

4th Dr. M.V. SHANTARAM MEMORIAL LECTURE

Speaker

Dr. D.L.N. RAO, FNAAS, FISSS

Project Coordinator,
All India Network Project on Soil Biodiversity and Biofertilizers
Indian Institute of Soil Science, Bhopal

Topic:

“New Horizons in Soil Biotechnology”

On

10.06.2016 at 2.30 PM

Venue:

College Seminar Hall
College of Agriculture, Rajendranagar

Organized by



**Hyderabad Chapter – Indian Society of Soil Science
and**

Department of Soil Science and Agricultural Chemistry
College of Agriculture, PJTSAU, Rajendranagar, Hyderabad

About the speaker:

Dr. D.L.N.Rao graduated from the University of Delhi and took his M.Sc. and Ph.D. degrees in Microbiology in 1975 and 1979 from the Indian Agricultural Research Institute, New Delhi. He joined the Agricultural Research Service of the Indian Council of Agricultural Research at the Central Soil Salinity Research Institute, Karnal and worked as Scientist and Senior Scientist until 1998. He was a Commonwealth Post-doctoral Fellow in Microbial Ecology at the University of Kent at Canterbury, U.K. during 1986-87. During 1995 he was a Visiting Research Fellow at Wye College, University of London and at University of Sussex, U.K. In 1998 he moved to the Indian Institute of Soil Science, Bhopal as Project Coordinator of the All India Coordinated Research Project on Biological Nitrogen Fixation and now the All India Network Project on Soil Biodiversity-Biofertilizers from 2004. Dr. Rao is conducting and guiding researches at 20 centres all over India on various aspects of Biological Nitrogen Fixation, Microbial Diversity, Biofertilizers and Soil Biology. He has published about 140 research articles in national and international journals of repute. Dr. Rao is a fellow of the National Academy of Agricultural Sciences and of the Indian Society of Soil Science. Dr. Rao is on the Research advisory committee and management committees of several ICAR institutes. Dr. Rao has traveled and lectured widely in India and abroad. In addition to research interests, Dr. Rao takes keen interest in the History and Philosophy of Science, and Science Policy.

4th Dr. M.V. Shantaram Memorial Lecture, ISSS- Hyderabad, PJSTSAU, June 10, 2016.

New Horizons in Soil Biotechnology

D.L.N.Rao

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I feel extremely honored to have been asked to deliver the 4th Dr. M.V. Shantaram memorial lecture in honour an eminent soil microbiologist who was fully dedicated to his work and teaching. Soil ecosystems are the foundation of human life support systems. They are the least understood among the natural ecosystems and increasingly among the most degraded. Soil erosion, loss of soil organic matter and nutrient depletion are among the leading contributors to impaired soil health, reduced crop yields and poverty. The recent warning signals of climate change and pollution of all the natural resources will further exacerbate the problem and hence the urgency to take the needed steps to guard the ecological security of planet earth. This requires a deeper knowledge of various systems and processes along with fresh approaches to solve old and new problems. The developments in molecular biology, biotechnology and electronics have created new knowledge on soils, and brought about a 360° change in our appreciation of the potential new applications of this knowledge. This lecture is focused on the renaissance in soil science in the new millennium and concerns on soil quality and environmental issues and the adoption of conservation and ecological farming as a response. Many grand challenges in soil research have been outlined recently. There is now a firm realization that a better understanding of soils is essential for addressing the challenges of mitigating abiotic stresses, climate change effects, environmental pollutants and ecosystem services of which the provisioning of clean water resources is unarguably the most urgent need. The UN has adopted a set of 17 goals in 2015 to deal with these and related issues of sustainable development.

Issues on soil quality, focusing on biological soil quality, its measurement by microbial, biochemical and meta-genomic methods and its interpretation will be highlighted in the lecture. The beneficial effects of balanced fertilization, organic farming, conservation farming and adverse effects of very high rates of pesticide and fertilizers applications will be highlighted through case studies in Alfisols, Vertisols and Entisols. The importance of focusing more attention on biological N fixation and in particular on rhizobial inoculants and mycorrhiza will be strongly outlined along with inoculants for stress mitigation. Recent researches on soil microbiome throw up exciting opportunities for mining novel antibiotics. The need for new instrumentation to do new soil science will be illustrated with recent examples. The need to address all issues of carbon sequestration, N and P fertilization, green house gas emissions and ecosystem services in the context of climate change will be emphasized along with a plea to set up long term sites for measuring ecosystem services. The need for sustainable intensification, whilst maintaining the health of the soil ecosystems for the future is an absolute imperative in which soil biotechnology would play a major role.

Selected Readings

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- Aparna, K., Rao, D.L.N. and Balachandar, D. (2015) Microbial Populations, Activity and Gene Abundance in Tropical Vertisols under Intensive Chemical Farming. *Pedosphere* 26 (5): 725–732, 2016.
- Baveye, P. C. (2015). Grand challenges in the research on soil processes. *Frontiers in environmental Science*. 3 (10).
- Berendsen, R. L., Pieterse, C. M. and Bakker, P. A. (2012). The rhizosphere microbiome and plant health. *Trends in Plant Science* . **17**, 478-486.
- Dijkstra, F. A., Carrillo, Y., Pendall, E. and Morgan, J. A. (2013) Rhizosphere priming: a nutrient perspective. *Frontiers in Microbiology*. **4**, doi: 10.3389/fmicb.2013.00216.
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- Lal, R. (2014). Societal value of soil carbon. *Journal of Soil and Water Conservation*. **69**, 186A-192A.
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- Ohlson, K. (2014) *The soil will save us* Rodale, New York, pp 242.
- Rao, D.L.N.(2006) Maintaining the Soil Ecosystems of the Future. In: *The Future of Soil Science* (A. E. Hartemink Ed.) International Union of Soil Sciences, Wageningen, pp. 116-118.
- Rao, D.L.N. (2013) Soil Biological Health and its Management. In: *Soil Health Management: Productivity-Sustainability-Resource Management* (H.L.S.Tandon Ed.), FDCO, New Delhi, pp 55-83.
- Rao, D.L.N., Aparna K., Krishnaraj P.U., Balachandar D. and Rup Lal (2014) Soil Biological Health: Unified Indicators across Soil Types and Management Practices. Proc. National Conference “Empowering Mankind with Microbial Technologies” 55th AMI Conference (AMI-EMMT 2014), Coimbatore, pp 1-4.
