	List of Tables	
Chapter 1	**Review of Literature and Introduction**	**Page No.**
Table 1.1	Cross-inoculation group and *Rhizobium*-legume association	2
Table 1.2	Growth-promoting substances released by phosphate solubilizing bacteria	13
Table 1.3	Ten years of studies on legume co-inoculation (2002-2012).	18
Table 1.4	Organic acids involved in P-solubilization and produced by PS bacteria	28
Table 1.5	Organic acids produced by phosphate solubilizing fungus	28
Table 1.6	Distribution of enzymes acting at PEP-pyruvate-OAA node in different bacteria.	44
Table 1.7	Cloning of genes involved in mineral phosphate solubilization	55
Table 1.8	Organic acids for phosphate solubilisation in different soil types	59
Chapter 2	**Materials and Methods**	**Page No.**
Table 2.1	List of *E. coli* strains used in the present study.	65
Table 2.2	List of *E. coli* strains used in the present study.	66
Table 2.2	List of *Rhizobium* strains used in the present study.	66
Table 2.3	List of plasmids used in the present study.	67
Table 2.4	Recommended doses of antibiotics used in this study	69
Table 2.5	PCR conditions used in the present study	77
Chapter 3	**Effect of constitutive overexpression of ppc gene of Synechococcus elongatus PCC 6301 on production of organic acid in *B. japonicum*USDA110 and *M. loti* MAFF030669**	**Page No.**
Table 3.1	Bacterial strains used in this study	102
Table 3.2	P solubilization index on Pikovskyas agar of *B. japonicum* USDA110 and *M. loti* MAFF0300669 transformants during 3 days of growth *Bj* and *Ml*:	106
Table 3.3	Physiological variables and metabolic data from of *B. japonicum* and *M. loti* MAFF0300669 *ppc* transformants	108

	grown in TRP medium.	
Table 3.4	Biofilm, exopolysaccharide and indole acetic acid production by *Bj* (pAB3) and *Ml* (pAB3) transformants in TRP medium	109
Table 3.5	Intracellular Citric acid levels of *Bj* (pAB3) and *Ml* (pAB3) transformants in TRP medium	110
Chapter 4	**Effect of overexpression of *E. coli cs* gene on production of organic acid in *B. japonicum* USDA110 and *M. loti* MAFF0300669**	**Page No.**
Table 4.1	List of bacterial strains used.	125
Table 4.2:	P solubilization index on Pikovskyas agar of *B. japonicum* USDA110 and *M. loti* MAFF030669 transformants during 3 days of growth.	131
Table 4.3	Physiological variables and metabolic data from of *B. japonicum* USDA110 and *M. loti* MAFF030669 *cs* transformants grown in TRP medium.	133
Table 4.4	Biofilm, exopolysaccharide and indole acetic acid production by *Bj* (pAB7) and *Ml* (pAB7) transformants in TRP medium	134
Table 4.5:	Intracellular citric acid production by *Bj* (pAB7) and *Ml* (pAB7) transformants in TRP medium.	137
Chapter 5	**Effect of overexpression of *E. coli* NADH insensitive Y145F *cs* gene on production of organic acid in *B. japonicum* USDA110 and *M. loti* MAFF030669**	**Page No.**
Table 5.1	NADH binding and inhibition by variant CSs (Stokell et al., 2003)	146
Table 5.2	List of bacterial strains	155
Table 5.3	P solubilization index on Pikovskyas agar of *B.japonicum* USDA110 and *M. loti* MAFF0300669 transformants during 3 days of growth *Bj* and *Ml*.	159
Table 5.4	Physiological variables and metabolic data from of *B. japonicum* USDA110 and *M. loti* MAFF0300669 *cs** transformants grown on TRP medium.	161
Table 5.5	Biofilm, exopolysaccharide and indole acetic acid production by *Bj* (pJNK3) and *Ml* (pJNK3) transformants in TRP medium with 50 mM Glucose .	162
Table 5.6	Intracellular citric acid production by *Bj* (pJNK3) and *Ml* (pJNK3) transformants in TRP medium.	164
Chapter 6	**Effect of overexpression of *E. coli* NADH insensitive**	**Page**

	Y145F *cs* and Na+ dependant citrate transporter in *B. japonicum* USDA110 and *M. loti* MAFF030669.	**No.**
Table 6.1	Enhanced organic acid efflux by transporter gene expression	171
Table 6.2	Characterized members of the 2HCT family (Lolkema, 2006).	186
Table 6.3	Bacterial strains used in this study	185
Table 6.4	P solubilization index on Pikovskyas agar of *B. japonicum* USDA110 and *M. loti* MAFF030669 *transformants* during 3 days of growth *Bj* and *Ml.*	189
Table 6.5	Physiological variables and metabolic data from of *B. japonicum* USDA110 and *M. loti* MAFF030669 *ppc* transformants grown in TRP medium	191
Table 6.6	Biofilm, exopolysaccharide and indole acetic acid production by *Bj* (pJNK4) and *Ml* (pJNK4) transformants in TRP medium with 50 mM Glucose.	192
Table 6.7	Intracellular citric acid production by *Bj* (pJNK4) and *Ml* (pJNK4) transformants in TRP medium	195
Chapter 7	**Genomic integration of *E. coli* NADH insensitive *cs* along with Na^+ dependent citrate transporter *citC* gene of *Salmonella typhimurium* with *vgb, egfp* genes in *B. japonicum* USDA110 *M. loti* MAFF030669 and *S. fredii* NGR 234**	**Page No.**
Table 7.1	Bacterial strains used in this study.	204
Table 7.2	P solubilization index on Pikovskyas agar of *B. japonicum* USDA110, *M. loti* MAFF030669 and *S. fredii* integrants during 3 days of growth on 50 mM Tris-Cl buffer pH 8 and 50 mM glucose containing rock phosphate.	210
Table 7.3	Physiological variables and metabolic data of *B. japonicum USDA110, M. loti* MAFF0300669 and *S. fredii* NGR 234 integrants grown on 50 mM Tris-Cl buffer pH 8 and 50 mM glucose containing rock phosphate.	213
Table 7.4	Intracellular citric acid levels of *B. japonicum USDA110, M.*	216

	loti MAFF0300669 and *S. fredii* NGR 234 integrants grown on 50 mM Tris-Cl buffer pH 8 and 50 mM glucose containing rock phosphate	
Chapter 8	**Effect of *Sinorhizobium fredii* NGR 234 genomic integrant containing *E. coli* NADH insensitive *cs* along with *S. typhimurium citC*, *vgb* and *egfp* gene cluster on growth promotion of Mung bean (*Vigna radiata*) plants**	**Page No.**
Table 8.1	Bacterial strains used in this study.	228
Table 8.2	Effect of genomic integrant on number of *S. fredii* NGR 234 integrants in the rhizospheric soil and in nodules from 45 days old mung bean plants.	232
Table 8.3	Effect of genomic integrant on the N, P and K content of rhizospheric soil from mung bean plants of 45 days old.	233
Table 8.4	Effect of genomic integrant on total plant N, P, K and protein content of 45 days old mung bean plants.	234
Table 8.5	Effect of genomic integrant on N, P, K and protein content of pods from 45 days old mung bean plants	234
Table 8.6	Effect of *S. fredii* NGR 234 genomic integrant on growth parameters of mung bean at 20 Days after sowing.	238
Table 8.7	Effect of *S. fredii* NGR 234 genomic integrant on growth parameters of mung bean at 45 Days after sowing	239
Table 8.8	Effect of *S. fredii* NGR 234 genomic integrant on PQQ levels in leaves and nodules of mung bean plant	241