

Emerging Trends in Agri-Bioinformatics – A meeting report

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ABSTRACT

Bioinformatics in agriculture is viewed as impending thrust areas that have opened new avenues for agri-bioinformatics developments. 'Omics' technologies have produced huge amount of sequence data from several crops, animals and microorganisms. Efficient computational tools comprising intelligent data query, retrieval analysis and visualization tools have been developed for data mining and accelerating the process of gene discovery. This paper highlights the frontier research work in Agri-Bioinformatics.

Keywords: agri-bioinformatics

INTRODUCTION

Substantial advancement in high throughput technologies together with genomics and proteomics, has undoubtedly contributed to a systems biology approach. These technologies have generated huge amount of sequence data from several crops, animals and microorganisms. A major challenge in biology is to make sense of giant quantities of sequence data. Bioinformatics is the science of managing, mining, integrating, and interpreting information from this biological data. Fortunately, efficient computational tools have now optimized, accelerating the process of discovery. Being an agriculturally rich country, India needs to harness the power of bioinformatics in the field of agricultural development for societal transformation.

Dr Ravish Chatrath, Coordinator and Convener of this project briefed about the activities undertaken in this project since 2009 onwards. He also told that the main purpose of this event is to create a vibrant platform for exchange of ideas, best practices and strategies that would help to generate a road map for future research and development in the country.

In this connection, Bioinformatics laboratory at Directorate of Wheat (DWR), Karnal, Haryana organised two days National symposium on "Emerging trends in Agri- Bioinformatics-2013 (ETAB-2013)" during December 16-17, 2013. Near about 75 research papers were communicated by different scientists and research scholars. The symposium was well attended by about 110 scholars from different parts of the country. Dr Pradeep Sharma, Sr Scientist and Co-Convener of the ETAB-2013 welcomed the dignitaries on the dais and introduced the chief Guest and other dignitaries presented in ETAB-2013. The conference was inaugurated by the Chief Guest, Dr. J. L. Karihaloo, Coordinator, Asia-Pacific Consortium on Agricultural Biotechnology (APCoAB), Asia, Pacific Association of Agricultural Institutions (APAARI), National Agriculture Science Complex, New Delhi. On this occasion, Dr Indu Sharma, Project Director, Directorate of Wheat Research, Karnal and DR N K Singh, National Professor, B.P. Pal Chair, NRCPB, New Delhi were also present in this meeting. Papers highlighting the findings from different on-going studies across wide range of issues covered in four technical sessions presented and debated upon.

Dr J L Krihaloo in his opening remarks that insufficient production and high prices have greatly reduced the access to food, particularly of poor sections throughout the world. Reversing the trend requires increase in production as well as profitability of agriculture, which can be achieved through appropriate policy initiatives and technological innovations. Among the latter, tool and techniques that improve availability of relevant information to all the stakeholders in food production and consumption chain will greatly help in translating research advances into practical gains. Being an agriculturally rich country, India needs to exploit the power of bioinformatics for rapid farm sector growth and development.

Dr Indu Sharma, Project Director, DWR, Karnal introduced the galaxy of scientists with various activities on-going at Directorate of Wheat Research. She expressed her concerns agriculture sector in India is witnessing a continuous growth. Rapid changes on the demand and supply side, which are progressive in nature, are happening. The motivation has been provided by central government in the form of "Agri-Bioinformatics Promotion Programme" in India. At this stage, Bioinformatics' approaches may prove to be the game changer to carry forward the momentum of agricultural development.

Dr N K Singh delivered inaugural talk on Genomics and GM crops for food security. In his keynote lecture, he spoke on the National efforts put forward towards by his team has successfully completed the sequencing of rice chromosome 11, tomato chromosome 5 and complete genome of pigeonpea and chickpea *Rhizobium M. ciceri* Ca181, high resolution mapping of salinity tolerance genes in rice and molecular tagging and map-based cloning of genes for aroma and linear kernel elongation in Basmati rice and development of high density reference map in pigeonpea. He also briefed the participants about work on finishing of tomato genome sequencing and this information will be used for the identification of agriculturally important genes in tomato. He also told the transgenic research work should be continued in the country.

First technical session-I was held on thematic area "database and software's. In this session, three invited talks and two oral presentations were made. Dr A K Bhatia (Senior Scientist, NBAGR) talked on Genetic Algorithm and its Application in Bioinformatics Problems especially GA has been utilised in decision making in computer learning, for feature selection that reduces noise and cost of decision making in classification and identify subsets of loci to maximize the accuracy in assignment of individuals to populations with the likelihood approach. Dr Sudhir Kumar from CCS Haryana Agricultural University, Hisar told Bioinformatics is the science for new biology in his talk. The main aim of Bioinformatics usage is the preservation and perpetuation of knowledge for the identification and conservation of genetic resources to ensure sustainability of agriculture through the

utilization of the tools and infrastructure of genomic science. Dr Ravish Chatrath (Principle Scientist, DWR) told about various features of the Wheat database, which was built and developed under the Aegis of Agri-Bioinformatics program.

Technical session-II was dedicated for Nanotechnology on Dec 16, 2013. In this session Dr N Dilbagi, Chairman of Department of Bio & Nano Technology, Guru Jambheshwar University of Science & Technology, Hisar spoke on User-friendly and eco-friendly nano delivery systems for nutrients and pesticides have started to find their place in the market. The agricultural sector will benefit greatly from nanotech-based tools to detect diseases in a rapid manner, improve the ability of plants to absorb nutrients and promote molecular treatment of diseases. Usage of nanotechnology in these processes ensures safety of food products creates a healthy food culture and enhances the nutritional quality of foods. Dr Sudesh Yadav, CSIR-IHBT emphasised that using nanotechnology our group has explored the potential of many medicinally important plants for the synthesis of silver and gold nanoparticle. Several plant isolated biomolecules possessing strong antioxidant, antimicrobial and anticancer activity such as quercetin, quercitrin, phodophyllotoxin and catechins have been encapsulated on biodegradable polymeric nanoparticles. Nanoencapsulation of these molecules has documented their improved solubility, bioavailability and slow and sustain release. Efforts have also been initiated towards studying the influence/role of nanomaterials on plant growth and development as well as in fruits/vegetables shelf-life improvement.

In Technical session-III (Molecular modelling and microRNA), Dr Jai Kaushik (Pr Scientist, Animal Biotechnology Centre, National Dairy Research Institute) discussed on his experiments analysed for the sequence variations between cattle and buffalo lactoferrin, lysozymes, and xanthine oxidoreductase, three important milk proteins, which serves as an important part of innate immune system by serving as strong antimicrobial agent. SNPs could occur in the coding as well as non-coding region. Finding related to effect of sequence on structure and function of these proteins also discussed. Dr Shailesh Sharma, National Agri-Food Biotechnology Institute (Department of Biotechnology, Government of India) at Mohali gave a lecture on functional characterization of expressed sequence tags of bread wheat (*Triticum aestivum*) and analysis of crispr binding sites for targeted genome editing. There were three oral presentations by Dr OP Gupta on miRNA mediated defense responses in wheat during stem rust invasion, Veenti Rana on Understanding proteomics technology under salinity stress and Bharty Pandey on Extrapolating the effect of nonsynonymous SNP in Bread wheat HSP16.9B Gene using molecular modelling and dynamics study approaches.

Dr. Monendra Grover, Senior Scientist (Computational Biology) Centre for Agricultural Bioinformatics, Indian Agricultural Statistics Research Institute, Pusa, New Delhi talked about importance of quantum computation in the biological network systems. In his talk by Dr Sachinandan Dey, Animal Genomics Lab Animal Biotechnology Centre, National Dairy Research Institute on Data Mining in Animal Genetics emphasised that it is difficult to deal with these genomic information using actual bioinformatics data mining tools, because data are heterogeneous, huge in quantity and distributed geographically. GenBank release 198 (October 22, 2013) containing 535 billion bases pairs of sequence [<http://www.ncbi.nlm.nih.gov/news/10-22-2013-genebank-release198/>]. There were two oral invited presentations on Pre-processing of raw EST sequences obtained from boll tissue of *Gossypiumarboretum* by P Siwach followed by Identification of SNP marker for clodinafop (ACCase inhibitor) herbicide resistance in *Phalartia minor*.

Apart from Keynote and oral presentations, there were more than 50 poster presentations displayed under the thematic areas of each technical session. Best poster presentations for the papers entitled “Comparative analysis of large scale phylogeny estimation software’s”

by Arora et al.; “Indian wheat rust disease database for decision support system” by Lata et. al.” and “isolation and characterization of cellulose nanofibers from Bamboo species” by Singla et. al. were adjudged for award.

In concluding and valedictory session, Dr. Alpana Dey, Director and office In-charge, DEIT, MCIT was Chief Guest. She informed that basic idea behind this Agri-Bioinformatics program was to promote the role of bioinformatics in Agriculture and development of Agri databases such as <http://indianwheatdb.com/>. At this moment, awards were distributed to the three Best poster presentations. Details about the conference can be found at the following URL: <http://www.dwr.res.in/sites/default/files/etab2013.pdf>.

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