

## **Proceedings of 22<sup>nd</sup> Annual Convention and National Conference of the Clay Mineral Society of India (CMSI) held at ICAR- IARI, New Delhi 110012**

The 22<sup>nd</sup> Annual Convention and National Conference on Application of Clay and Allied Sciences in Agriculture, Environment and Industry” held at ICAR-IARI, New Delhi during September 23-24, 2019. A brief report of the Convention is presented hereunder.

### **Day 1, September 23, 2019**

#### **Inaugural Session**

The inaugural session was held on 23<sup>rd</sup> September, 2019 at ICAR-IARI, New Delhi. The programme was started at 10.30 AM with the Invocation song. The Conference was inaugurated by **Dr. Trilochan Mohapatra, Secretary DARE**, Ministry of Agriculture, Government of India and Director General, ICAR. The guests of honor were Dr. Ashok Kumar Singh, Director, IARI and Deputy Director General (Extn.), ICAR and Dr. Anil Kumar Singh, Secretary, National Academy of Agricultural Sciences (NAAS) and Former Vice Chancellor, RVSKVV, Gwalior, Madhya Pradesh. The programme was presided by Dr. S.C Datta, President CMSI and Chairman of the Organizing Committee. Several awards of CMSI were conferred in the inaugural session when citations were delivered by Dr. S.K Mahapatra, Secretary CMSI and Organizing Secretary. The Honorary Membership was conferred to Dr. Tapas Bhattacharya, Former VC, BSKKV, Dapoli, Maharashtra. The Fellows of CMSI for the year 2018 were conferred to Dre. G.S. Siddhu, Registrar and Acting Vice Chancellor Guru Kashi University Talwandi Sabo, Bathinda Punjab and Dr. C.S. Walia, Former Principal Scientist, ICAR-NBSS 7 LUP, Regional Centre Delhi. CMSI Young Scientist Award -2018 was presented to Dr. Dibyendu Chatterjee, Scientist, ICAR-NRRI, Cuttack and the Best Ph. D. student Travel Grant Award were presented to Ms. Shraddha Mohanty, Dept. of Soil Science, Assam Agricultural University, Jorhat. The session ended with the formal vote of thanks by Dr. S.K. Mahapatra, Secretary, CMSI.

#### **6<sup>th</sup> Professor S.K. Mukherjee – CMSI Foundation Lecture**

After the inaugural session, the 6<sup>th</sup> Professor S.K. Mukherjee – CMSI Foundation Lecture was delivered by Dr. Tapas Bhattacharya, Former VC, BSKKV, Dapoli, Maharashtra on the topic “Sil clay minerals and ecosystem services”.

#### **Special Session**

A Special Session on “*Application Oriented Research on Clay Science*” was held, organized by TIFAC, DST, Govt. of India. The session was chaired by Dr. D.K. Pal, Former President, CMSI

and the convenor was Dr. Gautam Goswami, Scientist F and Head, TIFAC, DST New Delhi. Total seven presentations were made in this session.

1. Sitendu Mondal deliberated on “Application Oriented Clay Research in Frontier Areas of Glass and Ceramics”. He gave an overview of different technologies developed in CGCRI with respect to development of radiation shielding glass, its different properties. He briefly mentioned different refractory pot technology, chemical properties of different crucible products etc. Dr. Mondal also informed that Deptt. of Atomic Energy (DAE) has signed MoU with CGCRI to supply radiation shielding glass worth Rs.18 crores.
2. Mr. Sandeep Nagar, Engineer from Phillips informed the delegates on “Study of Clay Minerals using XRD”. He explained how the modified XRD machine works, its advantage over the other instrument.
3. Mr. B N Srivastava, Phillips deliberated on XRF instrument and how it will be useful in analysis of soil nutrients. He also briefly mentioned its advantages over ICP.
4. Dr. Gautam Goswami highlighted different industrial applications of clays and also requested delegates to take clues from such applications and orient clay research in the field of agriculture.
5. Dr D K Pal –made presentation on “Clays and Other Minerals on Soils and Sediments as Evidence of Climate Change”. He gave a key message that pedogenic clay minerals of intermediate weathering stages when preserved unaffected in a relict soil can be useful indicators of change of climate in the past and identifying the polygenetic characters of soils.
6. Dr S Mukhopadhaya talked about “Clay Minerals in Nano World: Where Dreams Never Die”. He appraised the delegates about the future market of Nano Clays, the gaps exist in nano clay research. He also mentioned about the negative impact of nano zinc formulation spray on crops.
7. Dr. Tapas Bhattacharya gave a brief presentation on future research areas.

The salient features of the sessions were:

- Out of box research ideas are required to be generated in the field of clay research taking clues from its industrial applications
- Research need to be carried out to understand Clay mineral and microorganism association.
- Soil water interaction and its management should have more stressed on type of clay minerals.
- Pedology- anthropology-animal husbandry- Fishery soil map can be prepared
- Soil mineral information technology needs to be studied.
- Research areas need to be expanded to understand the changes in clay mineral ecosystem as an indicator of climate change.

## **Technical Sessions**

**Four Technical Sessions** were organized by the Society.

The **Technical session: I “Geoscience and Industrial application of Clays”** was held with Dr. Swapna Mukherjee as Chair person and Prof. Pankaj Srivastava as Co-Chair person. In this technical session, out of 12 listed papers, only 7 speakers presented their research work on various aspects with data and interpretation. Prof. Pankaj Srivastava gave detailed paleopedological history of the last 30 Ma based on red and yellow paleosols of the Himalayan Foreland Basin. Dr. Abhijit Sarkar explained about the polymer coating and phosphorous cycle to comprehend its efficient use. Dr. Amrita Mukherjee spoke on application of clay in pharmaceutical industry. Dr. S. G. Savalia gave a presentation on physicochemical characteristics of the soils in Sourashtra in different physiographic settings. Mr. Bassel Mhalla present his findings from PhD wok and explained about the weathering characteristics based on different parent matter from Kumaun Himalayas. Ms. Ruma Das presented her work on the effect of pre-treated and treated soils on clay mineralogy. Mr. Ali gave a talk on clay mineral distribution and application of GIS approach in clay mineral map for the Raichur and Kurnool regions from south India. All speakers could generate lots of interest amongst the audiences as was evident with lively discussion on many points from their presentation.

The **Technical Session: II on the theme “ Clay Mineralogy and Nano-Science”** was held with Dr. Siddhartha Mukhopadhyay as Chair person and Dr. K.M. Manjaiah as Co-Chair person. Out of the seven papers listed in the session, four papers were presented by the authors. The first paper dealt on the characteristics and edaphological significance of nano size smectites of cracking clay soils (vertisols) representing central and eastern part of India. The studied soils contain 40-60% nano-size clays (<0.1  $\mu\text{m}$ ) which are dominantly smectitic (>90%) and Hydroxyl interlayering is less pronounced in nano clay smectite than in clay smectite. Despite its dominant presence and large surface area for expected favorable physical and chemical reactions, the hydroxyl-interlayered minerals of the nano hydroxyl interlayered in the present mild alkaline reaction, would remain inert. Its participation in stabilizing organic carbon and fixing added phosphorus is possible when nano hydroxyl interlayered materials remain as positively charged and this can happen in acidic soil reaction. Potassium release kinetics in relation to mineralogy in north-eastern Himalaya region under natural and managed ecosystem was studied. The rate of release of soil K was higher for soils having lower centre of gravity values ( $cg$ ) position of clay minerals. In general, the  $\text{mica}_{001/002}$  which acts as potent indicator of amount of di- and tri-octahedral component of mica was positively correlated, while  $cg$  was negatively correlated with cumulative release of K. Soil clays with lower  $cg$  and higher  $\text{mica}_{001/002}$  ratio would have much higher potential for greater K release in due course of time. The zinc applied through Zn loaded nanoclay biopolymer composites (NCBPC) is 5-6 times more effective in enhancing the yield of wheat as compared to  $\text{ZnSO}_4$ . Application of lower doses of Zn through seed coating with NCBPC could also produce biomass yield of wheat as that obtained with the recommended rate of Zn application through  $\text{ZnSO}_4$  signifying the novelty of the synthesized products. A study was

conducted with five different soils (alluvial, red soils, black soil calcareous soils) to quantify the contribution of various soil potassium (K) pools towards K release and alterations in clay minerals due to K-depletion. Potassium depletion caused significant reduction in available K in all five soils, but non-exchangeable K showed significant reduction only in alluvial soil (high K). In all the soils, highest contribution was recorded from lattice pool towards total K released, except the alluvial soil (high K). Depletion in K caused noticeable alterations in the distribution of clay minerals.

### **Annual General Body Meeting**

The 22nd Annual General Body Meeting of the Society (CMSI) was held at 7.00 PM on 23rd September, 2019. Dr. S.C. Datta, President, CMSI, chaired the meeting. The business of the meeting as per the listed agenda was transacted. The proceedings of the 21st AGM held on September 14, 2018 at ICAR-NBSS & LUP, Kolkata were considered and confirmed by the house. The Annual Report for the year 2018-19 of the Society was presented by Dr. S.K. Mahapatra, Secretary, CMSI and the same was approved after some deliberations. The audited statement of account for the year ending 31<sup>st</sup> March, 2019 and budget estimates for 2019-20 were presented by the Treasurer, Ms. Ritu Nagdev. The meeting ended with the vote of thanks by Dr. S.K. Mahapatra, Secretary of the Society. In any other matter Dr. D.K. Pal, Past President suggested to announce Annual Convention at least six months in advance. It was agreed by the house. Another suggestion was to publish a book on “Clay Science” which was also agreed by the General Body. It was agreed by the General Body and decided that the modalities would be discussed in the next EC meeting of the Society.

### **Day 2, September 24, 2019**

**Technical session: III on “Soil Health and Environment Quality:** This session was chaired by Dr. S.K. Ray, Head, ICAR-NBSS & LUP, Regional Centre, Jorhat. Out of 12 papers, 10 papers were presented by the speakers. Major recommendations of this session are:

- 1) Optimum dose of fertilizer (100% NPK + FYM) showed highest P release in most of the P forms.
- 2) Use of certain hydro gels was beneficial to increase the productivity as well as in improving the soil health quality, particularly, in rain fed areas.
- 3) Optimal dose of fertilizers (100% NPK + FYM) improved the quality and quantity of the SOC; labile pool in particular.
- 4) Deep rooted cropping systems helped improve SOC stock and its stabilization.
- 5) The diversification component of conservation agriculture was more influential during the initial years. Residue incorporation in combination with diversification appeared to be more effective. Moreover, no conclusion could be drawn about the efficacy of zero tillage operations.
- 6) Phosphorus solubilizing bacteria increased soluble and loosely bound P and decreased the Fe/Al bound P.
- 7) The toxicity characteristics leaching procedures stands for reversion with respect to their higher limits.

- 8) Conservation agriculture helped to enhance significantly the SOC sequestration and saturation density.
- 9) Blanket recommendation of FYM should be avoided and should be based on carbon saturation deficit to evade loss of SOC.
- 10) Weak acids secreted by various rice cultivators may have influenced in arsenic (As) accumulation in rice crop.

In the afternoon, the last **Technical Session IV on “Soil Resource Inventory”** was chaired by Dr. Nayan Ahmed, Principal Scientist, ICAR-IARI, New Delhi. Out of 16 papers, only 03 papers were presented by the speakers. First Presentation was delivered by Dr. Ritu Nagdev on "Study of Agri-environment characteristics in Rajpura Block of Patiala District in Punjab for sustainable productivity". In this paper the author highlighted the environmental issues faced by Rajpura block like fluctuating ground water table, nutrient deficiency of soil, contamination of pollutants affecting soil health and crop productivity.

The second presentation was made by Dr. Ashok Kumar on "Role of clay particles in sustainability of rice wheat cropping system in Indo-Gangetic Plains". In this paper he described a case study in Chhata Tehsil of Mathura District, Uttar Pradesh and evaluated soil resources for their suitability to sustain crop production. He reported cost benefit analysis for different crops and their suitability in the nine soil series established in this tehsil and concluded that clay content in the soil of the study area had greater influence on soil suitability of rice and wheat and sustaining crop productivity.

The last paper was presented by Dr. Nayan Ahmed on the topic "Assessment of clay-humus stability through IR spectroscopy in a long term integrated nutrient management experiment". In this paper he highlighted the FTIR spectra taken for clay, humus and clay-humus separated from soils which was treated with different organic inputs like FYM, straw and Green Manure in a thirty years long term Integrated Farming System (IFS) research experiment carried out in GBPAUT university Pantnagar. He concluded that the role of cations and broken edges of clay minerals in bonding humus in the clay-humus complex was evident by broadening of the water absorption band and sharpening and merging of other function groups bands of the humic acid in the clay humus complex.

### **Plenary Session**

The Plenary session was chaired by Dr. D.K. Pal with the penalists Dr. S.C. Datta, Dr. Siddhartha Mukhopadhyay Dr.(Mrs) Swapna Mukherjee, Dr. Gautam Goswami, Dr. Nayan Ahmed and Dr. S.K. Mahapatra. The chair persons from all the different technical sessions presented the report of the deliberations and the recommendations were finalized.

The Seminar was ended with the formal vote of thanks by Dr. S.K. Mahapatra, Organising Secretary.

### **Major Recommendations of the Conference:**

- Research is needed to understand the role of clay and other minerals in organic carbon sequestration and its enhancement in Indian tropical soils.

- In soil water interaction and its management, an emphasis on type of clay minerals is necessary
- Use of certain hydro gels may be beneficial to increase the productivity as well as in improving the soil health, particularly, in rainfed areas.
- Development of soil mineral information technology is the need of the hour.
- Research is needed to understand the role of clay and other minerals in climate change research and also to highlight their ecosystem services in soils.



**S.K. MAHAPATRA**  
**Secretary, CMSI**