seedlings by root dip inoculation method. The *gus* gene carrying plasmid TP003 was conjugated with wild type N4T strain and the transconjugate strain was taken for the study.

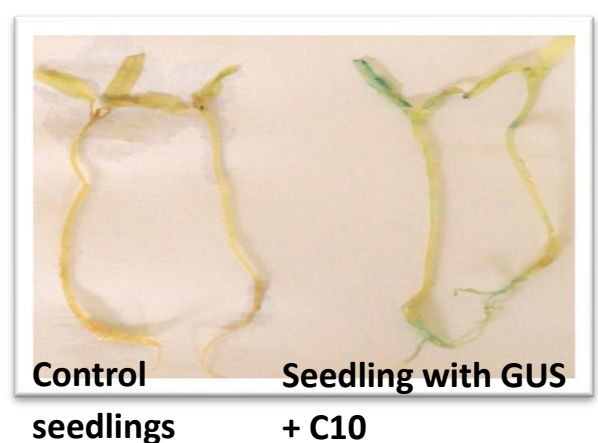
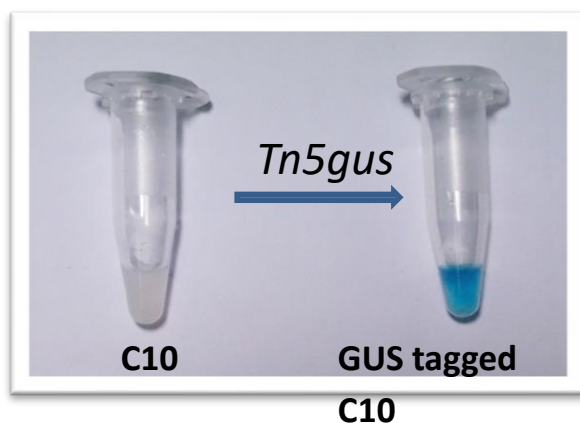


Fig: The colonization of *Enterobacter* C10 in tomato seedling was confirmed by inoculating of C10 in the seedlings by root dip inoculation method. The *gus* gene carrying plasmid TP003 was conjugated with wild type C10 strain and the transconjugate strain was taken for the study.

### Appendix III

#### Prediction of different genes associated with Plant growth promoting traits (PGPT) present in *P. putida* N4T strain

Table: Possible 3714 genes associated with plant growth promoting traits (PGPT) (by all blastp hits) present in the *P. putida* N4T genome. The genome o N4T was sequenced using Illumina platform and was annotated using different tool. The genome information of N4T was submitted in the PLaBAs for the generation of the possible genes associated with PGPT.

Sl No	Genes	Copy
1	nifM ppiC	4
2	nifS iscS	3
3	nifU iscU	1
4	nifV	2
5	ptsN	1
6	fixL	1
7	fixJ	1
8	fixO ccoO	2
9	fixP ccoP	5
10	fixQ ccoQ	2
11	hypE	1
12	narK nrtP nrt narU	2
13	napH	2
14	norQ	2
15	norR	1
16	nasR nasT	1
17	nasS	1
18	nosX apbE yojL fmnB	1
19	nirB	1
20	nirD	1
21	nirK	1
22	nrfE	1
23	nrfF	1
24	nrfG	1
25	fnr	1
26	modE	1
27	nreB	1
28	regA regR actR	1
29	regB regS actS	1
30	narL	4
31	yfdC	1

32	eutB	1
33	eutC	1
34	cynS	1
35	fmdA amiE amiF	1
36	eutR yfeG	1
37	gltB	1
38	gltD	1
39	glnA	7
40	glnE	1
41	glnD	1
42	glnK glnZ	1
43	ntrB glnL	1
44	ntrC glnG	1
45	gdhA	1
46	aspQ asnA asnB	1
47	gltI aatJ	1
48	gltK aatM	1
49	gltJ aatQ	1
50	gltL aatP	1
51	aaus	1
52	ntrA rpoN	1
53	aaur	1
54	gltP gltT	4
55	gltS	1
56	nitA nitB nitR nit1	3
57	amtB ybaG amt	2
58	exoR	9
59	hpxA	1
60	tgnR	6
61	tgnB	1
62	tgnC	1
63	tgnD	1
64	urtA	1
65	urtB	1
66	urtC	1
67	urtD	1
68	urtE	1
69	utp	1
70	ureA	2
71	ureB	1
72	ureC	1
73	ureD	1
74	ureE	1
75	ureF	1

76	ureG	1
77	ureJ	1
78	ycgI	1
79	atzF	2
80	ntrX	1
81	acoR	6
82	fixA etfB	2
83	fixB etfA	3
84	fixC	1
85	fixN ccoN	2
86	ABC_SN_S	5
87	ABC_SN_A ytlC	6
88	ABC_SN_P	5
89	cbbR cmpR ndhR	11
90	ppc	1
91	icd	2
92	pqqA	1
93	pqqB pqqG	1
94	pqqC	1
95	pqqD	1
96	pqqE	1
97	pqqF	1
98	pqqL yddC	4
99	gcd gdhAB	2
100	ghrB	1
101	dkgB	1
102	TC_GNTP	2
103	pta	1
104	poxB	1
105	lpd pdhD	3
106	aceE	1
107	aceF pdhC	3
108	actP	2
109	pckA	1
110	pycA	1
111	pycB	1
112	mgo	4
113	leuB	1
114	leuC	2
115	leuD	2
116	aceB glcB	1
117	dctA	5
118	CS gltA	1
119	acnA	2

120	acnB	1
121	IRG1_like	1
122	aceK	1
123	prpC	1
124	TC_CITMHS CitMHS_family citN	3
125	citA teuC	1
126	acnD	1
127	prpF	1
128	kgtP	2
129	sucA	1
130	sucB	1
131	sucD	1
132	aarC cat1	2
133	aceA	1
134	prpB	2
135	fadA fadI	1
136	pcaF	1
137	gabD	1
138	sad yneI	1
139	sdhD frdD	1
140	sdhC frdC	1
141	sdhB frdB	1
142	sdhA frdA	1
143	fahA	1
144	ycgM	1
145	fumA fumB	1
146	fumC	3
147	maeB	1
148	maeN	1
149	accA	1
150	accB bccP	1
151	accC	1
152	accD	1
153	mdcR	1
154	mdcF	1
155	gph	3
156	glcA	1
157	lra6	1
158	ldhA	2
159	lldD	1
160	gloB gloC	3
161	larA	1
162	dpkA lhpD	1
163	fabV ter	1

164	yciA	4
165	tesB	2
166	tesA	1
167	yigI	2
168	ybgC	3
169	paaF echA	5
170	fadB	1
171	ilvD	5
172	alaA	2
173	dld	4
174	dld	1
175	dgdA	1
176	bcpA	1
177	ilvA tdcB	5
178	sds	1
179	sdaA sdaB tdcG	3
180	metB met cysA	1
181	patB malY	1
182	metC	2
183	cuyA	1
184	pyk	2
185	ptsI	1
186	ptsP	1
187	pps ppsA	1
188	sseA	4
189	mhpE	1
190	eda	1
191	dapA mosA	2
192	ligK galC	1
193	fdhA	1
194	frmB fghA	1
195	frc yfdW	4
196	acdAB	1
197	acs	5
198	prpE	1
199	bcd	7
200	mmsA iolA	3
201	ttuB	6
202	soxD	1
203	cysNC	1
204	cysD	1
205	cynT can	3
206	GAMMACA_like	2
207	phnN	1

208	phnP	1
209	phnW	1
210	phnX	2
211	phnY	1
212	phnF	1
213	phnC	1
214	phnD	3
215	phnE	2
216	phy phyA phyB phyC	1
217	ppx ppx_gppA	3
218	ppa	1
219	stpI pppA	1
220	pstA	2
221	pstB phoT	2
222	pstC phoW	2
223	pstS phoS	3
224	phoU phoY	1
225	phoE	1
226	oprO	1
227	pitA pit	1
228	yjbB	1
229	phoB	1
230	senX3	1
231	yciG ymdF gsiB	4
232	ppk	1
233	ppk2	1
234	ppk2	1
235	phoH	2
236	phoR	2
237	trkA ktrA	1
238	kch trkA mthK pch	1
239	trkD kup	1
240	trkG trkH ktrB	1
241	kdpA	1
242	kdpB	1
243	kdpC	1
244	kdpD	1
245	kdpE	1
246	kdpF	1
247	aprA	1
248	aprB	1
249	cysH	2
250	cysI	1
251	cysJ	5



252	cysK	3
253	cysM	1
254	dmdB	1
255	ggt	3
256	tauD	3
257	tauA	1
258	tauB	1
259	tauC	1
260	shiA	2
261	cysB	1
262	cysQ	1
263	cysS	3
264	cysA	1
265	cysP ylnA	1
266	cysT cysU	1
267	cysW	1
268	cysZ	1
269	sbp	1
270	TC_SULP	4
271	glpE	1
272	ssuA	11
273	ssuB	5
274	ssuC	5
275	ssuD	11
276	ssuE	2
277	fptC	2
278	pchR	1
279	bauR	3
280	dhbF	2
281	btr ybbB	1
282	yfmI fabG efpI	15
283	blt	2
284	hemN hemZ	3
285	hemF	1
286	entD basI angD cbsD cbsE aebD	1
287	pfeS pirS	1
288	pfeR pirR	1
289	acrR smeT	6
290	ahpC	1
291	acrA lir mtcA mexA adeI smeD mtrC cmeA	3
292	acrB acrE mexB adeJ smeE mtrD cmeB	3
293	entS ybdA cbsS	1
294	fepB cbuB	1
295	mbtH nocI	1

296	pvdA	1
297	pvdQ	2
298	pvdE	1
299	fepA pfeA iroN pirA	1
300	quiC	1
301	ymfE	1
302	mdtA	1
303	mdtB	1
304	mdtC	1
305	tolC	2
306	hasA	1
307	hugZ hutZ chuZ	1
308	hemO pigA	2
309	hxA	1
310	hxB	2
311	hemA	1
312	hemB	2
313	hemC	1
314	hemD	1
315	hemL	1
316	cysG	2
317	feoB	2
318	efeU FTR FTH1	2
319	efeO	2
320	efeB	1
321	afuA fbpA	3
322	afuB fbpB	3
323	afuC fbpC	2
324	butB	1
325	tonB	6
326	exbB	4
327	exbD	4
328	yusV ABC_FEV_A feuD	4
329	feuA yvrC ABC_FEV_S fatB	3
330	feuB feuC chuU yfhA hmuU ABC_FEV_P fatC fatD	2
331	fptA fhuE fpvA C_FEV_OM1 fauA	7
332	TC_FEV_OM3 tbpA hmrR lbpA hpuB bhurR hugA hmbR	3
333	hutA fatA fct foxR	17
334	fecA	2
335	fieF	1
336	yceF	2
337	fiu bfrD	3
338	fur furB zur	2
339	prhI fecI	8

340	zur	1
341	rarD	4
342	prhR fecR	14
343	pmrA	2
344	pmrB	2
345	lipB	2
346	lipA	1
347	lipL	1
348	bfr	3
349	bfd yheA	1
350	yfhL	1
351	cycA cycM	1
352	ndh	4
353	foxA coxA ctaD	2
354	foxB coxB ctaC	3
355	coxC ctaE	3
356	coxD ctaF	3
357	ygjH	1
358	cyaY	1
359	dps dpsA	1
360	copA ctpA	4
361	cusS copS silS	6
362	cusR copR silR	7
363	pcoA	2
364	pcoB copB	1
365	pcoC copC	1
366	ATOX1 ATX1 copZ golB	1
367	cueR	2
368	comR ycfQ	2
369	delH	8
370	delftibactin_hydrolase_domain_protein	3
371	delftibactin_thioesterase	1
372	chrC sodB sodA	2
373	chrI	2
374	chrR	2
375	zntA cadA	1
376	zntB	1
377	znuA	4
378	znuB	2
379	znuC	2
380	TC_ZIP zupT ZRT3 ZIP2	2
381	smtA	1
382	bmtA	1
383	pbrR	1

384	zraR hydG	3
385	cmtR	1
386	nikR	1
387	nikA cntA	1
388	nikB cntB	1
389	nikC cntC	1
390	nikD cntD	1
391	nikE cntF	1
392	ddpA ABC_PE_S	6
393	ddpF	4
394	ddpB appB	4
395	ddpC appC	4
396	dppA	5
397	dppB	1
398	dppC	1
399	dppD	1
400	dppF	1
401	rcnA	2
402	ctpD	1
403	rhnA_cobC	2
404	cobQ cbiP	1
405	cobP cobU	1
406	cobS cobV	1
407	cobU cobT	1
408	cbiA	1
409	cbiC	1
410	cbiD	1
411	cbiF	1
412	cbiG	1
413	cbiJ	1
414	cobA btuR	1
415	cobC phpB	2
416	cobC1 cobC	1
417	cbiB cobD	1
418	apaG	1
419	btuC	1
420	btuF	1
421	cbiL	1
422	corC	3
423	arsB arsenite_transporter	2
424	arsB arsenical_pump_membrane_protein	2
425	arsC	1
426	arsC1	2
427	arsR	2

428	aoxS	3
429	glpF pduF	1
430	pbrB pbrC	1
431	selA	1
432	selD	1
433	selB	2
434	selU mmH	1
435	dedA	1
436	tehA	2
437	tehB	1
438	iscR	2
439	czcA cusA cnrA	1
440	czcB cusB cnrB	1
441	czcC cusC cnrC	1
442	cusS copS silS	6
443	crcB	1
444	pcaD catD	10
445	pcaB	2
446	pcaC	5
447	pcaG	1
448	pcaH	1
449	catE	1
450	dmpC xylG praB	1
451	pobA	1
452	dmpH xylI nahK	1
453	praC xylH	2
454	cynX yeaN	4
455	ligI	1
456	cmtC dhbA	1
457	cmtD dhbB	1
458	galD	1
459	bphH xylJ tesE	1
460	benE	1
461	benP	2
462	pcaK	3
463	nbaA	1
464	namA	2
465	catA	4
466	nfnB nfsB	1
467	nemA	3
468	mhpF	1
469	HGD hmgA	1
470	maiA GSTZ1	1
471	paaG	2

472	paaH hbd fadB mmgB	1
473	paaI	1
474	gctA	1
475	gctB	1
476	EC_3_5_1_4 amiE	4
477	atzB	1
478	biuH	1
479	nylB	1
480	dcaA	1
481	carAa	1
482	nahD	1
483	frmA ADH5 adhC	2
484	yiaY	1
485	EC_1_1_1_1 adh	1
486	EC_5_3_3_1	1
487	hsaB	3
488	mas	1
489	ybhF yadG ecsA	4
490	ybhS ecsB	2
491	cpxB	2
492	opaA pepQ	1
493	opaB	1
494	pepP	2
495	glpA glpD	1
496	fdx cndB	1
497	acpD azoR	3
498	ncd2 npd pnoA	2
499	bluB drgA	2
500	rhlA	1
501	rhlI phzI solI cepI tofI	1
502	dhaA	2
503	exaA	1
504	aldH dhaS	3
505	dehH	2
506	etnE	1
507	mldD linM	2
508	mldE linK	2
509	mldF linL mkl	2
510	linN	1
511	linA	1
512	linC	1
513	trpA	1
514	trpB	1
515	trpC	1

516	trpD	2
517	trpE phnA	3
518	trpG phnB	2
519	trpF	1
520	trpS	2
521	lysN	1
522	betB_homologous	2
523	aldB	1
524	auxin_symporter	2
525	miaA ipt	1
526	miaB	2
527	miaE	1
528	loglyvdD	2
529	dapF	1
530	recA	1
531	recX	1
532	hflX	5
533	xdhA	1
534	yagR	1
535	xdhB pucD	1
536	yagS	1
537	xdhC paod ygeB pucA	3
538	yagT	1
539	hprT hpt	2
540	xpt	1
541	pbuG azgA ghxP ghxQ adeQ	2
542	pubX	3
543	xanP	1
544	crtN	1
545	crtZ	1
546	ispB	1
547	idi	1
548	crtE ispA	1
549	gcpE ispG	1
550	ispC dxr	1
551	ispD	1
552	ispF	3
553	ispE	2
554	ispH lytB	4
555	gbuA	1
556	puuB ordL	8
557	puuC ordL	1
558	puuD	3
559	aofH	2

560	puuC kauB	1
561	patD prydcW	3
562	davT gabT	1
563	gabT	1
564	gabP	5
565	mIaC	1
566	mIaB	1
567	cfa	4
568	cdsA ynbB	3
569	CHO1 pssA	1
570	psd PISD	1
571	pgsA PGS1	2
572	pgpA	1
573	clsA_B ybhO ywiE	3
574	clsC ymdC	1
575	speE SRM SPEC_3 SPSD	1
576	speC speF ODC1	2
577	speA	1
578	paiA	3
579	speG	1
580	puuP	3
581	potF	7
582	potG	1
583	potI	1
584	potH	1
585	ABC_SP_P ydcV	6
586	ABC_SP_P1 ydcU	6
587	ABC_SP_S ydcS	7
588	ABC_SP_A ydcT	6
589	spuC	5
590	folE	1
591	folE2	2
592	GTP_cyclohydrolase_I	1
593	folB	1
594	folK	2
595	folP	1
596	folA	2
597	folC	1
598	ribA	2
599	ribBA	2
600	pabB	1
601	pabC	1
602	folM	1
603	folD	1



604	glyA	4
605	purN	1
606	purT	1
607	purH	1
608	fmt	4
609	gcvT	3
610	metH	2
611	thyA	4
612	purU	2
613	metF	3
614	ygfA fthC yqgN folN	1
615	budB ilvK alsS ilvB ilvG ilvI	6
616	budC	2
617	ilvH ilvN	1
618	acuB	1
619	acuC	3
620	ydjG	1
621	yghZ	1
622	bdh	1
623	hmgL	2
624	atoB	4
625	scoA	1
626	scoB	1
627	hydroxymethylglutaryl_CoA_synthase	2
628	accD	1
629	fabD bmyD	1
630	fabH	2
631	fabF	3
632	fabZ	2
633	fadD	8
634	acd	9
635	hcnA	1
636	hcnB	2
637	hcnC	1
638	moaC_	2
639	moaA	2
640	moaX	1
641	moaB	3
642	moeA	3
643	modA	2
644	modB	1
645	modC	1
646	gltX	3
647	hemE	1

648	hemY	1
649	hemJ	1
650	hemH ywfl	1
651	hemX	1
652	ahbC	1
653	ctaB cyoE	2
654	ctaA	1
655	ribD	1
656	yigB	1
657	ribB RIB3	1
658	ribH RIB4	1
659	ribE RIB5 ribC	1
660	ribF	2
661	NUDT23	2
662	ilvC	1
663	panB	1
664	panE apbA	2
665	panC	1
666	thnR	1
667	coaX	1
668	coaBC dfp	1
669	mazG	1
670	coaD kdtB	1
671	coaE	2
672	acpH	1
673	ilvE	1
674	bkdA1	1
675	bkdA2 bfmBAB	1
676	preT	1
677	preA	1
678	dht hydA	1
679	UPB1_like pydC	4
680	thiC	1
681	thiD	1
682	thiF	2
683	thiI	1
684	thiO	1
685	dxs	1
686	thiG	2
687	thiS	1
688	thiE	2
689	thiL	2
690	rsgA engC	1
691	adk AK	1

692	cytX	7
693	pdxH	1
694	pdxK pdxY	1
695	epd	1
696	pdxB	1
697	serA	4
698	serC pdxF	1
699	pdxA	2
700	pdxJ	2
701	thrC	1
702	cobG	1
703	cbiGH_cobJ	1
704	cobF	1
705	cobL	1
706	cobN	1
707	bacA yddA	1
708	kefF nqo ywrO	3
709	wrbA	3
710	qorB	1
711	hppD	2
712	ybgC fcbC1	1
713	ubiA	1
714	ubiB aarF	1
715	ubiC	1
716	ubiD	1
717	ubiE	2
718	COQ7_like	1
719	ubiG	5
720	ubiH	1
721	ubiI	1
722	ubiJ yigP	1
723	ubiX bsdB	1
724	ycgN	1
725	toxJ	2
726	toxF	2
727	toxI oprM oprM emhC ttgC cusC adeK smeF mtrE cmeC gesC	3
728	iorB	2
729	iorA	1
730	srfAA lchAA	4
731	actIV	1
732	otrA tetM tetO	3
733	otrB tcr	1
734	sypA	23
735	cefD	1

736	phoP	2
737	phoQ	2
738	tktA tktB	1
739	acpP	1
740	auaH	1
741	dcsA	1
742	dcsE	1
743	yejA	3
744	yejB	2
745	yejE	2
746	yejF	1
747	sadC dcrA	2
748	cvpA	1
749	rseP	1
750	chiA chtA chiI	1
751	putative_chitinase	2
752	chitin_deacetylase	2
753	chbG	1
754	nagZ	1
755	cd ma nplT	1
756	yajQ	2
757	desC	1
758	lysS	3
759	adiA	1
760	plpE	10
761	fitG	3
762	tccC	6
763	degU	1
764	bacF	1
765	phzD	2
766	phzF yddE	2
767	aroA	1
768	cyclohexadieny prephenate_dehydrogenase 3_phosphoshikimate_1_carboxyvinyltransferase	1
769	aroB	1
770	aroKB	1
771	aroE	3
772	aroDE	1
773	aroL aroK	1
774	aroQ qutE	2
775	aroF	1
776	3_deoxy_7_phosphoheptulonate_synthase aroF aroG aroH	3
777	gacS barA varS	2
778	gacA uvrY varA	1
779	soxR	2

780	soxS	3
781	oxyR	13
782	blc	4
783	envZ	4
784	yggE	1
785	ompR	3
786	hmp YHB1	3
787	nsrR yjeB	1
788	gshA ybdK	1
789	gshB	2
790	yghU yfcG	3
791	yqjG	1
792	trxA	7
793	trxC	1
794	msrA	1
795	msrB	1
796	msrP yedY	1
797	yfeX	1
798	prx3	1
799	tpx	2
800	bsaA gpx btuE	3
801	bcp PRXQ DOT5	1
802	cpo	2
803	tsaA PRDX2_4 ahpC	1
804	ahpF	1
805	ohrR	4
806	ohrB osmC ohr y kzA	4
807	katG	1
808	gst	10
809	gor	1
810	sodC sod1	1
811	cybB	3
812	dsbG	1
813	grxC	2
814	grxD	2
815	ydhL	3
816	fpr	3
817	dltE	1
818	katN ctjC ydbD yj qC	1
819	qor	4
820	rnfA rsxA	1
821	rnfB rsxB	1
822	rnfD rsxD	1
823	rnfE rsxE	1

824	rnfG rsxE	1
825	gloA ywbC	2
826	osmY	3
827	fabB	1
828	lpxL htrB	2
829	mdoH	1
830	mdoG	1
831	UPF0176_protein	5
832	ABC_CD_A	4
833	ABC_CD_P	4
834	nadB	2
835	nadA	1
836	nadC	1
837	pncB	3
838	punA	1
839	nadR	1
840	nucA ushA yhcR yfkN	1
841	surE	2
842	yrfG	1
843	yfkN	1
844	nadD	2
845	nudC	1
846	nadE	1
847	pncC2	2
848	iunH	2
849	pncA	2
850	ppnK	1
851	sthA	1
852	pntA	2
853	pntB	1
854	soxB_	3
855	soxA	2
856	soxD	1
857	soxG	1
858	opuA osmV yehX	1
859	opuCA	1
860	opuBD yehW	2
861	opuC yehZ	1
862	opuD ytfQ	2
863	betA CHDH	3
864	betC	1
865	betI	3
866	gbuA proV	2
867	gbuB proW	2

868	gbuC proX	8
869	proP	9
870	gbcA	1
871	gbcB	2
872	ykuT ybiO	1
873	yggT ylmG	1
874	nth	2
875	rhIE	11
876	emrB	5
877	osmE	1
878	vicR walR yycF micA	1
879	mscL	1
880	mscS yggB	4
881	mscM ybdG	1
882	kefB	1
883	kefG	1
884	mscK kefA aefA	3
885	phaA	1
886	phaC	1
887	phaD	1
888	phaE	1
889	phaF	1
890	phaG	1
891	cvrA nhaP2	1
892	czcO noxC yrdP trkA hapE	2
893	panS yocS ybaS	3
894	nhaK TC_CPA1	2
895	nhaA	2
896	nhaR	1
897	TC_SSS yerK opuE	1
898	putP yycG	1
899	TMEM165 gdt1	1
900	yloB ctpA	6
901	mgtE	2
902	mgtC	2
903	corA yjfQ	2
904	yrkA	1
905	yfbK	2
906	oprH	1
907	lysC	1
908	asd	3
909	doeA	1
910	doeB	2
911	doeC	1

912	doeX	11
913	ectB dat	1
914	treB	1
915	treC	1
916	treR2	1
917	treS	1
918	treY glgY	1
919	treZ glgZ	2
920	malK mtlK thuK	1
921	SPP_like	1
922	proA	1
923	proB	1
924	proC	3
925	proY	1
926	argHA	3
927	argAB	2
928	argJ	2
929	argB	1
930	ocd	1
931	argC	2
932	argD pqqI	4
933	argE	3
934	degS	1
935	degQ lhoA	1
936	gdhB	1
937	ycaD	4
938	atpC	1
939	atpD	1
940	atpG	1
941	atpA	1
942	atpH	1
943	rfbC rmlC	2
944	atpF	1
945	atpE	1
946	atpB	2
947	spoT	2
948	lon	6
949	rpmEB	2
950	prkA yeaG	1
951	rsbV	1
952	smpB	1
953	tatB	1
954	acrR1	1
955	katE CAT catB srpA	5



956	TC_LIVCS brnQ	1
957	ybaL TC_KEF	2
958	yrbG	1
959	yflA TC_AGCS	1
960	ydjE	4
961	olsA	1
962	olsB	1
963	olsE	1
964	evgS bvgS	4
965	evgA bvgA	4
966	uctC yfdE	1
967	pqiB	3
968	yerD	1
969	yfkH	2
970	yfkJ wzb	1
971	csbB gtrB yfdH	1
972	dnaJ	2
973	djlA	1
974	dnaK	7
975	dks	3
976	groES mopB	1
977	groEL mopA	1
978	clpA	2
979	clpB	2
980	clpC	1
981	clpP	3
982	clpX	2
983	htpX ykrL	1
984	hslJ	1
985	hslR yrfH	1
986	hptG	1
987	ibpA	1
988	hsp33 hslO	1
989	pspE	1
990	grpE	1
991	ytvA pfyP	2
992	ypdC	16
993	lapA	1
994	cspA	6
995	rpoS	3
996	yfhD	2
997	yfhF	1
998	phbB phaB	1
999	phbC phaC	2

1000	phaJ croR	2
1001	paiB yumE	1
1002	disA	1
1003	dnaA	3
1004	ftsW spoVE	1
1005	parB spo0J yyaA	3
1006	relA	1
1007	rcsB	1
1008	liaR	1
1009	gtaB UGP2 galU galF	2
1010	dinB	3
1011	umuC	1
1012	yx1J aag	2
1013	yugI	1
1014	lexA	4
1015	radA	1
1016	ligD	5
1017	uvrA	1
1018	uvrB	2
1019	uvrC	1
1020	bolA	2
1021	rcdA	2
1022	yoZG	1
1023	rpoE sigW	11
1024	pyrF	1
1025	uspA	1
1026	ykgB pgl	2
1027	rseA	1
1028	surA	1
1029	uspE	1
1030	yfkM pfpI yraA	4
1031	csbC	2
1032	nhaX	1
1033	yciH	1
1034	rstA	1
1035	rstB	1
1036	creC	1
1037	creB	1
1038	cstA	2
1039	csrA zfiA	4
1040	cyaA	1
1041	clpC	3
1042	psiE yjbA	1
1043	umuD	2

1044	prc ctpA	2
1045	cpxR	1
1046	degP htrA	3
1047	ppiA	2
1048	ppiB	3
1049	dsbA	1
1050	fliC laf1 lafA fla1 hag	1
1051	flgK	1
1052	fliD flaB	1
1053	tuaH	2
1054	tuaB	1
1055	wecA tagO rfe	3
1056	elf18 tuf tufA	6
1057	nodS	1
1058	nodN	1
1059	nodU	4
1060	nodV	1
1061	nodW	1
1062	nodD	1
1063	nodT ameC	1
1064	flhA lfhA fhiA rhcV	1
1065	flhB	1
1066	fliH	1
1067	fliI lgiI	2
1068	fliOZ	1
1069	fliP rhcR	1
1070	fliQ lfiQ	1
1071	fliR lfiR	1
1072	motA	2
1073	motB	2
1074	motY	1
1075	fliG	1
1076	fliM	1
1077	fliN lfiN fliNY cheC cheD	1
1078	flgA	1
1079	flgH	1
1080	flgI	1
1081	fliF	2
1082	flaG	1
1083	flgB	1
1084	flgC	1
1085	flgD	1
1086	flgE	1
1087	flgF	1

1088	flgG	1
1089	flgJ	1
1090	flgL	1
1091	fliE lfiE	1
1092	fliK motD	1
1093	fliL	2
1094	flgM	1
1095	flgN	1
1096	flhF	1
1097	flhG	3
1098	flrA fleQ	1
1099	flrB fleS	1
1100	flrC fleR	1
1101	hdfR	1
1102	fliA sigD whiG	1
1103	fliJ	1
1104	fliS	1
1105	fliT	1
1106	fliY tcyA yckK	2
1107	cheA wspE	3
1108	cheB chpB wspF	2
1109	cheBR	9
1110	cheR pilK	3
1111	cheV	3
1112	cheW	2
1113	cheY yneI	3
1114	cheZ	1
1115	aer	2
1116	mcp tlpC tlpA dcrA	28
1117	rbsB	1
1118	wspA	1
1119	wspB	1
1120	wspC	1
1121	wspD	1
1122	wspE	1
1123	wspF	1
1124	wspR	1
1125	chpA	1
1126	chpC	1
1127	chpD	3
1128	pilG	1
1129	pilH	2
1130	pilI	1
1131	pilJ	1

1132	pilR pehR	1
1133	pilT	1
1134	perP	1
1135	pleD	7
1136	pilA	1
1137	flp pilA	1
1138	pilB	1
1139	pilC	1
1140	pilD	1
1141	pilE	1
1142	pilF	2
1143	pilN	1
1144	pilM	1
1145	pilOP	1
1146	pilQ	1
1147	pilW	1
1148	pilX	1
1149	cpaA	1
1150	cpaB	1
1151	cpaC	2
1152	cpaE	1
1153	cpaF	1
1154	fimA	1
1155	fimC	2
1156	fimD fimC mrkC htrE cssD	2
1157	fimT	1
1158	fimV	1
1159	efp	1
1160	ycgR	1
1161	acgA	1
1162	sylA	2
1163	msmX msmK malK sugC ggtA msiK	1
1164	smoE mtlE	1
1165	smoF mtlF	1
1166	smoG mtlG	1
1167	gudP	2
1168	gtsA glcE	1
1169	gtsB glcF	1
1170	gtsC glcG	1
1171	glpP	1
1172	rbsC	1
1173	rbsD	1
1174	rbsA	2
1175	ytfQ	1

1176	mocA	1
1177	mocC	1
1178	mocR	6
1179	glpV	1
1180	glpQ	1
1181	glpS	1
1182	glpT	1
1183	glpT	1
1184	lamB	1
1185	ptsH	2
1186	ptsGb ganC	1
1187	mngR farR	3
1188	fruA	1
1189	uhpC	1
1190	uhpB	2
1191	uhpA	2
1192	ynfM	1
1193	exuT	1
1194	oxlT	2
1195	dctB	2
1196	dctD	2
1197	dctP	2
1198	dctQ	2
1199	dctM	3
1200	tctA	1
1201	tctB	2
1202	tctC	1
1203	tctD	1
1204	tctE	1
1205	talA talB	1
1206	zwf	3
1207	gnd gntZ	2
1208	rpiA	1
1209	hisG	2
1210	rbsK	1
1211	araD ulaF sgaE sgbE	1
1212	rpe cbbE	1
1213	fucA	3
1214	deoC	1
1215	araB L_arabinonolactonase	1
1216	araC	2
1217	xylB	1
1218	yajO iolS	2
1219	fruK fpk	1

1220	fruR1	1
1221	fbaA cbbA	2
1222	scrK	1
1223	glmS nodM	1
1224	fbp cbbFC	1
1225	fdhL	1
1226	fdhC	1
1227	yliI	1
1228	pgm	2
1229	pgmB	1
1230	pmm_pgm	1
1231	glk	1
1232	pgi	2
1233	rhaS	1
1234	rhaR	2
1235	galK	2
1236	DPM1_like arnC ppm1 wcaA	1
1237	ugd tuaD	2
1238	manA	1
1239	algA xanB rfaB wbpW pslB	1
1240	mgtA	1
1241	pld	2
1242	agaR	1
1243	sfsA	1
1244	hexR yebK	2
1245	lacI galR	2
1246	tpiA	1
1247	gapA	3
1248	gapN	1
1249	pgk	1
1250	gpmB	3
1251	gpmI	2
1252	eno	1
1253	gntK idnK	1
1254	kduD	1
1255	dgoR	2
1256	lldF ykgF lutB	1
1257	dld2	1
1258	lldR	3
1259	otnI ygbM	1
1260	garD	1
1261	kdgD ybcC	1
1262	aldH	2
1263	garR glxR	4

1264	garK glxK	1
1265	gudD	1
1266	kdgR	5
1267	exuR	4
1268	udh	1
1269	mtlK	1
1270	glpK	1
1271	glpR	1
1272	glpQ ugpQ	4
1273	suhB	2
1274	glgP	4
1275	malQ	1
1276	glgE	1
1277	malT	2
1278	celJ eglA eglS	2
1279	pda pgdA	4
1280	glucoamylase_like	1
1281	wecB	1
1282	wbpP	1
1283	trxB	1
1284	glmM	1
1285	glmU	1
1286	csxA	1
1287	cap1J wbgU	2
1288	mupP	1
1289	amgK	3
1290	murU	1
1291	bglX	1
1292	rrrD	1
1293	EC_3_2_1_58 bglC	2
1294	ISA treX	1
1295	EC_3_2_1_81 dagA	1
1296	MNS1_2_like	1
1297	algL	1
1298	putative_alginate_lyase_2	3
1299	putative_alginate_lyase	1
1300	ghrA	1
1301	citE	1
1302	citR	2
1303	icd2	1
1304	sucC	1
1305	bshA	3
1306	bshB1	1
1307	ulaG	1



1308	mdcA	1
1309	mdcB	1
1310	mdcC	1
1311	mdcD	1
1312	mdcE	1
1313	mdcG	1
1314	mdcH	1
1315	fdoG fdhF fdwA	3
1316	fdh	1
1317	fdoH fdsB	2
1318	fdoI fdsG	2
1319	fdsD	1
1320	nicA	1
1321	nicB	1
1322	nicC	1
1323	nicD	1
1324	nicE	1
1325	nicF	2
1326	nicX	1
1327	nicR	1
1328	quiB	1
1329	bsdA	5
1330	puuR	4
1331	ephA	1
1332	ahr yjbB	1
1333	atuC atuF	1
1334	galR	3
1335	padA	1
1336	yfiH	1
1337	calB	1
1338	yhhW pirA	3
1339	EC_1_3_1_45_like	1
1340	CHI_like	1
1341	metK	1
1342	map	2
1343	mdeA	2
1344	ybdL	1
1345	ridA tdcF	8
1346	alr	1
1347	ddl	3
1348	ala	2
1349	arcA	1
1350	arcB argF argI	5
1351	arcC	1

1352	astA	3
1353	astE	1
1354	aspB	1
1355	aspA	2
1356	argG	1
1357	purA	1
1358	asnB	4
1359	hom	1
1360	EC_3_5_1_1 ansA ansB	2
1361	sufS	2
1362	murI	2
1363	putA	1
1364	glsA	1
1365	purF	2
1366	hutH	2
1367	hutI	1
1368	hutF	2
1369	hutU	1
1370	hutD ves	1
1371	cysE	3
1372	thrB2	1
1373	aaaT	1
1374	phhA	1
1375	hisC	2
1376	tyrB	2
1377	dadA	2
1378	ldh leu	1
1379	davB	1
1380	lhpD	1
1381	ddc	1
1382	ltaE	1
1383	aoa	1
1384	gcvP	2
1385	metQ	4
1386	metI	3
1387	metN	3
1388	PA5153	1
1389	PA5154	1
1390	PA5155	1
1391	PA5152	1
1392	hutM	1
1393	hisJ	1
1394	hisM	1
1395	hisQ	1

1396	hisP	1
1397	cycA ydgF	1
1398	arcD lysl lysP	2
1399	lysE argO	1
1400	aotJ	1
1401	aotM	1
1402	aotQ	1
1403	aotP	1
1404	tcyB yecS	1
1405	tcyC yecC	1
1406	livK	3
1407	livH	3
1408	livM	3
1409	livG	3
1410	livF	3
1411	ABC_PA_A	6
1412	ABC_PA_P	11
1413	ABC_PA_S	18
1414	yuiF	1
1415	aroP	2
1416	TC_APA yhdG	2
1417	aapJ bztA	1
1418	aapQ bztB	1
1419	aapM bztC	1
1420	aapP bztD	1
1421	occP nocP	1
1422	putative_saccharopine_dehydrogenase	1
1423	putative_saccharopine_dehydrogenase	1
1424	pepT	1
1425	acdP	2
1426	pepD	1
1427	PREP	1
1428	ptrB	1
1429	prlC	1
1430	PUTATIVE_PROTEASE	3
1431	rhtB	14
1432	nepI	1
1433	pydC	4
1434	uraH pucM hiuH	1
1435	uraD	1
1436	pyrC	4
1437	carB	2
1438	carA	1
1439	pyrB	1

1440	pyrDI	1
1441	pyrDII	1
1442	pyrD	1
1443	pyrE	1
1444	pyrH	1
1445	ndk	1
1446	pyrG	1
1447	cmk	1
1448	dcd	1
1449	udk	2
1450	upp	1
1451	pyrR	1
1452	ydfG	3
1453	ppnP yaiE	1
1454	ppnN ygdH	1
1455	codA	1
1456	nrdD	1
1457	nrdA nrdE	1
1458	nrdB nrdF	1
1459	dut	1
1460	cdd	1
1461	deoA	2
1462	tmk	1
1463	guaB	1
1464	apt	1
1465	gmk	1
1466	prsA	2
1467	dgt	1
1468	amn	1
1469	allA	1
1470	guaD	2
1471	nudF	1
1472	apaH	2
1473	purE	1
1474	purK	1
1475	purB	2
1476	cyaB gidA	8
1477	purC	1
1478	purM	1
1479	purD	1
1480	guaA	2
1481	purL	1
1482	rdgB	3
1483	cpdA	2

1484	nudE	1
1485	ylbA	1
1486	tilS_hprT	2
1487	ndx1	2
1488	hit	1
1489	ade	1
1490	hpxY	1
1491	atoE	1
1492	ECHS1	1
1493	fadE	1
1494	ACADSB	2
1495	GCDH gcdH	1
1496	aas	1
1497	rubB alkT	2
1498	cdhR	5
1499	dhcR	11
1500	lcdH cdhA	2
1501	cdhC	1
1502	TC_BCT	1
1503	tgnP	1
1504	hpbA	3
1505	xerC	2
1506	int intR intV intQ intW xerC	4
1507	xerD	2
1508	bioM	1
1509	birA bpr	1
1510	bioC	5
1511	bioH	1
1512	bioF	3
1513	bioA	1
1514	BIO3_BIO1	1
1515	bioD	1
1516	bioB	1
1517	HLCS	2
1518	ata sadA emaA	21
1519	lapA	84
1520	bmaC yapH	1
1521	ompW yciD	1
1522	ompA_ompF_porin oprF	10
1523	lapB	2
1524	lapC	2
1525	lapE	2
1526	lapD	1
1527	lapP	1

1528	mlrA	1
1529	bcsC	3
1530	tadB	1
1531	tadC	1
1532	lpxA	1
1533	lpxB	2
1534	lpxC	1
1535	lpxD	1
1536	lpxO	2
1537	lpxH	2
1538	lpxK	2
1539	lpxT	1
1540	pagL	3
1541	eptA	3
1542	parR	1
1543	gpgS	1
1544	migA	1
1545	waaA kdtA	2
1546	waaC rfaC	1
1547	waaF rfaF	1
1548	waaG rfaG	1
1549	waaP rfaP	4
1550	waaQ rfaQ	1
1551	waaZ rfaZ	1
1552	ascD ddhD rfbI	2
1553	rfaA rmlA rffH	1
1554	rfaB rmlB rffG	1
1555	rfaD rmlD	3
1556	algD	1
1557	wecE rffA	2
1558	wbpM	1
1559	wbpV	1
1560	gmhA lpcA	1
1561	gmhB yaeD	1
1562	gmhC hldE waaE rfaE	1
1563	kdsA	1
1564	kdsB	1
1565	kdsC	1
1566	kdsD kpsF	1
1567	rfaC	3
1568	waaL rfaL	2
1569	wbpL	1
1570	lptF	1
1571	lptG	1

1572	lptE rlpB	1
1573	lptD imp ostA	1
1574	lptC yrbK	1
1575	lptB	1
1576	lptA yhbN	1
1577	ABC_2_LPSE_P wzm rfbA tagG	1
1578	ABC_2_LPSE_A wzt rfbB tagH	1
1579	mcbR yncC	1
1580	ltaS	2
1581	tarL	1
1582	gtaC	1
1583	pgaC icaA	1
1584	ysiA fadR	2
1585	apeE estA lip_1	1
1586	pldB	4
1587	mdaB	1
1588	curA yncB	1
1589	galP	7
1590	aaeA	3
1591	aaeB	3
1592	GGDEF EAL PAC PAS_domain_containing_protein	13
1593	smtA	1
1594	queA	1
1595	mtaD	1
1596	sam	1
1597	yeeJ	5
1598	smp ytjB aphA	1
1599	typA bipA	1
1600	ygiM htrG	2
1601	erfK	1
1602	ybiS	1
1603	ynhG	1
1604	mltA	1
1605	mltB	2
1606	mltD dniR	2
1607	ldcA	1
1608	mepS spr	2
1609	mepH	1
1610	mepM	3
1611	envC	1
1612	nlpD	1
1613	ftsI	1
1614	mrcA	3
1615	mrcB	1

1616	mrda	3
1617	pbpC	1
1618	mpl	1
1619	cwlo	3
1620	lytF cwIE	1
1621	dacB	1
1622	dacC dacA dacD	1
1623	pbp4b	3
1624	ampH	1
1625	pbpG	1
1626	slt	1
1627	murA	1
1628	ampD	2
1629	mraY	2
1630	mtgA	1
1631	murB	1
1632	murC	1
1633	murD	1
1634	murE	1
1635	murF	1
1636	murG	1
1637	amiD	1
1638	amiA amiB amiC	4
1639	bacA	1
1640	bcrC	2
1641	uppS ispU	1
1642	EC_3_4_17_14	1
1643	mviM yceM	1
1644	murJ mviN	1
1645	wbbL	1
1646	pimC	2
1647	gpsA	1
1648	dgkA DGK	2
1649	dagK	2
1650	PLB	1
1651	plsB	2
1652	plsY	1
1653	plsC	3
1654	mprF fmtC	2
1655	GGR	1
1656	plsX	1
1657	yahK	1
1658	gck gckA	1
1659	lip lipC	2



1660	rlpA	3
1661	Int	1
1662	lolA	1
1663	lolB	1
1664	mlaA vacJ	2
1665	slyB	2
1666	yajG	1
1667	ybbJ	1
1668	lolC_E	2
1669	lolD	1
1670	hlpA ompH skp	1
1671	yidC spoIIIJ oxaA ccfA	2
1672	aglI	1
1673	spo0F	1
1674	spoVK	2
1675	spoVR	1
1676	yhbH	1
1677	yraD	1
1678	spsD	1
1679	spsE	1
1680	kinE	1
1681	kapD	1
1682	cepR solR tofR	3
1683	trbJ	1
1684	trbL	1
1685	tqsA ydgG	1
1686	lsrG	2
1687	wza gfcE epsA	1
1688	hfq	1
1689	fis	1
1690	aphB	3
1691	rpfG	1
1692	secE	1
1693	secG	1
1694	secY	1
1695	yajC	1
1696	secA	3
1697	ftsY	1
1698	secB	1
1699	ffh	1
1700	sagS	1
1701	PA1979	1
1702	hptB;	1
1703	hsbA;	1

1704	hsbR;	1
1705	glgA	1
1706	ladF	1
1707	ppkA	5
1708	impA	2
1709	impB	2
1710	impC	2
1711	impF	2
1712	impG vasA	2
1713	impH vasB	2
1714	impJ vasE	2
1715	impK ompA vasF dotU	2
1716	impL vasK icmF	2
1717	impM	2
1718	hcp	2
1719	vasG clpV	2
1720	sadC	2
1721	tpbB	2
1722	roeA	1
1723	mucR	9
1724	bifA	2
1725	pslE	1
1726	pslH	1
1727	pslL	1
1728	alg44	1
1729	alg8	1
1730	algE	1
1731	algF	1
1732	algG	1
1733	algH	1
1734	algI	2
1735	algJ	1
1736	algK	1
1737	algX	1
1738	algR	1
1739	kinB	1
1740	algB	1
1741	yegE	3
1742	adrA	3
1743	adrB	2
1744	exsA	2
1745	paaK	1
1746	bluR ycgE	3
1747	bluF ycgF	1

1748	gshA ybdK	1
1749	icaR	2
1750	arcA	1
1751	gcvA	13
1752	gcvR	1
1753	gspA	1
1754	gspD epsD	1
1755	gspE epsE	1
1756	exoP vpsO	1
1757	exoY	1
1758	exoZ	1
1759	cydA	1
1760	cydB	1
1761	ndhB	3
1762	nuoA	1
1763	nuoB	1
1764	nuoCD	1
1765	nuoE	1
1766	nuoF	1
1767	nuoG	1
1768	nuoH	1
1769	nuoI	1
1770	nuoJ	1
1771	nuoK	1
1772	nuoL	1
1773	nuoM	1
1774	nuoN	1
1775	cas2	1
1776	csa5	1
1777	cas4	3
1778	hsdR	2
1779	hsdM	1
1780	K07317	1
1781	K07318	1
1782	yhdJ	1
1783	res	1
1784	mod	2
1785	mrr	2
1786	antitoxin_YdaS	1
1787	toxin_chpB chpBK	1
1788	antitoxin_chpS chpBI	1
1789	antitoxin_relB pasA	1
1790	toxin_ratA yjfG	1
1791	antitoxin_ratB yjfF pasI	1

1792	toxin_yoeB	1
1793	antitoxin_yefM	1
1794	toxin_hicA	1
1795	antitoxin_hicB	1
1796	toxin_higB_like	1
1797	antitoxin_higA_1	1
1798	toxin_yxiD	1
1799	toxin_darT	3
1800	ftsZ	1
1801	mreB	2
1802	parC	2
1803	parE	3
1804	antitoxin_abrB	5
1805	toxin_cptA ygfX	1
1806	antitoxin_cptB ygfY sdhE	1
1807	BrnA_antitoxin	1
1808	BrnT_toxin	3
1809	spvB eat1	2
1810	prtC	7
1811	marA	1
1812	tetA	1
1813	macA pvdR	2
1814	macB ybjZ pvdT	2
1815	rlmA2	1
1816	cfr	1
1817	tylC oleB carA srmB	2
1818	msrA vmlR	5
1819	mdfA cmr	1
1820	catA	1
1821	catB	1
1822	smvA qacA lfrA	2
1823	hcaT	1
1824	nudJ ymfB	1
1825	penP	1
1826	pac	1
1827	ampC	1
1828	ampE	1
1829	ampG	1
1830	mexT	8
1831	oprD	7
1832	blaTEM	1
1833	catD	4
1834	mhqD	1
1835	lmrP	2

1836	ydfI	1
1837	ydfJ	1
1838	aadA	2
1839	aph spcN	1
1840	nimD	1
1841	sugE	2
1842	mexE	1
1843	mexF	1
1844	oprN	2
1845	mexJ	1
1846	mexK	1
1847	mexL	2
1848	bpeT	25
1849	oprC opcM	2
1850	norG	3
1851	ydhP	4
1852	bcr tcaB	7
1853	mdlA smdA	3
1854	mdlB smdB	2
1855	mexM	1
1856	mexN	1
1857	ramA	1
1858	TC_MATE norM mdtK dinF	2
1859	triA	1
1860	triB	1
1861	triC	1
1862	vcaM	2
1863	yebQ	1
1864	mdtD	1
1865	emrB	4
1866	emrE qac mmr smr	2
1867	marR	1
1868	cecR ybiH	2
1869	secD	1
1870	secF	1
1871	tatA	1
1872	tatC	1
1873	ecpB matC	1
1874	ecpC matD	1
1875	hlyB cyaB	1
1876	hasD prtD	2
1877	hasE prtE	2
1878	hasF prtF	2
1879	comEA	1

1880	comEC	3
1881	comFA	1
1882	comFC	2
1883	yscD sctD ssaD	1
1884	yscJ sctJ hrcJ ssaJ	1
1885	yscL sctL	1
1886	yscN sctN hrcN ssaN	1
1887	yscQ sctQ hrcQ ssaQ spaO	1
1888	yscR sctR hrcR ssaR	1
1889	yscS sctS hrcS ssaS	1
1890	yscT sctT hrcT ssaT	1
1891	yscU sctU hrcU ssaU	1
1892	yscV sctV hrcV ssaV invA rhcV	1
1893	yscY sctY	1
1894	flhB2	1
1895	dsbC	1
1896	ssp pspB pspA ssph1 ssph2	1
1897	pspA	2
1898	aidA_I misL	2
1899	prn	1
1900	fhaC tpsB	2
1901	shlA hhdA hpmA	3
1902	shlB hhdB hpmB tpsB	1
1903	vgrG	6
1904	ppa prpA	5
1905	vasD lip	1
1906	fha1	2
1907	sfa3	3
1908	essC eccC ftsK spoIIIE	2
1909	atpI	1
1910	yqjQ	6
1911	greA	5
1912	phnA yjdM	1
1913	phnB yjdN	3
1914	faeB	1
1915	kaiC	1
1916	hdhA	1
1917	tnpA	1
1918	tnp	1
1919	yafM rayT tnpA	2
1920	putative_transposase	2
1921	fdxA	2
1922	petA	1
1923	petB	1

1924	petC	1
1925	ycf3	5
1926	iucB_like	1
1927	mbaO	1
1928	mbaF	1
1929	putative_hydrolase	1
1930	Major_facilitator_family_transporter	1
1931	lgrB	8
1932	lgrE	25
1933	pltR	1
	Total=	3714

## Appendix IV

### Multigenome synteny matrix of different *Pseudomonas* strains

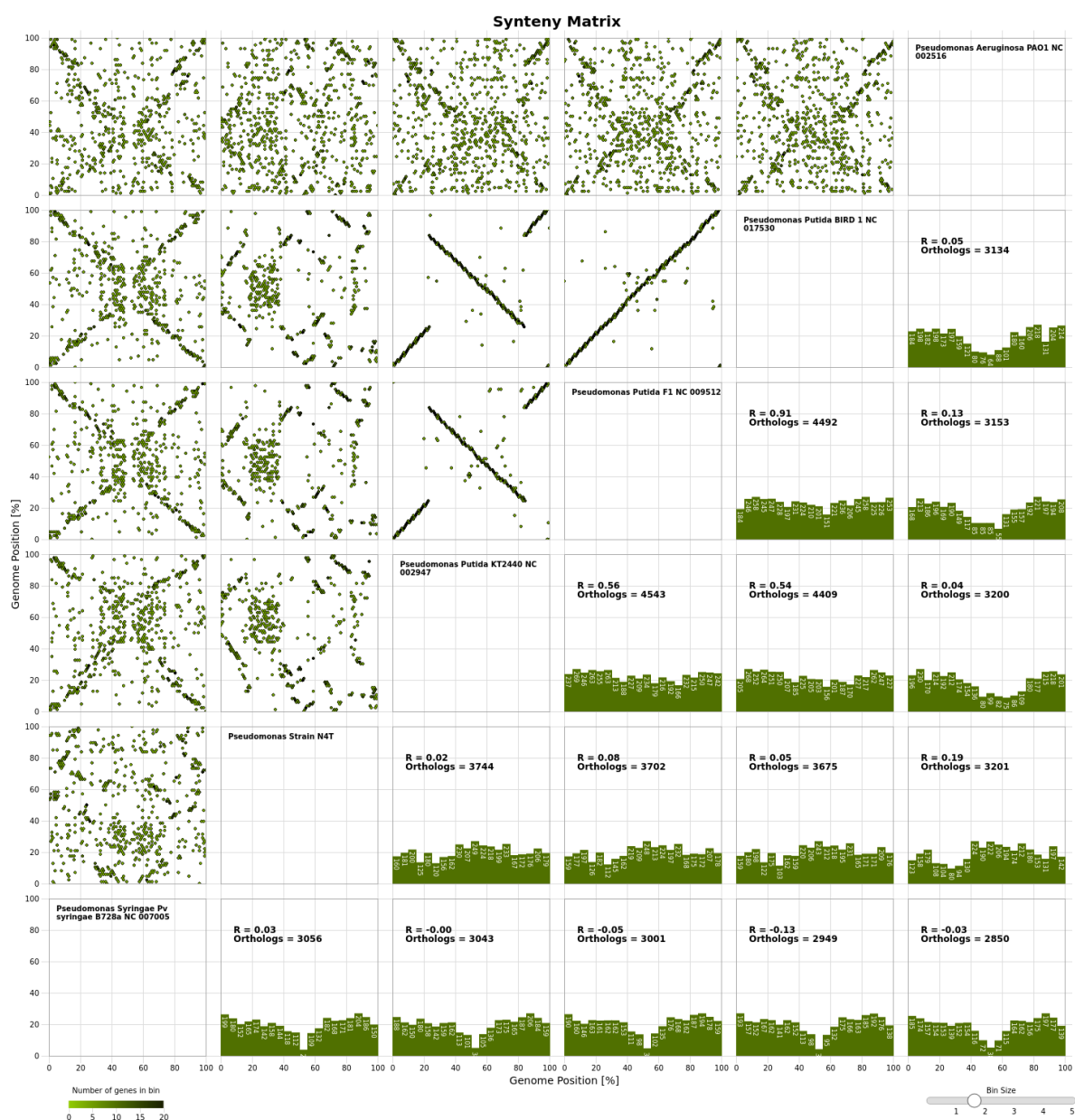


Fig: Synten matrix. Synten matrix for the six *Pseudomonas* strains, from top to bottom: *Pseudomonas aeruginosa* PAO1, *Pseudomonas putida* BIRD 1, *Pseudomonas putida* F1, *Pseudomonas putida* KT2440, *Pseudomonas putida* N4T and *Pseudomonas syringae* Pv. *Syringae* B728a. The upper triangular matrix shows synteny plots for every pair wise comparison of the six genomes. The low triangular matrix shows correlation parameters and a histogram of the number of gene pairs in different quantile of the synteny plot.



## List of Publications

### Published

- [1] Singh, N., Phukan, T., **Sharma, P. L.**, *et al.* An Innovative Root Inoculation Method to Study *Ralstonia solanacearum* Pathogenicity in Tomato Seedlings. *Phytopathology*, 108(4): 436-442, 2018.
- [2] Phukan, T., Kabyashree, K., Singh, R., **Sharma, P.L.**, *et al.* *Ralstonia solanacearum* virulence in eggplant seedlings by the leaf-clip inoculation. *Phytopathology Research*, 23(1).
- [3] Dowarah, B., Agarwal, H., Krishnatreya, D., **Sharma, P.L.**, *et al.* Evaluation of seed associated endophytic bacteria from tolerant chilli cv. Firingi Jolokia for their biocontrol potential against bacterial wilt disease. *Microbiological Research*, <https://doi.org/10.1016/j.micres.2021.126751>

### Manuscript under preparation

- [1] **Sharma, P. L.**, *et al.* Characterization of *Pseudomonas putida* N4T a bacterial endophyte isolated from tomato seedlings and its effect against the bacterial phytopathogen *Ralstonia solanacearum* F1C1
- [2] **Sharma, P. L.**, *et al.* Heat shock mediated transformation in *Pseudomonas putida* N4T, a bacterial endophyte of tomato that inhibits the growth of the bacterial wilt pathogen *Ralstonia solanacearum* F1C1

### Book Chapter

Konwarh, R., and **Sharma, P.L.** “Nanosensor platforms for surveillance of plant pathogens and phytometabolites/analytes vis-à-vis plant health status”. In Book “Nanomaterials for Agriculture and forestry applications”, *Elsevier*, 2020.

### Oral presentation

- [1] **Sharma, P. L.**, *et al.* Tomato seedlings isolated bacteria exhibit antagonistic activity towards a bacterial phytopathogen, *Ralstonia solanacearum*, causal agent of bacterial wilt. Host-Microbe Interactions, IASST, 1-2 Feb, 2019
- [2] **Sharma, P.L.**, *et al.* *Pseudomonas puida* N4T isolated from tomato seedlings shows bio-control activity against phytopathogen *Ralstonia solanacearum*, causal agent of bacterial wilt. ABC-01, International conference on plant science, GU, 4-6 Feb, 2019

### Poster presentations

- [1] **Sharma, P.L.**, et al. Isolation and characterization of bacteria from tomato seedlings exhibiting antagonistic activity against *Ralstonia solanacearum* , a bacterial pathogen of tomato. TIMR, ADNAT, 4<sup>th</sup> and 5<sup>th</sup> Feb, 2018, Tezpur University, Assam
- [2] **Sharma, P. L.**, et al. Effect of a bacterial endophyte isolated from tomato seedlings in control of bacterial wilt disease caused by *Ralstonia solanacearum*. AMI 2017, BBAU, Lucknow. Page no. 292
- [3] **Sharma, P.L.**, et al. Evaluation of antagonistic activity of bacterial endophytes isolated from tomato seedlings against tomato pathogen *Ralstonia solanacearum* in seedling condition. ISPBCI, 21-22 January, 2017, IIT, Guwahati. Page No.
- [4] **Sharma, P.L.**, et al. Protection against *R. solanacearum* infection in tomato seedling using an endophyte isolated from tomato seedlings. IBWS, 3-7 July, 2016, Toulouse, France. Page No. 51
- [5] **Sharma, P.L.**, et al. Tomato seedling endophytic bacteria inhibiting the growth of *Ralstonia solanacearum*, a bacterial pathogen of tomato plant. MCB 75, IISc, Bangalore. Page No. 72