Soil biotechnological interventions to sustain rice production

Objectives

- Soil Microbiological Intervention to minimize the impact of climate change in rice productivity
- Soil microbiological intervention to minimize the evolution of GHG from rice field ecosystem
- Soil biodiversity conservation amidst fragile micro climate
- Nano technological intervention to increase water use efficiency

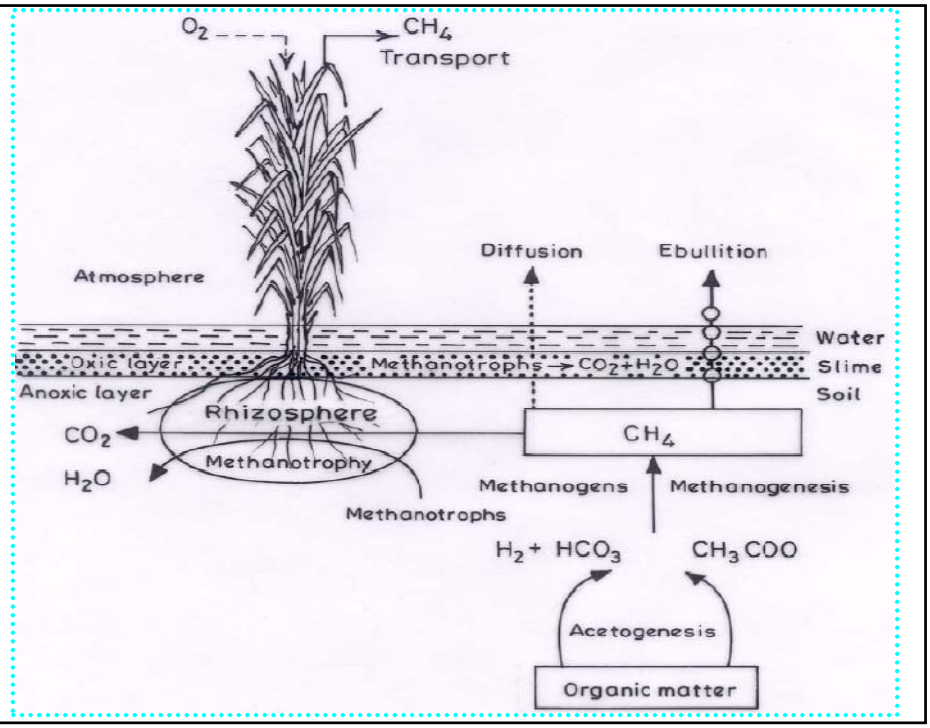
Climate change impact on soil biotechnology

- Biogeochemical cycling
- Nutrient flow dynamics
- Energy dynamics
- Soil respiration
- Soil enzymology
- Decomposition and mineralization

Rice soil biotechnology

- Micro biology of rice soil- more complex
- Wide variation in the Redox
- Oxidative and reductive phases that governs GHG emission

DNDC MODEL



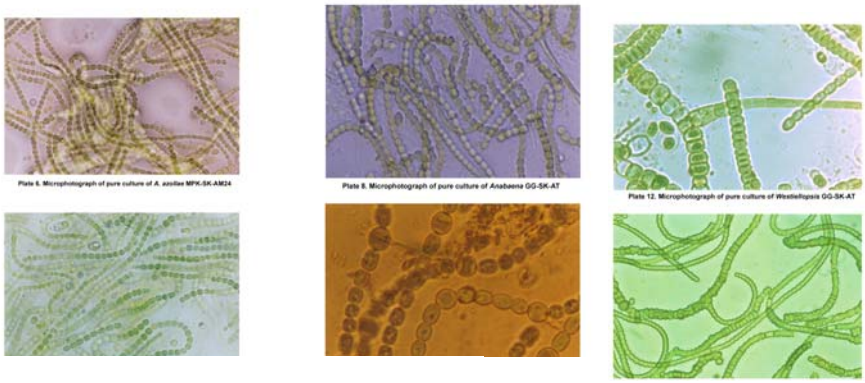
Microbes of our interest

- Cyanobacterial systems
- Azolla algal symbiosis
- PGPR and PPFM

Cyanobacteria- Agricultural significance

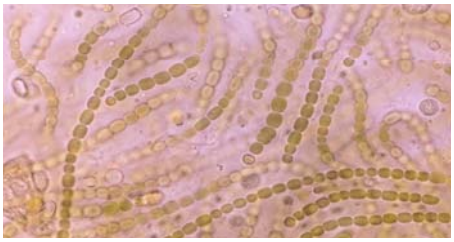
- Photo synthetic and live aerators
- Maintains rice field ecosystems under oxidative phase
- Develop drought resistance – (Akinetes)
- Co2 fixation (Coccolithophorids)

Self supporting Diazotroph -Ability to fix atmospheric nitrogen

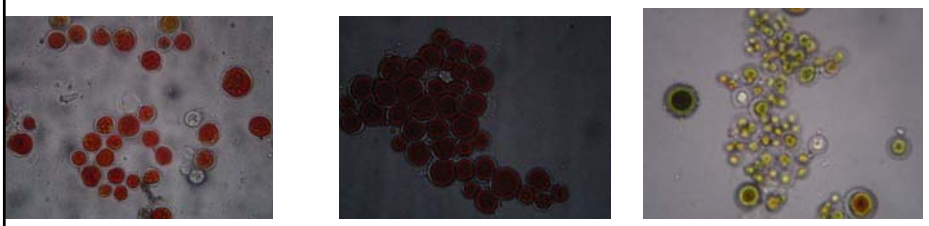


Cyanobacterial strains with high amount of NF

Plate 10. Microphotograph of pure culture of *Nostoc* GG-SK-AT



(Lakshmanan & Kumar, 2003)



Filamentous Cyanobacterial cultures from rice field ecosystem

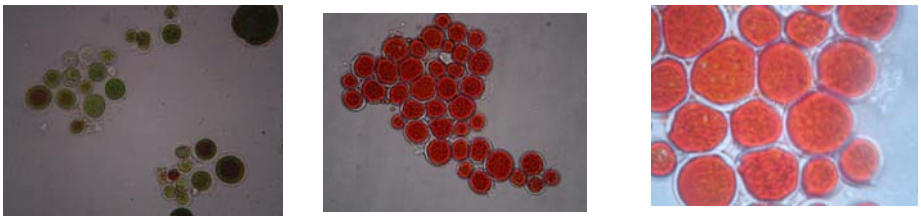


Plate 5. Mass multiplication of cyanobacterial cultures in laboratory fermentor with artificial illumination

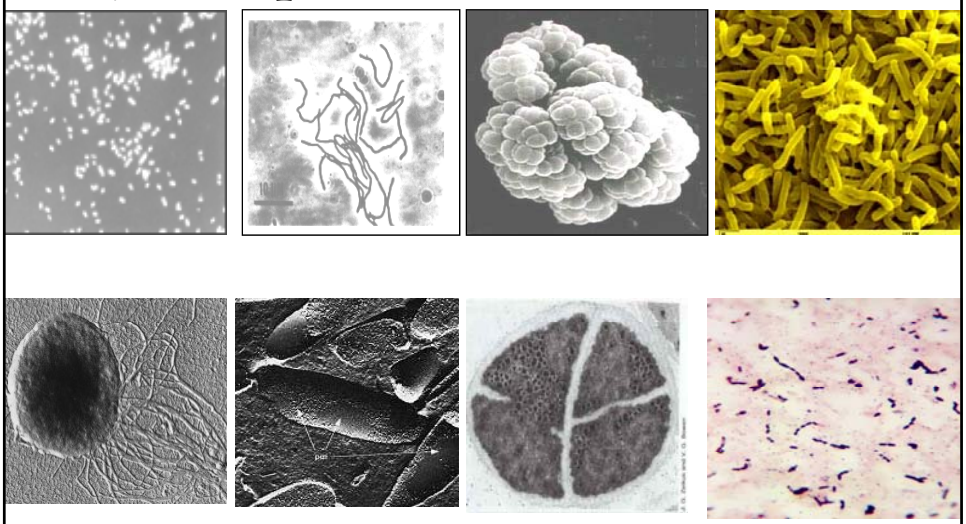
A - At the time of inoculation
B - After 20 days of inoculation

PPFM and PGPR

- Methylotrophs
- Pseudomonas

Rhizosphere bio degradation in drought resistance

Microscopic Views Of Various Methylotrophs isolated from rice field



Nano technology in rice field ecosystem

- Nano nutrients - Monterry Tech Mexico
- Nano siderophores
- Bacterial synthesis of nano particles

Facilities at TNAU to explore the above issues

- Algal germ plasm: 250 algal accessions
- Facilities for bio diversity mapping
- Facilities for GHG emission studies in rice field eco systems

Algal identification by DAF using RAPD PCR, rep PCR, Multiplex PCR

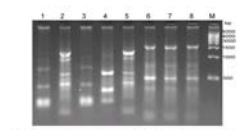


Plate 21. RAPD profile of cyanobacterial cultures for the decamer primer CRA 22

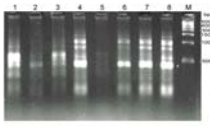
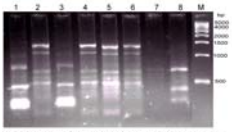


Plate 23. RAPD profile of cyanobacterial cultures for the decamer primer CRA 25



25. RAPD profile of cyanobacterial cultures for the decamer primer OPA 8

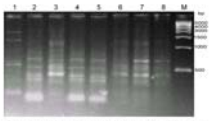


Plate 22. RAPD profile of cyanobacterial cultures for the decamer

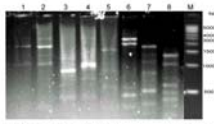
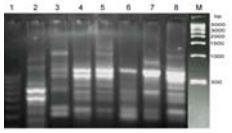


Plate 24. RAPD profile of cyanobacterial cultures for the decamer



APD profile of cyanobacterial cultures for the decamer imer OPA 11

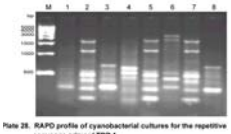


Plate 28. RAPD profile of cyanobacterial cultures for the repetitive sequence primer LTRR 1

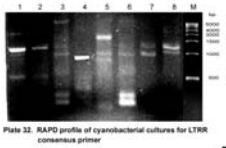


Plate 32. RAPD profile of cyanobacterial cultures for LTRR consensus primer

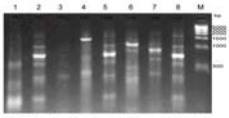
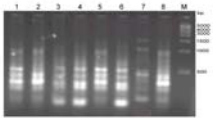


Plate 27. RAPD profile of cyanobacterial cultures for the decamer



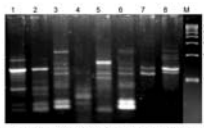


Plate 33. RAPD profile of cyanobacterial cultures for STRR consensus primer

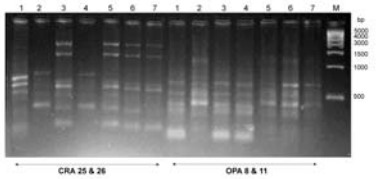


Plate 34. RAPD profile of cyanobacterial cultures for multiplex PCR using dual primers

Algalgermplasm at TNAU

Deliverables

- Development of Cyanobacterial Consortia to sustain rice production under water stressed condition
- Development of bacterial Consortia to promote dynamic soil rhizosphere
- Standardizing agronomic and microbiological practices to minimise GHG emission from paddy field
- Development of nano nutrients and nano capsules to improve water use efficiency


AZOLLA GERMPLASM