

CHAPTER 6

CONCLUSION

The experimental findings revealed that

1. 16S rDNA sequence homology, types of flagella, Gram stain reaction and RAPD-PCR fingerprints showed that the fast-growing isolates S171 and S172, isolates S174 and S175, and the slow-growing S162 and S178 were the same strains. Nitrogen-fixing isolate S172 was *Burkholderia* sp. S172, isolates S173 and S174 were tentatively identified as *Sinorhizobium fredii* S173 and S174.

2. *Burkholderia* sp. S172 was for the first time found to be a free-living nitrogen fixer in the rhizosphere of soybean (*Glycine max* cv. SJ 5) with high nitrogen fixing potential in terms of soybean cv. CM60 dry weight in Leonard jar experiments with nitrogen-free medium at pH 5.0 but not at pH 6.8. *Sinorhizobium fredii* S173 and S174 were found to have high nitrogen fixing potential when used to inoculate soybeans cv. SJ4 and SJ5 with nitrogen-free medium at both pH 5.0 and 6.8.

3. *Bradyrhizobium japonicum* S76, S78 and S162 (S178) were found to have good nitrogen fixing potential in terms of plant dry weight from Leonard jar experiments with nitrogen-free medium at pH 5.0. Nodulation of *B. japonicum* S76 and S78 in both soybeans *Glycine max* cv CM 2 and CM 60 yielded the highest dry weight (2.165 g/plant) while nodulation of *B. japonicum* S162 (S178) in soybean *Glycine max* cv ST 2 yielded the highest plant dry weight (2.24 g/plant) .

4. Growth curves at 30 °C, 35 °C, 40 °C, 45 °C showed *Burkholderia* sp. S172, *Sinorhizobium fredii* S173, s174 grew equally well over a broad temperature range (30°C-45°C) while *Bradyrhizobium japonicum* strains S76, S78 and S162(S178) were found to be thermotolerant.

5. Analysis of changes in protein profiles showed different responses in term of quantity of proteins when the seven bacterial strains were cultured at high temperatures. More 40 kDa polypeptide was found in *Burkholderia* sp. S172 when cultured at 40°C and

45°C. An increase in quantity of 43 kDa polypeptide was found in *B. japonicum* S162 (S178) when cultured at high temperatures. 55 kDa, 38 kDa and 25 kDa polypeptides were found to increase in *S. fredii* S173 and *B. japonicum* S162 (S178) at high temperature. No increase was observed for polypeptides with similar molecular weight as those of the heat shock proteins Clp (100 kDa), DnaK (70 kDa), GroEL (60 kDa) and GroES (10 kDa) in all the bacterial strains used in the experiments. Neither new protein bands nor decrease in protein quantity was observed in protein profiles of the seven bacterial strains cultured at high temperatures.



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