Summary

Until perhaps 10 years, studies of environmental stress and the legume-*Rhizobium* or *Bradyrhizobium* symbiosis were restricted to defining the problem, and to using physical or chemical amendments to overcome it, i.e., mulching to reduce soil temperature or liming to ameliorate soil acidity. The identification of bacterial strains and in some cases host cultivars that are tolerant to these stresses opens the way for alternate, lower cost solutions to these problems.

Therefore, in the present study, the ability of 25 local and foreign *Rhizobium* and *Bradyrhizobium* strains represent *R. meliloti* (5 strains), *R. leguminosarum* bv. *viceae* (5 strains), *R. leguminosarum* bv. *trifolii* (2 strains), *Bradyrhizobium* sp. nodulating peanut (5 strains) and *Bradyrhizobium japonicum* (5 strains) to tolerate increased concentrations of NaCl, high temperature, high levels of nitrogen, high pH values and desiccation was investigated. Rhizobial strains tolerant to the above mentioned stress conditions were selected and the symbiotic performance of the obtained strains was evaluated as well. Results are summarized as follows :

1- Effect of NaCl salinity on growth and survival of rhizobia :

1. All tested strains were able to tolerate NaCl concentration up to 0.1%. However, tolerance of NaCl salinization differed according to rhizobial spp. and strains. In general, *R. meliloti* and *R. leguminosarum* bv. *phseoli* were found to be more sensitive to NaCl salinity .

2. There was a great variation in the response of the tested strains to sodium chloride regimes. All strains were sensitive to higher concentration of NaCl (5%). The growth of some strains was completely inhibited at 2% NaCl. Some strains were sensitive to even 20g /L NaCl.

3. Two *Rhizobium leguminosarum* bv. *viceae* ARC 200F and ICARDA 441 were tolerant to 10 and 40 g/L NaCl, the two strains were identified as low and high tolerance to NaCl salinity respectively..

2- Growth and survival response of rhizobia to increasing temperature:

1. The most of the rhizobial strains tested showed optimum growth at 30-35 °C , then higher temperature resulted in gradual decreases in rhizobial numbers. Susceptibility to higher temperature of 50 °C is common among the rhizobial species and strains under investigation.

2. The decline in the number of surviving strains was especially noticeable between 40 and 45 °C . This behavior depends on the rhizobial sp. and strain.

3. In general, fourteen strains were found to tolerate temperature up to 45 °C such as *Rhizobium meliloti* (ARC 1, ARC 2, and A 2), *Rhizobium leguminosarum* bv. *viceae* (ARC 200 F and ARC 202F), *Rhizobium leguminosarum* bv. *trifolii* (TAL), *Rhizobium leguminosarum* bv. *phaseoli* (ARC 302 and UMR) , peanut *Bradyrhizobium* (619, 3339 and 601) and *Bradyrhizobium japonicum* (138, USDA 110 and ARC 500).

4. Three strains, however, were found to be susceptible to elevated temperature more than 35 °C such as *Rhizobium leguminosarum* bv.

viceae (ARC 206 F and ARC 207 F) and *Rhizobium leguminosarum* bv. *trifolii* (ARC 103).

5. Four rhizobial strains tolerant to high temperature representing peanut *Bradyrhizobium* (3456 T 40 °C and 619 T 45 °C) and *Bradyrhizobium japonicum* (3407 T 4o °C and 138 T 45 °C) were selected for further competence study.

3- Effect of mineral nitrogen levels on survival of rhizobia :

1. All tested strains were able to grow and survive under stress of 200ppm N as KNO_3 (20 kg N / fed) in YEM medium .
2. Strains representing *Rhizobium leguminosarum* bv. *viceae*, bv. *trifolii*, bv. *phaseoli* and *Bradyrhizobium* sp. (Peanut) were able to tolerate up to 300ppm N in liquid medium.
3. All tested strains representing *R. meliloti* were able to tolerate up to 400ppm N as KNO_3 (ARC 1, ARC 2, and ARC 3) . The other two strains (ARC 6 and A 2) were superior in surviving up to 500 ppm N.
4. With increasing the dose of mineral nitrogen up to 600 ppm N (KNO_3), no growth was observed for any of the tested strains.
5. Two rhizobial strains *Bradyrhizobium* sp. nodulating peanut (619 T 300 ppm N and 3456 T 500 ppm N) and two *Bradyrhizobium japonicum* strains (138 T 200 ppm N and 3407 T 500 ppm N) were selected for symbiotic performance evaluation as compared to sensitive original ones.