



# NRCPB NEWSLETTER

ICAR- National Research Centre on Plant Biotechnology,  
Pusa Campus, New Delhi



Vol. 03 | No. 1

January–June 2016

## FROM PROJECT DIRECTOR'S DESK

*Providing food and nutritional security to the large Indian population living below poverty line is one of the most important agenda of successive Indian Governments. Therefore, besides growing crops for increased agricultural production, increasing nutritional status of various food security crops like rice, wheat and maize is getting more attentions of the scientific communities. Most of the popular varieties of rice, wheat and maize grown in India are inherently low in important micronutrients like Fe and Zn, proteins and anthocyanins. Therefore, biofortification of these crops has been one of the important areas of research identified by different funding agencies. There are now good examples of improved biofortified Quality Protein Maize (QPM) having 30% more lysine and 41% higher tryptophan amino acids compared to the popular maize varieties. There has been very important biotechnological intervention where marker assisted selection has been used to introgress these quality traits for developing QPM maize hybrids in India.*

*Another important staple food in India is Rice which also lack major micronutrients. Therefore, Golden Rice programme started long back to enrich rice seeds with  $\beta$ - carotene and Fe contents by using transgenic technology. The gene crt1 (derived from the soil bacterium Ervinia carotovora), and psy gene from daffodil (Narcissus pseudonarcissus) has been introduced in rice to develop biofortified rice crop. This is very important in Indian context where majority of the population is deficient in important micro nutrients leading to many life threatening diseases. The biofortified rice, if approved by the government for commercial cultivation, can become an important part of the mid day meal scheme of the Govt. which targets people living below poverty line. Similarly, there are other examples of biofortified banana, cassava and many more crops being produced word over.*

*Therefore, biotechnology is a powerful tool which can be targeted towards the benefit of mankind and can act as a vehicle of change for developing crop varieties which suits to need of the society at large. Being expensive science, we should use these tools very carefully and cautiously. NRCPB has been using different biotechnological approaches to improve major cereal crops like rice and wheat, important pulses and oilseed crops i.e. chickpea, pigeon pea and mustard etc. In this newsletter we have included major highlights of the research and other activities of the centre conducted during the past six months.*

*I thank the editorial team lead by Dr PK Mandal who has made all efforts to include key highlights of the institute in this newsletter with very meticulous way. I also place on record my thanks to all the staff members who have contributed for this newsletter. I extend my sincere*



*thanks to Dr. T. Mohapatra, Secretary DARE and DG, ICAR, Dr. J S Sandhu, DDG (CS) and Dr J S Chauhan, ADG (Seeds) for their continued support to NRCPB. I am very much confident that this issue of the Newsletter would be received well by readers across different domains. Kindly send your comments and/ or suggestions for its further improvement.*

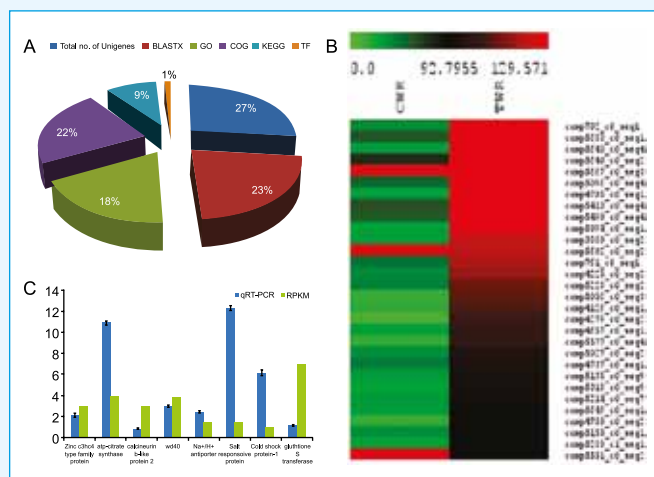
(T R Sharma)

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## Transcriptome profiling of Kharchia Local wheat under the salt-stress

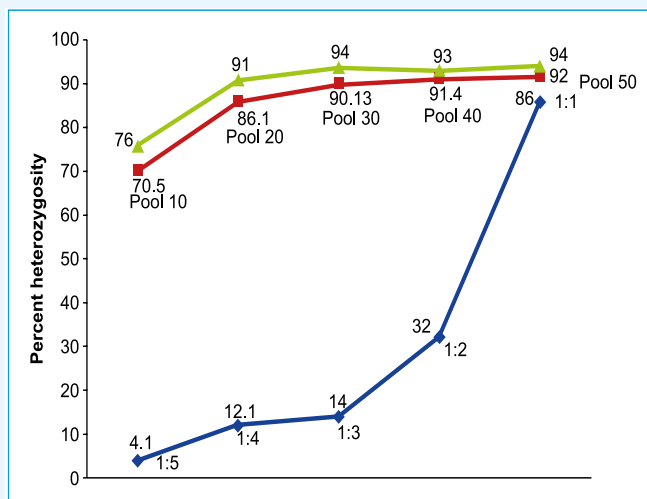
Kharchia Local is an Indian salt tolerant wheat cultivar. Despite of its salt tolerant property, genomic or transcriptome information of this cultivar is limited in the public database. Therefore, in order to gain insight into molecular mechanism under salt stress, high throughput *de-novo* transcriptome sequencing and analysis were carried out using Roche 454 platform. A total of 3,67,022 reads were obtained after quality filtering, resulting in a total of 17,911 unigenes. Out of all the assembled unigenes, 83.18% aligned to Nr protein database, 68.10% unigenes were summarized under three main GO categories. 83.17% of the unigenes showed COG classification, 34.29% showed KEGG mapping and only 4.6% unigenes were classified into putative transcription factors. In total, 2,495 unigenes were differentially expressed between control and the treated samples. These results constitute an essential resource for understanding the molecular changes mediated under salt stress, which can be used for improving salinity tolerance in important crop species.



Transcriptome sequencing analysis of *T. aestivum* under salt stress with annotation statistics and Heat Map of DEGs and qRT-PCR validation of candidate genes

## Rapid identification of QTLs for salt tolerance using SNP Chip developed at NRCPB

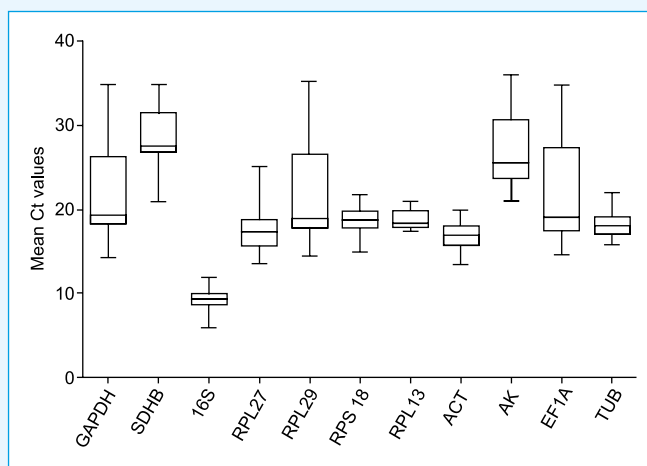
A method for rapid identification of QTLs for salt tolerance by Bulk Segregant Analysis (BSA) approach using a 50K rice SNP chip has been proposed and experimentally validated at NRCPB. Array based SNP genotyping of pools of 10, 20, 30, 40 and 50 RILs was done to identify the optimum pool sizes for maximum heterogeneity of alleles in the pool, so that the extreme pools did not differ for alleles other than those in the associated QTL regions. Since the maximum gain was between pool size of 10 to 30 RILs, the pool size of 30 was fixed as the optimum. Bootstrapping results also validated the experimental results. Using the parents CSR11, MI48 and the bulked-tolerant (BT) and bulked-susceptible (BS) pools of 30 RILs, we identified total 21 QTLs for SSI for grain yield on rice chromosomes 1, 2, 3, 5, 6, 8, 9 and 12.



Analysis of heterogeneous loci in different RIL pool sizes and mixture of parental DNA samples using 50K SNP chip.

## A way forward to the qRT-PCR study in mustard aphid.

qRT-PCR has rapidly gaining importance as a robust method for studying gene expression. Even though qRT-PCR is regarded as a powerful technique for gene expression studies, certain limitations such as differential expression of reference genes under chosen experimental parameters lead to misinterpretation of the qRT-PCR data. Appropriate reference genes are not known in case of mustard aphid (*Lipaphis erysimi*), which often has become an impediment in gene expression analysis. In this study, gene-expression data of 11 candidate reference genes under wide range of experimental parameters were evaluated by employing four independent statistical softwares. Drawing consensus on the results from different softwares, three best reference genes 16S, RPS18 and RPL 13 were recommended for use in normalization of RT-qPCR data in *L. erysimi*. This study has been a way forward to the qRT-PCR study in *L. erysimi*, that are undertaken in diverse research projects worldwide owing to the growing economic importance of this insect-pest.



Whisker box plots of reference gene expression under various treatment conditions.

# EVENTS

## New Year Day Celebration



ICAR-NRCPB Celebrated the New Year's Day at the Institute where Project Director addressed the Staff of NRCPB.

## Foundation Day

ICAR- NRCPB celebrated its Foundation Day on 15th January, 2016. During this occasion the Former Director, Indian Institute of Sciences, Bengaluru, Padma Bhushan Prof. G. Padmanaban delivered foundation day lecture on "Biotechnology in Health and Agriculture Sectors – Relevance for India". Prof. V. L. Chopra, Former Member, Planning Commission and Former Director General, ICAR & DARE Secretary was the Chief Guest of the function. Dr. J. S. Sandhu, Deputy Director General (Crop Sciences), ICAR was the Guest of Honour on this occasion. Several other distinguished invitees were present in this function. On this occasion NRCPB released Compendium of Products and Technologies of NRCPB.

## Felicitation of Director General, ICAR

ICAR-NRCPB organized a felicitation programme for newly appointed Director General, ICAR & Secretary, DARE, Govt. of India, Dr. T. Mohapatra on 7th March 2016. On this occasion Dr. TR Sharma, Project Director, NRCPB welcomed Dr. Mohapatra on behalf of staff of NRCPB and on his personal behalf. While addressing the audience Dr. Mohapatra touched upon several aspects of sincerity and hard work in the field of scientific research. He also urged the scientists of NRCPB for high quality research which must address farmers need. On this occasion Prof. VL Chopra, Former Member, Planning Commission and Former Director General, ICAR & DARE Secretary, Former Project Directors Prof. RP Sharma and KR Koundal were also present.



## International Women Day Celebration

NRCPB celebrated International Women's Day on 8th March, 2016. Mrs. Kalpana Mohapatra, wife of Dr. T. Mohapatra, Secretary, DARE and DG, ICAR graced the function as the Chief Guest. On this occasion, a free Health Check Up Camp for NRCPB staff and their spouse was organized with the help of experienced doctors of Metro Hospitals and Heart Institute, New Delhi.



## Institute Management Committee Meeting

The Institute Management Committee meeting was held on 26th March, 2016 under the chairmanship of Dr. TR Sharma, Project Director, ICAR-NRCPB. Other members present were Drs, NP Singh, JS Chauhan, KV Bhat, Ratan Tiwari, RM Sundaram. Drs. NK Singh, PK Mandal, Jasdeep Padaria, PK Jain, Kishore Gaikwad and Sh. Mohan Singh (AFO) were special invitees.



## Annual Review Meeting of BNF Project

The annual report and technical review meeting of the project "Genetic modification to improve Biological Nitrogen Fixation for augmenting N needs of cereals (BNF)" under Incentivizing Agricultural Research was held on 5th April, 2016 at NRCPB under the chairmanship of Dr. TR Sharma, Project Director, NRCPB and in the presence of three experts members viz. Prof. KR Koundal (Former Jt. Director, Research, IARI, New Delhi), Prof. HK Das (Honorary INSA Scientist and Former HOD, School of Biotechnology, JNU, New Delhi) and Dr. AK Tripathi (Director, CSIR-CIMAP, Lucknow). The Project Investigators of all centres presented their research progress. The chairman and experts suggested several valuable points.

## Institute Research Committee Meeting

The Institute Research Committee Meeting (IRC) was held on 6-7 May, 2016 under the chairmanship of Dr. TR Sharma, Project Director, ICAR-NRCPB. All the scientific staff of the centre presented research progress of their in-house projects as well as externally funded projects. The research progress

was reviewed by two eminent scientists viz. Prof. NK Singh (National Professor, NRCPB) and Dr. V Siva Reddy (Former Programme Leader, Plant Molecular Biology, ICGEB, New Delhi). Subsequently several valued suggestions were given by the expert members to streamline the progress.



## Swachhta Pakhwara

ICAR-NRCPB celebrated Swachhata Pakhwara during 16-31 May, 2016. During this period various cleaning programme were conducted by all staffs of the centre. A talk on "Public Health Challenge of Urban Air Quality and The Way Forward" by Anumita Roychowdhury, Executive Director, Research and Advocacy Centre for Science and Environment, New Delhi was also organized. To sensitize the janitorial staffs for regular cleanliness of NRCPB premise, a floor level competition was organized and cash prize was given to them.



## International Yoga Day

International Yoga day was celebrated on 21st June 2016 at NRCPB. Ms. Indira, yoga Instructor, from Morarji Desai National Institute of Yoga (An autonomous Organization under the Ministry of AYUSH, Govt. of India) demonstrated various ASANAS for the NRCPB Students and Staff.



## New Facilities

New Transgenic Net houses have been constructed for experiment on various GM crops.

## Sports

Dr. P. K. Dash, Sr. Scientist won the Gold Medal in ICAR Inter-Zonal Sports Tournament held at ICAR-CAZRI, Jodhpur, from 8-12 February, 2016 in individual shot-put competition. A total number of 44 ICAR Institutes participated in the tournament.



New Transgenic Net houses have been constructed for experiment on various GM crops.

# NEW PROJECTS

Following new projects from different funding agencies have been sanctioned during the reporting period:

Sl. No.	Title of the Project	Funding Agency	PI	Grant Amount (Rs. in Lakh)
1.	Indo-UK Centre for Improvement of Nitrogen Use Efficiency in wheat (INEW) - (DBT-BBSRC)	DBT	Dr PK Mandal	217.154
2.	Understanding the mechanisms of tolerance to low-light intensity in rice	ICAR-NASF	Dr Prasanta Dash	131.955
3.	A novel micro RNA-induced gene silencing strategy for development of pest and disease tolerant cotton plants (DBT-BIRAC).	DBT	Dr Rohini Srivathsa	92.64
4.	Study on <i>Sclerotini asclerotiorum</i> with emphasis on management of Sclerotinia	ICAR-EMF	Dr NC Gupta	27.87

# OUTREACH

## Visit of Newly Joined ARS Scientist from IARI, New Delhi

A batch of newly joined Scientists from IARI, New Delhi visited NRCPB on 7th January 2016 and interacted with the Scientists of this Institute. They also visited various facilities and infrastructure available at NRCPB.



## Visit of School / College students

Almost hundred students from Kerala Agricultural University, Kerala and Kumaun University, Nainital, Uttarakhand visited NRCPB during Jan-June 2016. They visited different labs and interacted with scientists about biotechnology and the current research undergoing at centre. A batch of farmers also visited the centre on 15th February 2016 and discussed with Scientists. They were told about different technologies developed by NRCPB and their application.



Visit of Students and Farmers

## MTA signed

- ♦ ICAR-NRCPB signed Benefit Sharing Agreement as formatted by ISCB/DBT on 28th August 2009 post facto on 21.01.2016 with Assam Agriculture University, Jorhat for use of *cry2Aa* gene.
- ♦ ICAR-NRCPB signed Material Transfer Agreement (MTA) for LOC\_Os11g47510 gene with Indian Institute of Maize Research, Pusa Campus, New Delhi on 30.05.2016.
- ♦ ICAR-NRCPB signed Material Transfer Agreement (MTA) with ICGEB, New Delhi pertaining to sharing of rice mutants developed at NRCPB on 27.05.2016.

## Training

- ♦ ICAR-NRCPB conducted ICAR sponsored training on “Marker free transgenics and methods of transgene detection” from 1-21 Feb, 2016 and there were twenty two participants from different parts of India who get benefited from this training.
- ♦ A DBT-BIRAC sponsored Training program on “Application of Marker Assisted Selection and Transgenic Development



for Crop Improvement” was conducted at the National Research Centre On Plant Biotechnology, Pusa Campus, New Delhi from 18th – 20th February 2016. A total of 22 participants, 11 from eight different seed industries and the rest from academic institutions attended the training from across the country. After successful completion of the training Dr. NK Krishna Kumar, DDG (Hort.); Dr MB Chetti, ADG (HRD) and Dr TR Sharma, PD presented all the trainees with certificates.

- ♦ Training for school teachers was organized by XV Genetic Trust at NRCPB during 19-20, May, 2016. Twenty five school teachers from different schools of Delhi participated in the programme.

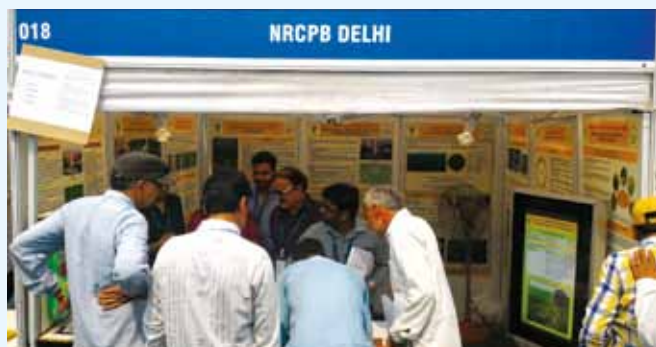


## Professional Training

During this period thirteen ARS scientists joined NRCPB for their three months professional training in the field of molecular biology and biotechnology from various ICAR institutes all over India.

## Krishi Unnati Mela

NRCPB participated in the ‘Krishi Unnati Mela’ held at Pusa, New Delhi during 19-21 March 2016. The Mela was inaugurated by Hon. Prime Minister Shri Narendra Modi. All Scientific and Technical staff participated in the Mela and interacted with farmers, students and other visitors at NRCPB stalls. NRCPB exhibited various technologies, models and live demonstration related to Plant Biotechnology for farmers, students and other visitors at its stall in the Mela.



Over crowded NRCPB Stall in Krishi Unnati Mela

## VISITS AND EXCHANGES

### International

- ♦ Prof. Oron Shagrir, Vice Rector and Prof. Shmuel Wolf, Dean, The Hebrew University of Jerusalem visited NRCPB on 14th January, 2016 and interacted with the scientists.



Prof. Shmuel Wolf was felicitated by Project Director



Dr. Morven A McLean and Dr. Donald J. MacKenzie (2nd and 3rd from right respectively)

- ♦ Under the ICAR’s programme on Biosafety Awareness and Compliance Readiness, lectures were organized at NRCPB on April 6, 2016. The first lecture was on, “Biosafety compliance as an essential part of GE product development” by Dr. Morven A McLean, Executive Director, ILSI Research Foundation and the second was on “Best practices in regulatory dossier development” by Dr. Donald J. MacKenzie, Regulatory Affairs and Stewardship Leader, IRRI.
- ♦ Professor Ian Bancroft, Department of Biology, University



of York, UK visited the institute and interacted with the scientists working on *Brassica* in ICAR-NRCPB and ICAR-IARI and also delivered a lecture on "Associative transcriptomics and visualization of genome structural evolution in *Brassica* oilseed crops" on April 28, 2016.

- ♦ Dr. Paul Quick and Dr. Anindya Bandyopadhyay from IRRI visited the Centre on June 1, 2016 to discuss about the students exchange programme with MBB Division of IARI (NRCPB).

## National

- ♦ Prof. Govind Makharia, eminent Gastroenterologist from All India Institute of Medical Science (AIIMS), New Delhi



delivered a lecture on 'CELIAC DISEASE' (CD) on 17th May 2016.

- ♦ Dr. Vandana Rai delivered a lecture on 'Genetic and biochemical analysis of salt tolerance in rice' in International Symposium on Natural Environmental Science, Mejo University, Nagoya, Japan (February 1, 2016).
- ♦ Dr Ajay Jain delivered an invited talk entitled '*In planta* synthesis of gold nanoparticles and hormesis: en engine' at Hisar Agriculture University (March 16, 2016).
- ♦ Dr Ajay Jain delivered an Invited talk entitled 'Complex regulation of phosphate starvation in plants: sensing and signaling cascades and cross talks with sugar and phytohormones' at the National Seminar on 'Plant and Microbes in Human Welfare' at Dayalbagh Institute, Agra (28-29 March, 2016).

## Publications

Type of Publication	Number
Research Papers	35
Book chapters	01

## AWARDS AND HONOURS

Dr Siddanna Savadi received the IARI Gold medal from Hon. President of India, Shri Pranab Mukharjee during 54th Convocation of IARI for his outstanding Ph.D. Research work.



## हिन्दी गतिविधियां-2015

वर्ष 2016 की तिमाही के अंतर्गत दो कार्यशालाओं एवं दो हिंदी राज भाषा कार्यान्वयन समिति की बैठकों का आयोजन किया गया जिनका विवरण निम्न प्रकार से है:-

दिनांक 30-01-2016 एवं 02-05-2016 को हिंदी राज भाषा कार्यान्वयन समिति की बैठकों का आयोजन केंद्र में सफलता पूर्वक किया गया।

सं.	दिनांक	तिमाही	व्याख्यानकर्ता
1.	05-03-2016 अपराहन 03.00 बजे	जनवरी -मार्च	श्री निमिशकपूर, अध्यक्ष एव वैज्ञानिक, वैज्ञानिक चलचित्र उत्सव (Science Film Festival Division), विज्ञान प्रसार (VIPNET), नोएडा
2.	25-05-2016 अपराहन 02.30 बजे	अप्रैल -जून	श्री अशोक सेल्वटकर, साइंटिफिक ऑफिसर एवं एडिटर, वैज्ञानिक एवं तकनीकी शब्दावली आयोग, मानव संसाधन मन्त्रालय, नई दिल्ली



## STUDENTS' SECTION/NRCPB BIOTECH CLUB

Biotech Club organized a lecture of Prof. Eduardo Blumwald, Eminent Scientist from UC Davis, USA on 'Engineering stress tolerance: Role of NHX-type cation/H<sup>+</sup> antiporters on 'Ion and pH homeostasis and their influence on protein processing and vesicular trafficking' on 23rd Jan 2016. The club has also organized a lecture of Dr Alexandra (Sacha)

M. Allen from Life Sciences Department, University of Bristol, UM on 'Functional Genomics in Wheat' on 15th February 2016.

Biotech Club also organized a farewell programme on 5th Feb-2016 and felicitated all 7 Ph.D. and 6 M. Sc. Degree recipients from MBB division of IARI during 54th Convocation.



Prof. Eduardo Blumwald (3rd from left)



Dr Sacha is felicitated by Prof. S.R. Bhat



## PERSONNELIA

### New Joining

- ♦ Dr. Ramcharan Bhattacharya, Principal Scientist, ICAR-NRCPB joined as Professor, Molecular Biology and Biotechnology on 26th April 2016.
- ♦ Mr. Rajesh Kumar Sharma joined the ICAR-NRCPB as Senior Administrative officer on 23rd May 2016 after getting transferred from ICAR-CIRG, Mathura.
- ♦ Dr. Sandhya joined the ICAR-NRCPB as Scientist on 8th April 2016 after completing her training at ICAR-NAARM, Hyderabad.



### Promotion

- ♦ Dr. Monika Dalal and Dr. Kanika Kumar are promoted to Principal Scientist through CAS.

### Retirement

Dr. S. R. Bhat, superannuated on 29th Feb 2016 as Professor, MBB after serving 36 years at ICAR and 20 years at ICAR-NRCPB, Delhi. He started his professional career at ICAR-IISR, Lucknow in 1978. During this service he has immensely contributed in *Brassica* genetics mainly on developing the CMS and fertility restorer lines of *Brassica juncea*. He has identified and

characterized CMS-associated novel *orf108* causing male and female gamete sterility. His contribution on widening germplasm base in *B. juncea* would help the breeder to develop improved varieties in future. He has also significantly contributed on Biotechnology and Plant Molecular Biology of several other crops like banana, ginger, piper, citrus. NRCPB family wishes him a happy, healthy and peaceful retired life.



Ms. Suman Bala worked at centre as Chief technical officer. She worked in different project and showed her competence in research. She worked in ICAR about 37 years and superannuated on 29th Feb 2016. NRCPB family wishes her a happy, healthy and peaceful retired life.



Mr. H. C. Upreti superannuated from service on 30th April 2016. He was associated with the genomics group from many years at centre and retired from the post of Chief technical officer. NRCPB family wishes him a happy, healthy and peaceful retired life.



Ms. Piyush Malyan got relieved from ICAR-NRCPB as Senior Administrative Officer on 29th Feb 2016. NRCPB family wishes her a happy, healthy and peaceful life.



## FORTHCOMING EVENTS

- ♦ Research Advisory Committee meeting of NRCPB: 8th August, 2016
- ♦ Welcome of New PG School Students
- ♦ Hindi Chetna Saptah
- ♦ Kharif Field Day
- ♦ ICAR Sponsored Winter School on "Genomics and Phenomics for Enhancement of Crop Nutrient Use Efficiency" from 1-21 September 2016 at ICAR-NRCPB, New Delhi.

### Credit lines:

Published by : Dr. TR Sharma, Project Director, NRCPB, New Delhi-110012

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Compiled and Edited by : Dr. PK Mandal, Dr. SK Sinha, Dr. Amolkumar U. Solanke and Dr. Mahesh Rao

Typeset & Printed by : M/s Royal Offset Printers, A-89/1, Naraina Industrial Area, Phase-I, New Delhi-110 028