भाकृअनुप
ICAR

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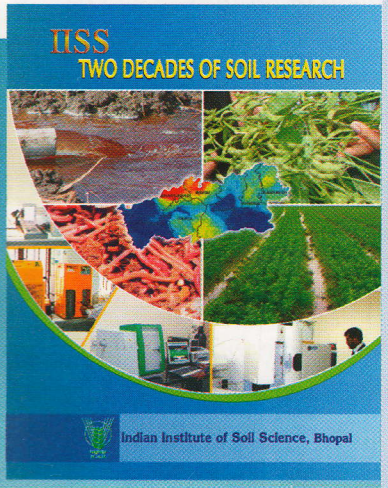
New Publication



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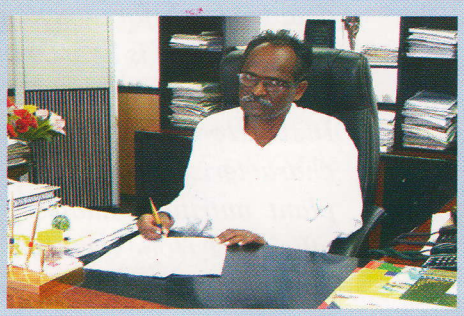
Forthcoming Events

- Model Training Course (MTC) on **"Crop Production and Environmental Sustainability through Organic Farming"** during September 08-15, 2009.
- Model Training Course (MTC) on **"Efficient Recycling of Mineral and By-product Nutrient Sources for Sustainable Crop Production"** during November 2-9, 2009.
- Winter School on **"Efficient Farm Wastes Utilization for Sustainable Agriculture and Enhancing Soil and Produce Quality"** during December 1-21, 2009.

From the Director's Desk

Nanoporous Zeolites in Soil and Crop Nutrition Research: Issues Ahead



In many parts of the world food security is at risk due to declining quality and/or quantity of the soil resource base. Climate change is alarming and is expected to influence food production in the days to come. In order to reverse this trend of soil resource degradation, it is necessary either to expand the land base under cultivation without much enhanced productivity or to intensify crop production by improving productivity per unit of land. The soils under cropping are either inherently low in fertility or made less fertile due to mining of nutrients without adequate replenishment. It is in this context, farming with zeolites assumes greater significance.

Zeolites, a group of crystalline aluminasilicates, are a class of novel materials with very broad applications in refineries as catalysts, sorption and separation processes, and als in agriculture and environmental engineering. The reason zeolites are now attracting so much interest lies in their strict crystalline honeycomb framework of cavities and minute channels running in different directions which at the cellular level help trapping nutrient ions, heavy metals and toxins.

Most of the initial research on the use of zeolites in agriculture took place in the 1960s in Japan. Discovery of the first zeolite mineral stilbit in 1756 by Cronsted was the starting point for these minerals. Different connections of silicon tetrahedra and aluminium octahedra lead to the formation of three dimensional framework with pores and voids of molecular dimension. Dimensions, shape and linkage of zeolite pores and voids are characteristic of zeolite materials. The pores and interconnected voids are occupied with cations and water molecules. Zeolites, because of their unique structural architecture, have variety of properties and varied functions. The structure of each of the zeolite minerals is different, but they all have large open 'channels' in the crystal structure that provide a large void space for the adsorption and exchange of cations. The internal surface area of these channels are reported to reach as much as several hundred square meters per gram of zeolite, making zeolites extremely effective ion exchangers.

Ion-exchange properties of zeolites can be utilized in plant nutrition because of their large porosity and high cation exchange capacity. They can be used both as carriers of nutrients and as a medium to free nutrients. The main use of zeolites in agriculture is, however, for nitrogen capture, storage and slow release. It has been shown that zeolites, with their specific selectivity for ammonium (NH_4^+), can take up this specific cation from either farmyard manure, composts or ammonium-bearing fertilizers, thereby reducing

losses of nitrogen to the environment. Ammonium-charged zeolites are also reported to have the ability to increase the solubilization of phosphate minerals, leading to improved phosphorus uptake and crop yields.

Zeolites can hold water more than half of their weight due to a high porosity of the crystalline structure. Water molecules in the pores could easily be evaporated or reabsorbed without damage to such structures. Thus, zeolites assure a permanent water reservoir, providing prolonged moisture availability during dry period. They also promote a rapid rewetting and improve the lateral spread of water into the root zone during irrigation. Another important aspect of zeolites is the simultaneous presence of the Bronsted and Lewis acid centres. Bronsted acid sites (BAS) are assigned to bridging hydroxyl groups, while Lewis acid sites (LAS) are essentially electron acceptor centers. Characterization of the Bronsted and Lewis acid centres is another important researchable issue.

While most zeolites are beneficial for plant growth, it has been demonstrated that certain zeolites with sodium as the main exchangeable cation can actually decrease rather than increase plant growth and yield. Some species of zeolites are known to be harmful to human health. Therefore, an intelligent selection of zeolites of good mineralogical and chemical characteristics to suit desired applications is very important. However, only negligible information is available on the long-term benefit of zeolites. It will be an important researchable issue to characterize the available zeolites in the country and to carry out detailed study for advancing knowledge of their use in agriculture. It is heartening to note that the scientists of the Division of Soil Chemistry and Fertility of this Institute have initiated research work on characterization of zeolites for their use in soil and plant nutrition studies for improving nutrient use efficiency. Hope their endeavours may provide a new path of research at the Institute.

(A. Subba Rao)

Research Highlights

Tillage and manure interactive effect on some soil parameters

Varying levels of farm yard manure (FYM) incorporation in the soil affected soil moisture content. Application of 10 t carbon through FYM recorded higher soil moisture content than control (without FYM). Greater availability of N was registered under no tillage than in conventional tillage at both soil depths (0-5 and 5-15 cm). Reverse trend was observed in available P and K at both soil depths with respect to tillage. Available N, P and K were found to increase significantly with increase in levels of FYM. Total organic carbon (TOC) percentage in soil varied from 0.89 to 1.48 after wheat harvest. Also, levels of FYM, tillage, and their interactions had significant effect on TOC at 0-5 and 5-15 cm soil depth.

Transformation of different fractions of zinc in a Vertisol

The status of different fractions of Zn as influenced by continuous application of inorganic fertilizers alone, manures and fertilizers, manures alone in a Vertisol after five years of soybean-wheat cropping has been investigated. Surface (0-15 cm) soil samples collected after 5 years of cropping have been analyzed for Zn fractions using sequential extraction method. The total zinc content in the soil varied from 97 mg kg^{-1} in soils receiving STCR based dose of NPK to 145 mg kg^{-1} in plots those receiving farmyard manure alone @ 24 t ha^{-1} $year^{-1}$. Among the zinc fractions, residual Zn constituted the major fraction of total zinc in Vertisol followed by AMOX-Zn, PYRO-Zn, AAC-Zn and CA-Zn. The 5-year continuous integrated use of NPK with FYM or poultry manure (PM) or urban compost (UC) and FYM alone significantly influenced only the PYRO-Zn, and AMOX-Zn fractions. The highest status of AMOX-Zn was observed in treatment that received FYM alone @ 8 t ha^{-1} to soybean and 16 t ha^{-1} to wheat every year.

Combating negative nutrient balance through balanced fertilization

The negative nutrient balance in soil is mainly due to insufficient application of N and K. The maximization of N fixation potential of legume may narrow down the gap between N removed and that applied to soil. The computation of N fixation in 36 year old long-term fertilizer experiment (LTFE) with soybean-wheat system showed that balanced fertilization not only resulted increase in system productivity but also increased N fixation by soybean which in turn added larger amount of biologically fixed N to soil for subsequent wheat crop. Application of N alone resulted in fixation of N by soybean to the tune of 37.4 kg ha^{-1} yr^{-1} which increased to 93, 113.7 and 141.9 kg ha^{-1} yr^{-1} with the application of NP, NPKS and NPK+FYM, respectively.

INM intervention effects on soil aggregates and SOC

Application of manures and fertilizers for five years in soybean-wheat system in a Vertisol has improved aggregation. The proportion of small size macro aggregates (0.250-2.000 mm) was the highest followed by micro aggregates (0.053-0.250 mm) in all the three depths. Proportion of small size macro-aggregates increased with depth due to pressure of the upper layer on the lower layer. Carbon content was higher in macro-aggregates than in micro-aggregates. Carbon content in aggregates of surface (0-7.5 cm) soils ranged between 7.7 and 18.9 g kg^{-1} in large size macro-aggregates followed by 9.4 and 11.0 g kg^{-1} in small size macro-aggregates. Carbon content in lower layers was relatively low. Significant changes with respect to carbon content in different aggregates were found in the treatments of wheat residues + 1 t PM, wheat residues + 5 t FYM, 16 t FYM in *kharif* + 8 t FYM in *rabi*, 50%NPK + 20 t FYM (once in four years) and 50% NPK + 5 t FYM to soybean.

Behavior of nano-particles in soil - plant system

a) Stability of nano-particles in aqueous system

The commercially available nano-particles of ZnO (<100nm), CuO (<50nm), iron oxide (<100nm), hydroxy apatite (<200nm) and tri-calcium phosphate (<100nm) were characterized with respect to their size and zeta potential in aqueous system by dynamic light scattering (DLS) techniques. The size distribution carried out under aqueous medium revealed that all the particles had dimensions more than claimed by the concerned supplying firm. This might be due to the formation of hydrodynamic layer of the particles that had strong affinity for water due to high surface area and charge density, and to agglomerate and culminate into higher particle sizes. All nano-particles except hydroxy apatite (<200 nm) were highly unstable in water because of their low zeta potential in aqueous medium (zeta potential for unstable suspension ranges between -30 mv to +30 mv) and have a strong tendency to agglomerate and settle down. Therefore, there is a need to use suitable surfactant to stabilize the nano-particles in aqueous system.

b) Germination and growth of some plants as affected by zinc nano-particle (ZnO)

Nano-particles of ZnO (<100 nm) were used to test their effects on seed germination and growth of some crops with reference to $ZnSO_4$. Zinc oxide nano-particles had no toxic effect on chickpea seed germination, whereas, it prevented the germination of mustard seed at the level greater than 500 ppm. Solution culture study also showed that zinc oxide nano particles could enhance and maintain the growth of maize plant vis-à-vis conventional Zn fertilizer (Plate 1), indicating that plant root might have got the unique mechanism of assimilating nano ZnO for its growth and development.

Plate 1. Growth of maize plant affected by zinc oxide nano-particles in solution culture

c) Growth of Spirulina (algae) as affected by different nano-particles

A preliminary study was undertaken on growth of algae Spiriluna (*Arthrospira)* as affected by different nano-particles in CFTRI growth medium. It was found that the CuO (<50 nm) at 10 ppm was found to be toxic while ZnO (<100nm) did not show any toxic effect at 10 ppm. The hydroxyapatite (<200 nm) and calcium phosphate (<100 nm) nano-particles at 90 ppm P promoted the algal growth at different growth periods in phosphate free CFTRI growth medium which conclusively proved that these nano-particles of hydroxyapatite and calcium phosphate were transported inside the algal cell and subsequently assimilated (Plate 2).

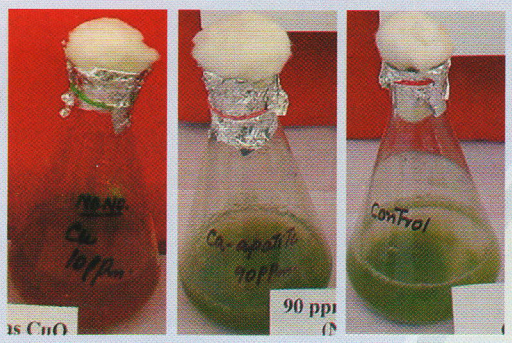


Plate 2. Growth of Spirulina at 10th day affected by various nano-particles

Maximum allowable limits (MAL) for lead and cadmium in municipal solid waste compost for agricultural soils

Cadmium and lead are important environmental pollutants with high toxicity to animals and human beings. To quantify the limits of Pb and Cd loading in soil for the purpose of preventing food chain contamination beyond background concentration levels, two separate sets of pot experiments were carried out for these two heavy metals with graded levels (Pb @ 0.4 -150 mg kg^{-1} and Cd @ 0.02 -20 mg kg^{-1}) on

an acidic light textured alluvial soil. Spinach crop was grown for 50 days on these treated soils after a stabilization period of two months. Upper limit of background concentration levels (C_{ul}) of these metals were calculated through statistical approach from the heavy metals' concentration values in leaves of spinach crop grown in farmers' fields. Pb and Cd concentration limits in soil were calculated by dividing C_{ul} with uptake-response slope obtained from the pot experiment. Cumulative loading limits (concentration limits in soil minus contents in uncontaminated soil) for the experimental soil were estimated to be 170 kg Pb ha^{-1} and 0.8 kg Cd ha^{-1}. Based on certain assumptions on application rate and computed cumulative loading limits values, maximum permissible Pb and Cd concentration values in municipal solid waste (MSW) compost were proposed as 170 mg Pb kg^{-1} and 0.8 mg Cd kg^{-1} respectively. In view of these limiting values, about 56% and 47% of the MSW compost samples from different cities were found to contain Pb and Cd in the safe range.

Productivity and fertility of organic farms in India

A survey was conducted during 2008 - 09 in Maharashtra, Karnataka, Tamil Nadu (including Pondicherry), Kerala and Uttarakhand involving 50 certified organic farms and 50 comparable conventional farms. On an average, the productivity of crops in organic farming is lower by 9.2 % compared to conventional farming. There was a reduction in the average cost of cultivation in organic farming by 11.7 % compared to the conventional farming. Due to the availability of premium price (20 to 40 %) for organic produce in most cases, the average net profit was 22.0 % higher in organic compared to the conventional farming. However, there was an overall improvement in soil quality in terms of physical (bulk density), chemical (pH, EC, organic carbon), biological (dehydrogenase, alkaline phosphatase, microbial biomass carbon) parameters and macro (N, P and K) and micro nutrients (Zn, Cu, Fe, Mn) indicating an enhanced soil health in organic farming systems.

Impact of linear alkylbenzene sulphonate on growth of Spirulina algae

A study was undertaken to examine the impact of an organic pollutant Linear Alkylbenzene Sulphonate (LAS), which is an integral part of all detergent powder/cake - on the growth of Spirulina (*Arthrospira)* algae. The study revealed that the LAS concentration beyond 8 mg kg^{-1} was found to be toxic, but at levels below 6 mg kg^{-1} showed growth promotion of Spirulina algae (Plate 3).

Biofortification of wheat grains with zinc and iron

The effect of foliar applied Zn (0.5%) and Fe (0.5%) on the

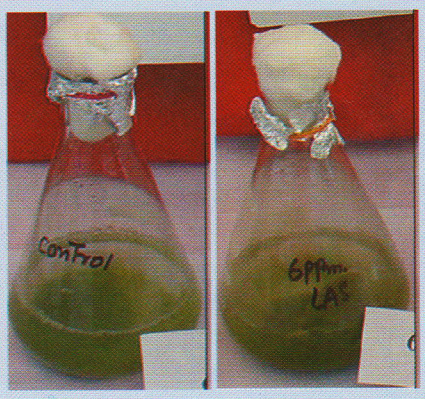


Plate 3. Growth of Spirulina at 10th day affected by LAS

productivity of different wheat varieties and their enrichment in wheat grains was studied in Ludhiana for two consecutive years (2006-07 to 2007-08). The soil of the field was loamy sand (*Typic Ustochrept*) having the DTPA-extractable Zn and Fe levels of 0.72 and 4.80 mg kg^{-1} respectively, at the time of sowing. Five wheat varieties viz. PDW 274, PDW 291, PBW 343, PBW 502 and PBW 550 were selected for this study and these include both *durum* and *aestivum* cultivars. Four foliar sprays were applied as Zn (0.5%) and Fe (0.5%) during growth period of different wheat varieties. The 1st and 2nd spray of Zn and Fe was made at maximum tillering stage and flower initiation stages, respectively, whereas, 3rd and 4th sprays were made at milk and dough stages, respectively. The concentration of Zn and Fe in wheat grain ranged from 30.4 - 43.3 mg kg^{-1} and 36.6 50.3 mg kg^{-1} with foliar applications of Zn and Fe respectively. Application of Zn raised the maximum concentration of Zn to 43.3 µg g^{-1} in PDW 291 and 42.8 mg kg^{-1} in PBW 502, which were 38.8 and 37.7 % higher over control, respectively. Also the application of Fe raised the maximum concentration of Fe to 50.9 mg kg^{-1} in PBW 343 and 47.9 mg kg^{-1} in PBW 502, which were 24.8 and 23.1 % higher, respectively, over control.

Delineation of micro-nutrient deficiency in soils

Analysis of 1885 geo-referenced soil samples collected from 18 blocks of Coimbatore district revealed that higher Zn deficiency was observed in Sulthanpet (94.7%), whereas the lowest deficiency of 4.6 per cent was noted in Valparai block. The highest Fe, Mn and Cu deficiency was recorded in Udumalpet (70.5 %), Sulthanpet (80.3 %) and Madukarai (83.6 %) respectively. Lowest deficiency of Fe, Cu and Zn in Valparai (1.5, 1.5 and 4.0 %) and Mn in Madukarai (1.7 %) blocks was observed. Comparing the various micronutrients, Zn was predominantly deficient in most of the blocks followed by Cu, Fe and Mn. As a whole, 68.5 per cent Zn, 56.6 per cent Cu, 40.4 per cent Fe and 15.3 per cent Mn deficiencies were observed in the district. Fertility rating of the soils of Coimbatore district was worked out using the nutrient index values. The Zn status

was low to very low in most of the blocks, while Fe was found low to very high. Generally Mn status was high to very high in most of the blocks and the Cu status was very low to marginal. Thematic maps prepared for available micronutrient status in the soils of Coimbatore district are depicted in Plate 4.

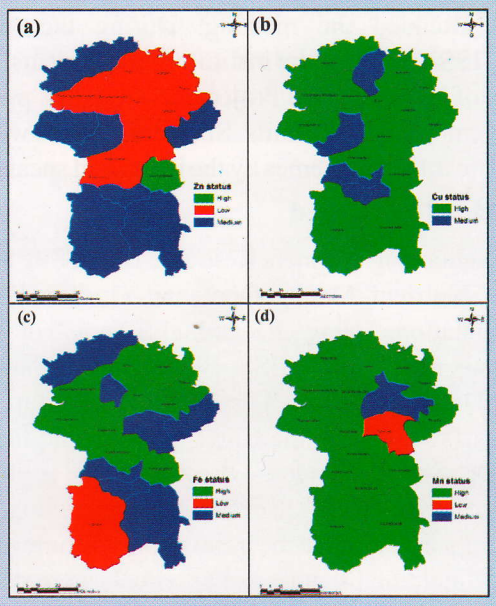


Plate 4. Maps showing available Zn (a), Cu (b), Fe (c) and Mn (d) status of soils in Coimbatore district

Improving yield and quality of pomegranate

Maximum fruit yield was recorded in integrated nutrient management (7.79 kg plant^{-1}) followed by organics (7.11 to 7.30 kg plant^{-1}) and inorganics alone (6.89 kg plant^{-1}) and was the lowest in control (4.72 kg plant^{-1}). The fruit quality parameters *viz.* sugars, TSS and ascorbic acid content increased significantly due to application of integrated, organic and inorganic alone, whereas, juice acidity, carotenoids and tannin content did not vary significantly due to application of various nutrient sources. Juice recovery percentage was the highest in cattle dung manure (59.8%) followed by integrated nutrient source (58.3%), vermicompost (55.8%) and phosphocompost (55.4%) and was the lowest in control (41.0%). Higher accumulation of ascorbic acid was recorded in INM (19.3 mg /100g) treatment followed by organics and inorganic treatments and was the lowest in control (16.2 mg/ 100g).

Effect of chromium on some soil enzymes

The effect of different levels of chromium on some soil enzymes was studied. The application of all the levels of chromium (5, 10, 25, 50, 100 and 200) resulted in a decrease in the activity of dehydrogenase and alkaline phosphatase enzymes. However, the magnitude of the effect on the two enzymes was different. At the lower levels, the activity of both the enzymes was close to the control but as the level of chromium increased, the activity of dehydrogenase enzyme decreased gradually and declined by 50% at the highest level unlike alkaline phosphate. However, the electrical conductivity of the soil increased with the increase in the level of chromium.

Impact of temperature and moisture on microbial decomposition of SOC under long-term INM system

The interactive effects of temperature and moisture were studied on soil collected from selected treatments of a long-term INM experiment after 7 cycles of soybean-wheat rotation. The soils were incubated for 60 days at three temperature (25, 35 and 45 °C) and three hydrological regimes (50% WHC, 100% WHC and submerged). Carbon dioxide evolution was maximum upto 40 days of incubation in all these treatments. Among the three hydrological regimes, the higher amount of CO_2 evolution observed in 50 % WHC followed by100 % WHC than submerged condition at 35 °C in Vertisol. Further it was observed that the CO_2 evolution was maximum (192 mg CO_2/100) by the application of 100 % FYM at 100 % WHC followed by NPK+CR, 100% NPK and 50% NPK+ FYM possibly due to greater release of water soluble carbon and acid hydrolysable carbohydrates, which acted as source of bio energy for higher amount of exogenous micro organisms.

Awards and Honours

Dr. K. Ramesh, senior scientist (Agronomy) received NAAS Young scientist award (soil, water and environmental sciences) for 2007-08 from His excellency Shri N.N. Vohra, Governor (Jammu & Kashmir) on 22.06.2009 at Ninth Agricultural Science Congress held at Srinagar, Kashmir.

Major Events

Launching Workshop and First CAC Meeting of NAIP Sub-Project on Micro-nutrients

The launching workshop of the NAIP subproject entitled "*Understanding the mechanism of variation in status of a few nutritionally important micronutrients in some important food crops and the mechanism of micronutrient*

enrichment in plant parts" (C4/C30022) was held at NBSS&LUP, Nagpur on 8th May, 2009. Dr. N. Panda, CAC chairman (Sub project C4/C30024) presided over the session and Dr. A. Badyopadhyay, National Coordinator, Component 4, NAIP was the Chief Guest. CAC members, Dr. P.N. Takkar (Chairman), Dr. C. Chatterjee (Member), Dr. A.K. Dabadghao (Member), Dr. A. Subba Rao, Director, IISS, Bhopal and Dr. Deepak Sarkar, Director, NBSS & LUP, Nagpur were also present.

Inaugural function of the NAIP sub-project

First CAC meeting of the NAIP sub-project

Annual Group Meeting of Research Workers Under AICRP on STCR

Annual group meeting of STCR research workers was organized at Acharya N.G. Ranga Agricultural University from 6 -7 June, 2009 to review the research progress of all cooperating centres. Dr. A.K.Singh, DDG (NRM), ICAR was the chief guest for the group meeting. Dr. P. Raghava Reddy, Vice-Chancellor ANGRAU presided over the inaugural session. Dr. M. Velayutham, outside expert, Dr. A. Subba Rao, Director, IISS and Dr. G. Lakshmikanta Reddy, Director of Research of the University also participated in the meeting.

Group meeting of AICRP on STCR

Research Advisory Committee (RAC) Meeting

RAC meeting was held at Indian Institute of Soil Science during May 21-22, 2009. Dr. J.S.P. Yadav, Chairman and Dr. R.K.Gupta, Dr. P.K. Chhonkar, Dr. P.D. Sharma and Dr. Biswapati Mandal, Members along with Dr. A. Subba Rao, Director, IISS and Dr. Y. Muralidharudu, Member-Secretary attended the meeting. During the meeting, Director, IISS presented the institute achievements, and all the Heads of Divisions and Project Coordinators presented the achievements of their units. Six status papers were also presented on different themes by the identified speakers.

Winter School Organized

A Winter School on "Farmers Resource Based Site Specific Integrated Nutrient Management and On-line Fertilizer Recommendations Using GIS and GPS Tools" of 21 days duration was organized at IISS, Bhopal during January 3-23, 2009. Dr. D.N. Sharma, Director of Agriculture, Govt. of Madhya Pradesh was the Chief Guest of the inaugural session. Dr. M. M. Pandey, Director, CIAE and Dr. A. Subba Rao, Director, IISS also attended the meeting. A total of 22 participants attended the training programme in which 57 lectures including theory and practicals were delivered to the trainees. Dr. Y. Muralidharudu and Dr. K. Sammi Reddy functioned as Course Director and Co-Director, respectively. Dr. A.K. Singh, DDG (NRM), ICAR was the Chief Guest and Dr. Shukla, IFFCO advisor was Guest of Honour in the closing function.

Inaugural Function of the Winter School

Participants of Winter School

Republic Day

The Institute celebrated the '*Republic Day*' with all gaiety and fervour. All the staff of IISS participated in various events with thrill and great enthusiasm. Activities include races, poem recitation, songs, drawing competition for children, and musical chair for the women and men. The program was concluded with the distribution of prizes to the winners by Dr A. Subba Rao, Director, Mrs. Subba Rao, Shri A.K. Singh and Dr. A.B. Singh, President, SRC.

International Women's Day

The Institute observed the International Women's Day. On the occasion the Chief Guest, Dr. Rashmi Jha, medical Officer, District Ayurvedic Hospital, highlighted the importance of nutrition and balanced diet for children and women. Other guest speakers for the occasion were Mrs. Young, Principal, People Public School and Smt. A. Bhulakshmi Devi. Various competiotions viz., *Rangoli*, musical chair, *antakshri* were held to bring forth the talent of women participants.

Sports

The Institute participated in the Central Zone Sports Meet organized by Central Institute of Agricultural Engineering, bhopal and brought number of medals in different events.

Extension Activities

On farm training on preparation of vermicompost was proveded by Dr. A.B. Singh during a training programme organized by Mohan Siksha Evam Kalyan Samiti Gwaliar (M. P.) during June 1-2, 2009

l Institute Technologies were demostrated to 36 farmers from Amarwada, Chhindwara district of Madhya Pradesh by Dr. N.R. Panwar on March 7, 2009

Personnel

New Appointments

- Dr.M.C. Manna, consequent upon his selection as Head, joined the Division of Soil Biology on 12 May, 2009.
- Dr.S.R. Mohanthy joined as senior scientist on 18th June, 2009.
- Dr. B.N. Mandal joined the Institute as Scientist (STCR) on 19th June, 2009.
- Ms. T.K. Radha joined as Scientist on 20th June, 2009.

Promotion

Mr. Thomas Joseph, Personal Assistant promoted to Personal Secretary to the Director *w.e.f.* February 2, 2009.

Relieving

Dr. D. Damodar Reddy, Principal Scientist, consequent upon his selection as Head of Department in Soil Science and Agricultural Chemistry, was relieved to join Central Tobacco Research Institute, Rajahmundry, A.P. on 16th May, 2009.

Retirement

Shri K. Chandrabhanu, PS to the Director, retired on 31st January, 2009 from the Office. He rendered his services in various capacities as Personal Assistant, Private Secretary, Personal Secretary during last 18 years.

Training Imparted to Post Graduate Students

S. No.	Name of student	Co-ordinating Scientist	Affiliated Institution
1.	Ms. Manta Narware	Dr. A.K. Biswas	Barkatullah University, Bhopal
2.	Ms. Marry V. Toppo	Dr. A.K. Biswas	Barkatullah University, Bhopal
3.	Ms. Alankrita Dashora	Dr. Tapan Adhikari	Barkatullah University, Bhopal
4.	Ms. Aradhana Sharma	Dr. Tapan Adhikari	Barkatullah University, Bhopal
5.	Mr. Arijit Biswas	Dr. D.L.N. Rao and Dr. A.K. Biswas	Vellore Institute of Technology, Vellore

Scientists' Participation in Conference/Seminar/Training/Group Discussion

Name	Programme	Venue	Period
Dr. Ajay and Dr. Tapan Adhikari	96th Session of Indian Science Congress	North-eastern Hill University, Shillong	Jan. 3-7
Dr. Y. Muralidharudu	Delivered a lecture on " Modern approaches, strategies and future projections of STCR project" in the National Symposium on Vegetable Oils Scenario: Approaches to meet the growing demands	ANGRAU, Hyderabad	Jan. 29-30
Drs. A. Subba Rao, Y. Muralidharudu, A.K.Misra, D. Damodar Reddy, Blaise D Souza, K. Sammi Reddy K.M. Hati, Brij Lal Lakaria J. Somasundaram and K. Ramesh	4th World Congress on Conservation Agriculture	NAAS, New Delhi	Feb. 4-7
Dr. S. Kundu and Dr. Tapan Adhikari	Workshop for consortia partners on "Procurement Procedures of the World Bank- NAIP"	IISR, Lucknow	Feb. 9-10
Dr. Y. Muralidharudu	Delivered a lecture on " Soil test based recommendations of rice and rice based cropping system during Winter School on SSNM in rice and rice based cropping system at DRR	DRR, Hyderabad	Feb. 9-10
Dr. A. B. Singh	National Seminar on Environment Protection Through Organic Farming and Waste Management	Yash Krishi Takniki Evam Vigyan Kendra, Allahabad.	Feb. 14-15
Dr. M.C.Manna	CAC/CIC/ and workshop on NAIP (Code 2031)	CRRI Cuttack	Feb. 20 & June 23
Dr. J. K. Saha	2nd Meeting of Technical Group to look into the feasibility and all technical and scientific aspects of organic fertilizers and biofertilizers included in the FCO 1985	Krishi Bhavan, New Delhi.	Feb. 27
Dr. A. B. Singh	5th National Extension Education Congress -2009 on Extension Perspective in Changing Agrirural Environment	C.S. Azad University of Agriculture and Technology	March 5-7
Dr. K. Sammi Reddy	National Conference on Open Access to Scientific Publications: Policy Perspective, Opportunities and Challenges	CSIR, India Habitat Centre, New Delhi	March 24
Dr. M. V. Singh	First annual workshop of the Component-4 of NAIP	IVRI, Izatnagar, U. P.	April 14-15
Dr. M. V. Singh and Dr. S. K. Behera	Launching workshop and first CAC meeting of NAIP sub-project "Understanding the mechanism of variation in status of a few nutritionally important micro-nutrients in some important food crops and the mechanism of micronutrient enrichment in plant parts"	NBSSLUP, Nagpur	May 08-09
Dr. A.K. Biswas and Dr. Tapan Adhikari	CAC and CIC meeting of NAIP on Nanotechnology	PAU, Ludhiana	June 16-17

IISS NEWSLETTER

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