Fig.: Field grown mycorrhizal maize with less Fe deficiency

Fig.: Mycorrhiza inoculated and uninoculated tomato seedlings

days drought cycle, M+ drought-sensitive and resistant rice plants retained RWC of 56% and 66% while M- plants had only 52% and 59%, respectively. The data suggest that mycorrizal fungal inoculation has some role to play in drought tolerance when the plants exposed to severe drought conditions. The drought tolerance of mycorrhizal plants closely coincided with higher nitrate reductase activities. Proline content of mycorrhizal plants were 25-30% lower than non-mycorrhizal plants regardless of intensities of drought stress suggesting that symbiosis lessened the impacts of drought stress.

- ***Boron dynamics in tomato-mycorrhizal system:*** It is hypothesized that mycorrhizal colonization improves the availability of highly immobile anionic micronutrient "boron" thereby alleviating the deficiency. The trial was laid in both greenhouse and field condition in Thondamuthur near Coimbatore. Mycorrhizal tomato plants had maintained sufficient levels of B content in both roots and shoots while uninoculated plants retained deficient level of B especially when added B level was lower. Mycorrhizal inoculation significantly increased the tomato fruit yield by 20-24% besides improving the quality of fruits by registering significantly lower amounts of titrable acidity and higher quantities of ascorbic acid.

Seminar, Symposia and Conferences attended

- International Research Workshop on New Innovations in Biotechnology Applications", School of Biosciences & Technology (SBST), VIT University, Vellore, Feb. 16-26, 2010.
- CAS – Agronomy Training. Role of VAM in Conservation Agriculture, TNAU, Coimbatore, March 5, 2010.
- CAS – Microbiology Training. Role of VAM in Carbon Sequestration, TNAU, Coimbatore, March 17, 2010.

Harnessing agriculturally beneficial microorganisms for production and protection of sorghum and rice

PI : S. Gopalakrishnan
Co-PI : G. V. Ranga Rao
International Crops Research Institute for Semi-Arid Tropics, Patancheru, A. P.

Rationale

Secondary metabolites from microbes, particularly actinomycetes, are known to suppress various insect pests and disease causing plant pathogens. Spinosad (product of soil actinomycete *Saccharopolyspora spinosa*) are known to kill many insects and fungal pathogens including *Helicoverpa* and *Aspergillus flavus*. Microbial rich natural sources like composts and organic amended rhizosphere soils could serve as an excellent source for isolating novel actinomycetes. Hence, in this project, 27 different herbal composts were used for isolation of actinomycetes against 3 pathogens of chickpea and sorghum [*Fusarum oxysporum* f.sp.*ciceri* (FOC), *Sclerotium rolfsi* and *Macrophomina phaseolina*] and further purification of metabolites responsible for inhibition is on.

Objectives

- To identify and evaluate beneficial microorganisms in relevant crop husbandry system(s) involving sorghum and rice.
- Laboratory evaluation of traditional knowledge products/protocols involving agriculturally beneficial microorganisms.
- To submit promising accessions of beneficial microorganisms to NBAIM, after due evaluations and characterization (including nomenclature using molecular level methods).

Significant Achievements

- Twelve actinomycetes were identified as having plant

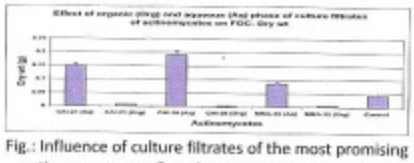

Fig.: Influence of culture filtrates of the most promising actinomycetes on *Fusarium oxysporum* f. sp. *ciceri*.

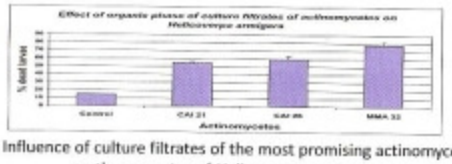

Fig.: Influence of culture filtrates of the most promising actinomycetes on the neonates of *Helicoverpa armigera*.

growth promotion and biocontrol traits (against *M. phaseolina*), of which 7 actinomycetes were demonstrated for their potential in green house, an increase of 22-45% in shoot & root dry wt were observed.

- All the 12 isolates were identified by 16s rDNA gene sequence analysis and of which 5 was submitted to NBAIM.
- Organic phase of the culture filtrates of the 3 most promising actinomycetes viz. CAI 21, 26 and MMA 32 completely inhibited FOC and *S. rolfsi* and killed 1-2 instar larvae of *H. armigera* whereas aqueous phase enhanced the growth of FOC by at least 2-3 times.

Conclusion

- Three of the 127 actinomycetes (CAI 21, 26 and MMA 32; all are *Streptomyces* spp) isolated from the herbal compost has the potential to control *M. phaseolina*, FOC and *S. rolfsi*.

Seminar, symposia and conferences attended

- 5th International Conference on Biopesticides, India Habitat Centre, Lodhi Road, New Delhi, April 26-30, 2009.

Isolation, identification, evaluation and exploitation of microorganisms for management of important plant pathogens and having PGPR potential for vegetable crops

PI : M. Loganathan
Co-PIs : S. Saha, A. B. Rai
Indian Institute of Vegetable Research, Varanasi

Rationale

Vegetables are the important horticultural crops in India and their production loss of 2-90 % is estimated due to diseases caused by many fungal pathogens (Malatharakis, 1983; Sahi and Shyam, 1993; Kanjilal *et al.*, 2000; Pataky *et al.*, 2000). Among the fungal diseases, wilt (*Fusarium oxysporum* fsp. *lycopersici*), collar rot (*Sclerotium rolfsii*), leaf spot (*Colletotrichum* spp.) and blight (*Alternaria solani*) are the major diseases. Earlier, management of diseases with Plant Growth Promoting Rhizobacteria (PGPR) has been proved effective (Leeman *et al.*, 1995; Wei *et al.*, 1996). Hence in the present study, investigations are made to isolate PGPR and utilize them for the management of wilt, collar rot, leaf spot and blight diseases of major vegetable crops.

Objectives

- Exploitation of rhizospheric microorganisms for disease suppression and growth promotion.

Significant Achievements

- 142 PGPR isolates were isolated from the rhizosphere of different vegetable crops.
- Among the isolates, 31 showed significantly high growth promotion on cowpea.
- In dual culture studies the isolates Chilli 1, Chilli 2, Chilli 5 and B.s.D were identified as potential antagonists against *Fusarium oxysporum* f.sp. *lycopersici*, *Sclerotium rolfsii*, *Alternaria solani* and *Colletotrichum* sp.
- Induction of growth promotion activities *viz.*, IAA, siderophore production and phosphate solublization were significantly more in chilli 1 and chilli 2 isolates.
- Based on *in vitro* experiments, chilli 1 and chilli 2 were forwarded to greenhouse studies. Talc based formulation of chilli 1 and chilli 2 showed significantly less wilt/collar rot incidence(s) in tomato and cowpea under greenhouse conditions.

Fig.: Effect of PGPR on wilt disease of tomato under greenhouse conditions.