

## RHIZOLOGY OF SOME CROP LEGUMES IN SRI LANKA FOR PRODUCTION OF RHIZOBIAL INOCULANTS

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The application of chemical nitrogen fertilizer (urea) has led to various environmental, economic and health problems especially in the third world countries. The current study was undertaken to develop effective Rhizobial inoculants for 3 major legume crops in Sri Lanka namely, *Vigna mungo* (black gram), *Vigna radiata* (green gram) and *Glycine max* (soybean) to replace the use of urea in their production. Rhizobial isolates were obtained from root nodules of different cultivars of edible legumes, non-edible wild legumes and wild relatives of *Vigna* spp., from 34 agro-ecological zones representing major areas of food legume cultivation in Sri Lanka. Intrinsic resistance to antibiotics, carbon source utilization and tolerance to pH, salinity, temperature and drought were carried out for 143 isolates, followed by molecular characterization. Authentication and screening for infectivity and effectiveness of the isolates were carried out in sand cultures as pot experiments. Based on the experimental results, strains isolated from non-edible wild legumes (6 strains) and wild relatives of *Vigna* spp. (4 strains), which were infective and/or effective and stress tolerant were selected for cross inoculation with the 3 legume crops to determine the most suitable strain/s for each crop. Molecular characterization revealed that these 10 strains were different from each other. The selected strains were field tested in the Department of Botany, Faculty of Science, University of Peradeniya and in the dry zone of Sri Lanka under farmers' practice (*V. mungo* and *V. radiata*; at Mahailuppallama and Bulagala and *G. max*; at Mahailuppallama and Galnawa) as single strain and multi strain inoculants. The results of all the trials indicated that the addition of rhizobial inoculants increased the growth performances of all treatments when compared to the N- control and in some instances even significantly higher ( $p \leq 0.05$ ) than the N fertilizer application. The results of the single strain inoculation in *V. mungo*, *V. radiata* and *G. max* indicated that 2, 1 and 3 strains resulted in significantly higher yields of 4% -16%, 3% - 4% and 7% - 14% respectively for each crop over the N fertilizer application. In the trial with multi strain and single strain inoculation, in *V. mungo* all the inoculants gave higher yields compared to N fertilizer application, while 2 single strain inoculants and 3 multi strain inoculants resulted in significant yield increases ranging from 3% to 39%. With *V. radiata* yield increases ranged from 5% to 14%, while a single strain inoculant and a multi strain inoculant resulted in significantly higher yields. In *G. max*, 2 single strain inoculants and 2 multi strain inoculants gave significantly higher values compared to N fertilizer application, with yield increases ranging from 4% to 13%. In *V. mungo* and *G. max* multi strain inoculants resulted in higher increases in yield when compared to single strain inoculants, whereas in *V. radiata* both single and multi strain inoculants gave similar increases. In conclusion, the current study has shown that the Rhizobial inoculants, both single strain and multi strain have the capability of replacing urea application to *V. mungo*, *V. radiata* and *G. max* cultivation in Sri Lanka. Multi-location, large scale field testing over two or more seasons are necessary prior to recommendation of these inoculants for widespread use.