CURRICULUM VITAE

Name:	**Sujay Rakshit**
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Date of Birth:	January 03, 1970
Nationality:	Indian
Languages known:	English, Hindi and Bengali

CAREER GOAL

To pursue and coordinate frontier multi-disciplinary research towards genetic improvement of crop plants to increase agricultural productivity, particularly in dryland agriculture

EDUCATION

Ph.D.	Division of Genetics, Indian Agricultural Research Institute, New Delhi (India) *Thesis title*: Biochemical and molecular analyses of powdery mildew resistance in pea (*Pisum sativum* L.) *Year of passing*: 1998 *Distinction*: OGPA 4.00/4.00, Ranked first, and received Best Ph.D. Student Medal and IARI Merit Medal
M.Sc. (Ag.)	Department of Genetics & Plant Breeding, Banaras Hindu University, Varanasi (India) *Thesis title*: Mutagenic effects of ethyl methane sulphonate in green gram (*Vigna mungo* (L.) Wilczek) and black gram (*V. radiate* (L.) Hepper) *Year of passing*: 1993 *Distinction*: OGPA 9.07/10.00, Ranked first, and received Binani Gold Medal and BHU Gold Medal
B.Sc. (Ag.) Hons.	Institute of Agriculture, Visva Bharati, Santiniketan (India) *Year of passing*: 1991 *Distinction*: Ranked 3rd, received University Merit Scholarship

POST-DOCTORAL FELLOWSHIP RECEIVED/GRANTED

Organization	Period	Fellowship	Research work
NE Borlaug Fellowship	2011	USDA	Visited Purdue University, USA and worked on characterization of sorghum World Collection and fine mapping of *D11* mutant in maize
Iwate Biotechnology Research Center, Japan	2003-2005	JSPS Post-doctoral Fellowship	Molecular phylogenetic studies in rice, fine mapping of mutations, and eco-TILLING based rapid SNP detection
BOYSCAST Fellowship	2003	Dept. Science & Tech., Govt. of India	Did not avail as got selected for JSPS PDF

PROFESSIONAL APPOINTMENTS

Director, Indian Institute of Agricultural Biotechnology, Ranchi from 9 December, 2022 to- till date

Leading the ICAR-IIAB, Ranchi as Director with focus on Research, Education and Extension.

Director, Indian Institute of Maize Research, PAU Campus, Ludhiana 141 004 (India) from March 24, 2017 – 08th December, 2022

I am leading the maize research and development activities in India through All India Coordinate Research Project (AICRP) on Maize. I also coordinate with the government line departments and other national and international bodies to promote maize research and development in India.

Principal Scientist (Plant Breeding) from Nov. 29, 2008 – March 23, 2017: ICAR-Indian Institute of Millets Research (formerly Directorate of Sorghum Research), Rajendranagar, Hyderabad (India)

Research responsibilities: Genetic diversification of rainy and post-rainy season sorghum parental lines, improvement of grain storability, development of early duration parental lines/varieties, development of red sorghum cultivars, deployment of genomics tools towards sorghum improvement

Management responsibilities: As Principal Investigator, All India Coordinated Sorghum Improvement Project (AICSIP) Grain Sorghum Breeding – leading the grain sorghum breeding program in India through a multi-disciplinary approach. As Nodal Officer, AICSIP from 2010-14 coordination of multi-location inter-disciplinary trials, organization of annual sorghum meeting for the country etc. As Member Secretary, Quinquennial Review Team coordinated review of sorghum research in public sector in India for the period of 2007-11.

Senior Scientist (Genetics) from March 22, 2005 to Nov. 28, 2008 and Scientist (Genetics) from Sep 05, 2000 to March 21, 2005 (barring June 01, 2003 – May 31, 2005): Directorate of Maize Research, New Delhi (India)

Research responsibilities: Breeding for specialty corn, morphological and molecular characterization of promising lines, maintenance and distribution of maize parental lines among maize workers across India, development of maize transgenics

Management responsibilities: As Nodal Officer creation of DUS Testing Guidelines for maize in India, which was adapted by the Protection of Plant Varieties and Farmers' Rights Authority (PPV&FRA), Government of India; coordination of DUS testing of maize across centers, submission of application for PBR to PPV&FRA etc.

Teaching responsibilities: Teaching and guiding of PG students of IARI, New Delhi

Scientist (Genetics) from Sep 02, 1996 – Sep 04, 2000: Indian Institute of Pulses Research, Kanpur (India)

Research responsibilities: Research on pulse (chickpea) genetics and biotechnology

Scientist (Genetics) from March 22 – Sep 01, 1996: National Academy of Agricultural Research Management (India)

Foundation Course on Agricultural Research Service including field experience training at GB Pant University of Agriculture and Technology (India)

TEACHING EXPERIENCE

- Teaching at the Department of Plant Breeding & Genetics, Punjab Agricultural University from 2017. Teaching two courses, *viz*., Advances in Plant Breeding System (PBG603) and Heterosis Breeding.
- Faculty Member of the Division of Genetics, IARI, New Delhi from December, 2000 and taught three courses, *viz*., Development of Gene Concept (Gen 200), Cytogenetics I (Gen 110) and Mutagenesis (Gen 201)

STUDENTS ADVISED/ADVISING

1 Sukhdeep Kaur (M.Sc.) from Punjab Agricultural University. Thesis title: Identification of quantitative traits loci (QTLs) for popping traits and kernel size in maize (Completed).

2 Shreya V (M.Sc.) from Punjab Agricultural University. Thesis title: Analysis of nucleotide diversity in waxy locus and genetic diversity of waxy and non-waxy maize germplasm (Continuing).

3 Arushi Arora (Ph.D.) from Punjab Agricultural University. Thesis title: Gentic enhancement of white maize (Zea mays l.) through conventional and molecular approaches for yield and amylose content (Continuing).

4 Zerka Rashid (Ph.D.) from Jamia Milia Islamia: Regeneration and transformation studies in maize (*Zea mays* L.) (Completed – 2010)

5 Ravindra Nath (Ph.D.) from Univ. of Rajasthan: Molecular, biochemical and morphogentic studies on high oil maize(Completed – 2016)

AWARDS AND HONORS RECEIVED

1 Dr. BR Barwale Award (2021) for Application/Excellence in Plant Genetic Resources
2 Fellow, National Academy of Agricultural Sciences, New Delhi from 2022
3 Agriculture Leadership Award 2021 by National Education Empowerment and Development Foundation (NEEDEF), Lucknow
4 Dr. AB Joshi Memorial Award 2020 by Indian Society of Genetics & Plant Breeding, New Delhi
5 Kallaya Kirshnamurti National Award 2020 by University of Agricultural Sciences, Bengaluru
6 ICAR Best Annual Report Award 2020
7 ICAR Chaudhury Devilal Outstanding AICRP Award, 2019
8 President, Agriculture & Forestry Section, Indian Science Congress Association 2018-19
9 President, Maize Technologists Association of India, 2018 - 20
10 Associated Editor, Indian Journal of Genetics & Plant Breeding, 2016
11 Fellow, Indian Society of Genetics & Plant Breeding, New Delhi, 2014
12 NE Borlaug Fellowship (USDA) 2010
13 JSPS Post-doctoral Fellowship for Foreign Researchers, 2003
14 BOYSCAST Fellowship, 2003
15 CSIR Scientist Travel Fellowship, 2002
16 Indian Science Congress Association Young Scientist Award, 1999
17 Jawaharlal Nehru Award, 1999 for outstanding post-graduate research
18 UNESCO Fellowship in Biotechnology, 1998
19 Best Ph.D. Student of IARI Medal, 1998
20 IARI Merit Medal, 1998
21 Jawaharlal Nehru Memorial Award, 1994 for outstanding performance during M.Sc. (Ag)
22 Binani Gold Medal, 1994 for ranking first during M.Sc. (Ag)
23 BHU Gold Medal for ranking first in Dept. of Genetics and Plant Breeding, BHU, Varanasi

PROFESSIONAL ACHIEVEMENTS

Total citation 1917 (h-index 23)

1. Technologies developed

A. Cultivars developed

i. **IMH 121/Shalimar Maize Hybrid 5/DMRH 1417 (Gazette notification: S.O. 1056 (E) Sl. No. 69, Dated 6th March, 2023)**: A short duration single cross hybrid of maize for Kharif season cultivation in Jammu & Kashmir. It has high grain yield (7.5 t/ha), attractive orange grain colour, semi dent grains, and cylindrical cob. The kernel rows per cob range from 14-16. It has shown tolerance to turcicum leaf blight, maydis leaf blight and common rust diseases of maize. IMH 221 has also performed well in AICRP rainfed trials, farmer's field of Jammu and Kashmir and Himachal Pradesh with average grain yield ranges from 4.0-6.5 t/ha. It has shown tolerance to Chilo partellus insect in the AICRP as well as station trials of maize. This hybrid found responsive to nutrients application.

ii. **MZM 11 (Gazette notification: S.O. 1056 (E) S. No. 59, Dated 6th March, 2023):** It is white grain maize composite variety notified for Kharif season cultivation in Mizoram state i. This variety have yielded 5.0-5.5 t/ha in the experimental and 3.5 to 4.0 t/ha in the farmers field. It found responsive to nutrients application. MZM 11 showed significantly grain yield superiority (33 %) over the best check in state trials. This variety bears long cobs with 35-45 kernels per row. As per the AICRP trials It has shown moderately resistant (MR) response to Turcicum Leaf blight (4.7) and Banded leaf and sheath blight (5.0) on 1-9 scale.

iii. **MZM 17 (Gazette notification: S.O. 1056 (E) S. No. 60, Dated 6th March, 2023)**: It is a dark purple popcorn composite variety recommended for cultivation in Mizoram state. This variety has average yield of 4.1 t/ha, and 95 % popping percentage. It showed 20.78% yield superiority over check Amber Pop during three years of testing in state trials. This composite has also shown moderately resistant (MR) response to Turcicum Leaf blight (4.7) in AICRP trials on 1-9 scale. It found responsive to nutrients application. This composite is preferably suitable for the

upland (*jhum*) agro-ecosystem in the North Eastern India Hills of Mizoram. But may also be successfully grown in the low land rice fallows during *rabi* season

iv. **PMH 1-LP (Gazette Notification No. S.O. 4065(E). Sl. No. 70, Dated 31st August, 2022):** It is the first low phytic acid maize hybrid released in the country. It is a long duration kharif hybrid released and notified for commercial cultivation in north western plains zone (NWPZ) comprising states of Punjab, Haryana, Western Uttar Pradesh and plains of Uttarakhand. It is an improved version of PMH 1, a yellow maize hybrid released by the Punjab Agricultural University in 2007 with phytic acid content of 1.89 mg/g of endosperm, which is 36% lower as compared to PMH 1. Inorganic phosphate (Pi) content in PMH 1-LP is 0.66 mg/g which is 140% higher than the original hybrid, PMH 1. It has grain yield potential of 9560 kg/ha. It has moderate resistance to major diseases namely Maydis leaf blight, Turcicum leaf blight, charcoal rot and also pests namely maize stem borer and fall armyworm. The hybrid has been developed through marker assisted backcross breeding by transferring lpa2 allele. The hybrid is expected to play an important role in poultry sector.

v. **IMH 222 (Gazette Notification No. S.O. 4065 (E) Sl. No. 71 Dated 31st August, 2022):** This is medium maturity single cross field corn hybrid released by CVRC for cultivation during rabi season inPunjab, Haryana, Plains of Uttarakhand, Western UP and Delhi. It has grain yield of 10.19 t/ha and has shown significant yield superiority (17.53%) over the relevant best check in North Western Plains Zone. This hybrid is moderately resistant to Chilopartellus insect, Charcoal rot, Turcicum leaf blight, resistant to Maydis leaf blight and Fusarium stalk rot (FSR) diseases. This hybrid is responsive to high inputs.

vi. **IMH 223 (Gazette Notification No. S.O. 4065 (E) Sl. No. 72 Dated 31st August, 2022):** This is medium maturity single cross field corn hybrid released by CVRC for cultivation during rabi season inPunjab, Haryana, Plains of Uttarakhand, Western UP and Delhi. It has grain yield of 10.48 t/ha and has shown significant yield superiority (20.89%) over the relevant best check in North Western Plains Zone. This hybrid is moderately resistant to Chilopartellus insect, Charcoal rot, Turcicum leaf blight, resistant to Maydis leaf blight and Fusarium stalk rot (FSR) diseases. This hybrid is responsive to high inputs.

vii. **IMH 224 (Gazette Notification No. S.O. 4065 (E) Sl. No. 73 Dated 31st August, 2022):** This is medium maturity single cross field corn hybrid released by CVRC for cultivation during kharif season inEastern UP, Bihar, Jharkhand andOrissa. It has grain yield of 7.23 t/ha and has shown significant yield superiority (13.49%) over the relevant best check in North Eastern Plains Zone. This hybrid is moderately resistant to Chilopartellus insect, Maydis leaf blight, Turcicum leaf blight, Charcoal rot, resistant to Fusarium stalk rot (FSR) diseases. This hybrid is responsive to high inputs.

viii. **IQMH 202 (Gazette Notification No. S.O. 500 (E) Sl. No. 48, Dated 29th January, 2021; PPVFRA Appl. No. DL150321006):** It is a medium maturing QPM hybrid, released for cultivation in Zone II (Punjab, Haryana, Delhi, Western UP and Plains of Uttarakhand). The yield potential of this hybrid is 7.2 t/ha and it is moderately resistant to *Chilo partellus* and MLB. This is rich in two essential amino acids i.e., Tryptophan (0.66%) and Lysine (3.05%). It is responsive to inputs. This hybrid is the one among 17 bio-fortified hybrids which were released by the hon'ble Prime Minister of India on World Food Day, 2020.

ix. **IQMH 203 (Gazette Notification No. S.O. 500 (E) Sl. No. 49, Dated 29th January, 2021; PPVFRA Appl. No. DL1503210005):** It is a medium maturing QPM hybrid released for Rajasthan, Gujarat, MP and Chhattisgarh. The potential yield of this hybrid is 6.3 t/ha and it is highly responsive to inputs. This hybrid is resistant to Fusarium stalk rot and moderately resistant to Rajasthan Downy Mildew and Curvularia Leaf Spot and *Chilo partellus.*It has high Tryptophan (0.77%) and Lysine (3.48%) content in endospermic protein. This hybrid is the one among 17 bio-fortified hybrids which were released by the hon'ble Prime Minister of India on World Food Day, 2020. It is licensed to M/s Sampoorna Seeds for commercialization.

x. **LQMH 1 (Gazette Notification No. S.O. 3482 (E) Sl. No. 38, Dated 7th October, 2020):** It is **e**arly maturity single cross kharif QPM hybrid released by CVRC for Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Meghalaya, Sikkim, Assam, Tripura, Nagaland, Manipur and Arunachal Pradesh. This hybrid is the one among 17 bio-fortified hybrids which were released by the the hon'ble Prime Minister of India on World Food Day, 2020. It has grain yield of 8.0 t/ha and has shown significant yield superiority (22.4%) over the relevant best check in Northern Hill Zone. It exhibited high Tryptophan (0.75-0.80%) and Lysine content (3.0-3.5%) in endospermic protein. This hybrid is tolerant to *Chilo partellus* insect, Turcicum leaf blight and Banded leaf and sheath blight diseases. This hybrid is responsive to high inputs, and due to its short duration, it can fit better in any maize based cropping system. The DAC allocation of its breeder seeds for kharif 2021 is 15 kgs (10 kgs female and 5 kgs male) and for kharif 2022 it is

42 kg (28 kg female and 14 kg male). It is licensed to two seed companies, viz., M/s Koshi Agro Biotech Pvt. Ltd. (Bihar) and M/s Chakra Seeds (AP) through M/s AgrInnovate Ltd., New Delhi.

xi. **LBCH 3 (Gazette Notification No. S.O. 3482 (E) Sl. No. 37, Dated 7th October, 2020):** LBCH 3 is an early maturing baby corn hybrid released by CVRC for kharif cultivation in J&K, Himachal Pradesh, Uttarakhand, Meghalaya, Sikkim, Assam, Tripura, Nagaland, Manipur, and Arunachal Pradesh. The de-husked baby corn yield of this hybrid is 1.3 t/ha. This hybrid has shown significant baby corn yield superiority (14.3%) over the best check over three years of testing in AICRP trials. The baby corn length of this hybrid is 9.6-11.6 cm and fodder yield of 17.0-21.0 t/ha. It has attractive creamish baby corn colour with high prolificacy. This hybrid is moderately resistant (MR) to multiple diseases, *viz*., turcicum leaf blight, maydis leaf blight, and banded leaf and sheath blight.

xii. **LPCH 2 (Gazette Notification No. S.O. 3482 (E) Sl. No. 43, Dated 7th October, 2020):** This is an early maturing popcorn single cross hybrid released from CVRC for kharif cultivation in Rajasthan, Madhya Pradesh, Chhattisgarh & Gujarat. The average popcorn grain yield of this hybrid is 3.5 t/ha which has shown significant grain yield superiority of 15.9**%** over the best check during the three years of testing in AICRP trials. Highest Popping percentage in this hybrid has been reported up to 95% with a mean of 86.1 in AICRP trial. The highest Popping expansion (PE) has been reported up to 1:23 in AICRP testing. LPCH2is moderately resistance (MR) to Charcoal rot, Fusarium stalk rot and Curvularia leaf spot diseases.

xiii. **LPCH 3 (Gazette Notification No. S.O. 3482 (E) Sl. No. 44, Dated 7th October, 2020):** It is early maturity popcorn single cross hybrid released by CVRC for kharif cultivation in Bihar, Jharkhand, Uttar Pradesh, Odisha, West Bengal, Telangana, Andhra Pradesh, Tamil Naidu, Karnataka, Maharashtra, Rajasthan, Madhya Pradesh, Chhattisgarh & Gujarat. The average popcorn grain yield of this hybrid is 4.0 t/ha which has shown significant grain yield superiority of 18.1% over the best check in three years of testing in AICRP trials. Highest Popping percentage in this hybrid has been reported up to 96.0% with a mean of 89.8% and expansion of 1:20 in the AICRP trial. LPCH 3 has shown Moderately Resistance (MR) to Charcoal rot, Fusarium stalk rot, Maydis leaf blight and Curvularia leaf spot. This hybrid has been commercialized to Gourmet Popcornica LLP A.P. through AgrInnovate India Pvt. Ltd.

xiv. **CSV 38F (JaicarHariyali) (Gazette Notification No. SO1498 (E); Sl. No. 108, dt. April 1, 2019):** It is a single cut forage sorghum variety released by CVRC for Maharashtra, Karnataka and Tamil Nadu with average green fodder and dry fodder yield of 564.6 q/ha and 144.8 q/ha, respectively. It also has highest per day fodder productivity. This has very high seed yield of 1438 kg/ha. It has resistance against major diseases, *viz*., grey leaf spot, shooty stripe, leaf blight and rust and moderately resistant to zonate leaf spot, anthracnose and Grain mould, and tolerance to both stem borer and shoot fly. It has protein content of 7.40%, protein yield (7.79 qtl/ha) and *in vitro* dry matter digestibility of 62.15% and Digestible Dry matter of 56.30 q/ha. This variety has done well in NDDB trial as well. Current DAC indent for this variety is 1.2 q besides NDDB has already it taken in their forage, silage and other trials. Since release the sale/ demand of breeder seed is 4 q.

xv. **DMRH 1305 (Gazette Notification No. SO 6318(E); Sl. No. 40, Dt. Dec. 26, 2018; PPVFRA Reg. No. REG/2019/183H):** It is yellow early khairf maize hybrid released by CVRC for Jammu & Kashmir, Himachal Pradesh, Uttarakhand (Hill region), Meghalaya, Sikkim, Assam, Tripura, Nagaland, Manipur and Arunachal Pradesh. It has grain yield potential of 6.5 t/ha. The hybrid is resistant to Curvularia leaf spot, moderately resistant to TLB, MLB and to spotted stem borer. The DAC allocation for breeder seeds of its parental lines till now is 110 kg. It has been licensed to M/s Sampoorna Seeds and M/s Koshi Agro Bitech through AgrInnovate India Pvt. Ltd.

xvi. **IMHB 1532 (Gazette Notification No. SO 6318(E); Sl. No. 42, Dt. Dec. 26, 2018; PPVFRA Reg.No. REG/2019/187H):** It is a kharif medium maturity baby corn hybrid released by CVRC for Punjab, Haryana, Delhi, Uttarakhand, Western Uttar Pradesh, Rajasthan, Gujarat, Madhya Pradesh and Chhattisgarh. It has dehasked baby corn yield potential of 2.0 t/ha. The hybrid is resistant to Curvularia leaf spot, moderately resistant to TLB, MLB and Charcoal rot, and to spotted stem borer. The DAC allocation for breeder seeds of its parental lines till now is 40 kg.

xvii. **IMHB 1539 (Gazette Notification No. SO 6318(E); Sl. No. 42, Dt. Dec. 26, 2018; PPVFRA Reg. No. REG/2019/188H):** It is a kharif early maturing baby corn hybrid released for J&K, Himachal Pradesh, Uttarakhand (Hill region), Meghalaya, Sikkim, Assam, Tripura, Nagaland, Manipur and Arunachal Pradesh. It has dehasked baby corn yield potential of 1.3 t/ha. The hybrid is moderately resistant to multiple TLB, MLB, BLSB and charcoal rot, and to spotted stem borer. It has been commercialized to M/s Koshi Agro Bitech through AgrInnovate India Pvt. Ltd.

xviii. **Pratap QPM Hybrid 1 (*Gazette Notification No. SO 2817(E) Sl. No. 45, Dt. Sep. 19, 2013; PPVFRA Reg. No. 229 of 2016*):** It is a medium maturity kharif QPM hybrid released by CVRC for the states of Rajasthan, Gujarat,

Chhattisgarh and Madhya Pradesh, both for irrigated and rainfed conditions. It has average grain yield of 5.9 t/ha. The hybrid is resistant to major diseases like PFSR, RDM, TLB, and moderately resistant to BLSB, MLB and cyst nematode. This was the first QPM hybrid exclusively released for this Zone. In 2013-14 and 2014-15 the breeder seed demand for the female parent was 15.38 q, which roughly turns out to area coverage of over 2 lac ha. In 2016 the breeder seed demand for male and female seed was 7 and 14 q, respectively.

B. Genetic stocks registered

Sl. No.	Name	INGR No.*	Salient features	Year
1	IS 31714-2-1-1	22028	High oil sorghum line	2022
2	IS 1212-4-1-1	22027	High oil sorghum line	2022
3	IML 21	21208	Resistant to Turcicum Leaf Blight (TLB) (Disease mean score 2.6)	2021
4	IML 11	21126	TLB resistant late maturing maize line (Disease mean score 2.6)	2021
5	IML 12	21209	Resistant to Turcicum Leaf Blight (TLB) (Disease mean score 2.5)	2021
6	IML 13	21210	Resistant to Turcicum Leaf Blight (TLB) (Disease mean score 2.4)	2021
7	SPV 2315	20086	Single-cut forage sorghum resistant to foliar diseases with high per day productivity for green fodder and high seed yield	2020
8	SPV 2389	20085	Single-cut forage sorghum with less HCN, High protein content and high seed yielding ability	2020
9	DMR E63	14014	Pink borer resistant maize inbred	2014
10	DMR E9	11028	Pink borer resistant maize inbred	2011
11	DMR E57	11029	Pink borer resistant maize inbred	2011
12	DMR PFSR-1	11041	Post flowering stalk rot resistant maize inbred	2011
13	DMR PFSR-9	11042	Post flowering stalk rot resistant maize inbred	2011
14	DMR 7	10077	Pink borer resistant maize inbred	2010
15	DMR 15	10078	Promising maize parental line	2010
16	DMR 16	10079	Promising maize parental line	2010
17	DMR 17	10080	Promising maize parental line	2010
18	DMRQ 107	10084	Quality protein maize (QPM) parental line	2010
19	WSC 1	10085	Promising sweet corn inbred line	2010
20	DMSC 1	10086	Promising sweet corn inbred line	2010
21	DMSC 6	10087	Promising sweet corn inbred line	2010
22	DMS 201	10088	Promising sweet corn inbred line	2010
23	DMS 203	10089	Promising sweet corn inbred line	2010
24	DMS 206	10090	Promising sweet corn inbred line	2010
25	DMS 207	10091	Promising sweet corn inbred line	2010
26	DMS 208	10092	Promising sweet corn inbred line	2010
27	SC 24-(92)-3-2-1-1	08117	Maydis leaf blight resistant maize parental line	2008
28	SC 7-2-1-2-6-1	07025	Maydis leaf blight resistant maize parental line	2007

2. Contributions in basic studies

A. Maize

- Organized introduction of 86 donors/germplasm from the USA, and 462 from CIMMYT, besides 7 wild accessions. These are being used in systematic breeding for improvement of baby corn, sweet corn, specialized starch (high amylase/high amylopectin) programme and others (Annual Report of ICAR-IIMR 2017-18, 2018-19, 2019 and 2020). From NBPGR GeneBank 11667 accessions were taken out for characterization in one go at ICAR-IIMR RMR&SPC, Begusarai during 2020-21. Further evaluation of selected subset at hotspot for BLSB, SDM and TLB led to identification of sources of resistance (unpublished). Out of these 8 BLSB resistant lines as identified across 5 locations are most significant outcome as till date no BLSB resistant sources have been reported from anywhere in the world (unpublished data). Fingerprint of was developed for promising maize inbred with SSR markers having high discrimination rate (DR) showing probability of identical match by chance at 4.06×10^{-8} (*J Plant Biochem.*

Biotech., **17**: 133). Published the first Catalogue of Indian Maize Inbred Lines having trait information of 811 inbred lines (DMR Technical Bulletin No. 2008/3. 39 pages). It was worked out that pink stem borer (PSB) prefers 1st and 2nd leaf sheaths for egg laying (*Ind. J Ento.,* **70**: 280). Accordingly, the best method of artificial screening was standardized as manual release of 15-20 neonates with camel brush between 1st and 2nd leaf and sheath at 14-18 DAS (*Ind. J Ento*., **71**: 199). Screening of large maize germplasm following the technique led to identification of potential lines for further improvement (*Ann. Pl. Protec. Sci*. 16: 404; *J Plant Genet. Resour*. 21: 155). Cyclic selections (4) among maize lines with moderate resistance led to 9.1-35.2% improvement in resistance against PSB (*Indian J. Genet*. **70**: 204). Molecular diversity among seven pink borer resistant and eight PFSR lines along with eight other inbred lines revealed average pair-wise genetic dissimilarity of 0.64. The 23 genotypes were clustered in two main groups, which were further subdivided into 5 and 6 sub-clusters, respectively. The study has revealed considerable diversity among inbred lines differing for resistance against pink borer and PFSR. Molecular diversity among seven pink borer resistant and eight PFSR lines along with eight other inbred lines revealed average pair-wise genetic dissimilarity of 0.64. The 23 genotypes were clustered in two main groups, which were further subdivided into 5 and 6 sub-clusters, respectively. The study has revealed considerable diversity among inbred lines differing for resistance against pink borer and PFSR (*J Plant Biochem. Biotech.* **20**: 173). The systematic study led to registration four PSB resistant genetic stocks (INGR Nos. 4014, 11028, 11029, 10077). Besides systematic evaluation of germplasm led to identification genetic stocks resistant to Turcicum leaf blight (3 – INGR Nos. 21208-21210), post-flowering stock rot (2 – INGR Nos. 11041 and 11042), maydis leaf blight (2 – INGR Nos. 08117 and 07025) besides sweet corn lines (8 – INGR Nos. 10085 – 10092), promising breeding lines (3 – INGR Nos. 10078-10080 & 10084).

- Identified 10 metaQTLs for popping traits on chromosome 1 (7 metaQTLs) and 6 (3 metaQTLs) with physical distance ranging between 0.43 and 12.75 Mb, respectively. Four identified metaQTLs, viz., mQTL1_1, mQTL1_5, mQTL1_7 and mQTL6_2 harboured 5–8 QTL shows more significance. MetaQTL1_1 at bin location 1.01 coin cided with the reported QTLs related to various agronomic traits like stalk diameter, tassel length, leaf area and plant height. A total of 229 genes were detected in the region with potential role in modifying carbohydrate metabolism, implying their future characterization to improve popping traits in maize (*PLoS ONE*, **16**: e0256389).
- Through evaluation of 5 tropical genotypes under various media combination established an effective and reliable regeneration protocol from immature embryos (*Plant Cell Tissue and Organ Culture*, **100**: 31), which has been used towards development of Bt maize at the Directorate of Maize Research until recently another protocol from mature embryos was reported under my leadership (*Plant Cell Tissue and Organ Culture*, in press).
- Demonstrated that mutations at His205 of Inositol Phosphate Kinase 1 (IPK1) destabilize the protein leading low phytate content (*Scientific Reports*, **10**:6324). Phytate content is generally low in white germplasm as compared to other kernel colours. Identified CML150 and CML176 as donors for low phytate (*Indian J Genet*., **81**: 245). There were perturbations in yield, starch and seed characteristics of the stable low PA establishing the constraints to be faced in breeding for low PA in maize (*Physiol Mol Biol Plants*, **26**:1477).
- A positive significant association of kernel colour was observed with total carotenoid but not for β-carotene. Under normal storage condition HP704 can be used as a donor for provitamin-A (*Indian J. Genet*. **81**: 50). Diversified maize germplasm for proA content through MAS using InDel marker specific to crtRB1. Both additive and dominance gene actions were significant for proA (*PLoSONE*, **16**: e0245497). ProA in maize reduces significantly within 2-6 months with best storage in aluminium box exhibited (*Indian J Exp. Biol*. **59**: 79).
- Expression dynamics of protein fractions in developing maize endospem revealed that the opaque-2 mutation affects protein expression at initial stages, whereas, the modifiers effect at the intermediate and later stages of kernel development. Prolamin, glutelin and glutelin-like fractions can be used as quick markers for quality assessment for differentiating QPM varieties at the immature stage of kernel development (*Scientific Reports*, **11**: 2469).
- Reported a novel chitosan-silicon nanofertilizer (CS–Si NF), which promoted growth and yield in maize crop in terms of increased seedling vigour index, higher plot yield and test weight as compared with SiO2 (*Plant Physiol. Biochem*., **159**: 53).
- Role of phenolics, p-Coumaric acid (p-CA), ferulic acid (FA) and total tannin contribute to defense against pink borer in maize. Particularly p-CA and FA enhances in the resistant and moderately resistant genotypes in response to pink borer attack, which varies stage of crop growth and plant tissue (*Maydica*, **65**: M8). The resistance is

polygenically governed, with gene interaction varying from crosses. Based on the findings pedigree and population improvement breeding with low selection intensity in early generations are suggested (*Indian J Genet.*, **72**: 284; *Plant Breeding*, **134**: 394). Stem borers found to penetrate seventh internode of maize plant at V6–10 stage. Penetration resistance of rind found to be a strong predictor of antibiosis, which can be used for phenotyping for resistance to the insect (*Phytoparasitica*, **48**:455). Demonstrated that Tinospora cordifolia treated double bags provide protection to maize from rice weevil infestation up to five months and can be readily used as an alternative to synthetic pesticides (*Maydica*, **63**-M3).

- Protein exhibited a significant negative correlation with starch and 100-kernel weight, indicating that an increase in the protein concentration will down-regulate the starch and 100-kernel weight.

B. Sorghum

- Studied the population genetics parameters in sorghum minicore collection which revealed that the race and geographical origin were responsible for diversity and structure in it with high genetic differentiation between the rainy and post-rainy sorghum groups but narrow diversity within groups (*Plant Genetic Resources: Characterization and Utilization*, **15**: 127). Very high estimate of fixation index was obtained when genotypes were structured as rainy and post-rainy season adaptation, and a much higher estimate was obtained when the genotypes were classified as varieties, maintainers, restorers and germplasm lines (*Australian J Crop Sci*., **6**: 1486). Demonstrated significant morphological and molecular diversity within Maldandi landraces and identified 13 accessions for rabi improvement programme (*J Plant Biochem. Biotech*., **21**: 145). Screening of a subset of minicore and popular cultivars identified IS 23514 and Phule Chitra as stable drought tolerant sorghum lines to be used in post-rainy sorghum breeding (*Indian J Plant Physiol.*, **21**: 8). Also identified IS 30466, IS 30536 and IS 1212 with high oil content (4.46%-4.76%) (*Indian J. Agril Sci*. **91**: 1636). Analyzing agro-morphological diversity among landraces identified 20 promising genotypes to support varietal programme of West African country, Benin (*The Scientific World Journal*, **2015**: Article ID 916476). Developed a reference set of 96 geneotypes for drought studies with 29 identified sources of tolerance. Identified over 50 thousand genome-wide sequence variants to be deployed in genome selection. Registered 45 sequences of genes related to abiotic stress response from different genotypes with NCBI. Wide variations were observed among the rabi sorghum cultivars tested for different nutritional and shelf stability parameters. Parboiling result in increased grain calcium and zinc, improved grain proximate compositions and content of thiamine, niacin and folic acid. Parboiling improves shelf stability of sorghum grains till 90 days (*Agric. Res.* **8**: 513). Two genetic stocks with potential fodder traits are registered with NBPGR (INGR Nos. 20085-20086).
- Shoot fly resistance response in 19 parental line and 78 hybrids identified MS 104A, SPSFR94010A, SFCR 125, SFCR 151, ICSV 705, ICSV 708 and PS 30710 with best shoot fly resistance. Leaf glossiness and trichome density showed high correlation with shoot fly resistance (*Indian J. Genet.*, **72**: 31). Detectedthat duplicate epistasis (particularly dominance × dominance) interaction governs moisture stress tolerance in rabi sorghum, suggesting that selection for drought tolerance should be avoided in early generations and practiced in the advanced generations (*Indian J. Genet.*, **73**: 44).
- Reported high crossover genotype × environment interaction in sorghum multilocation trial sites. Extensive GEI studies indicated existence of 3-4 mega-environments (ME) among kharif (*Euphytica*, **185**: 465) and rabi sorghum (*J. Agric. Sci*. **155**: 44; *Indian J. Genet*., 74: 558) testing locations, while two ME forage sorghum testing locations (*J. Agri. Sci.*, **154**: 73).
- Projected the genetic gains in Indian sorghum improvement programme over four decades vis-a-vis yield gains in top 10 sorghum producing countries. The study indicated need to strengthen post-rainy sorghum improvement programme in India. Study also highlighted need to strengthen hybrid breeding in India and elsewhere (*Crop Sci*. **54**: 1571).
- Demonstrated that combining incidence and severity of charcoal rot in 40:60 proportions is the most stable index to evaluate performance sorghum entries for charcoal rot resistance (*Crop Protection* **108**: 102). This protocol is under Reported Pokkah boeng as an emerging disease of sorghum and SLR 30 was identified as the most susceptible variety. Stem injection with the pathogen found the best method for artificial screening against the disease (*Crop Protection*, **77**: 94).

C. Rice

- DNA sequence based phylogenetic studies on 30 rice accessions revealed that *O. sativa* ssp. indica and ssp. japonica were independently domesticated from *O. rufipogon*. Demonstrated low nucleotide diversity among

japonica rice as compared to indica or wild relatives, which suggested the immediate need to diversify the genetic base through wide crosses. Reported linkage disequilibrium (LD) decay in *O. rufipogon* within 5 kb, whereas it extends up to ~50 kb in O. sativa ssp. indica. The work has paved way for GWAS in rice (*Theoretical & Applied Genetics*, **114**: 731).

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- Cloned and characterized *PTOX1* gene from rice, and for the first time demonstrated its role in both carotenoid and strigolactone synthesis in monocots, required for normal plant growth. The work enabled understanding the consequences of carotenoid deficiency in monocots (*New Phytologist*, **202**: 116).

D. Pulses and other crops

- Developed fingerprints of 47 upland cotton genotypes with probability of identical match by chance of 3.98×10^{-8}. A set of ten SSR markers was identified which could distinguish all the 47 genotypes with a moderate probability of identical match by chance (X^{D}_{n} = 0.01). The study detected very low diversity within the hirsutum accessions (*J Plant Biochem. Biotech.*, **19**: 153).
- Screening of mapping populations derived from a cross between wild and cultivated species of chickpea identified tightly linked markers for ascochyta blight resistance QTL1 and placed it on the chickpea linkage group 4. Demonstrated cross population reproducibility of STMS markers and contributed towards chickpea genome maps (*Euphytica*, **132**: 23).
- Identified a DNA marker, $OPD10_{650}$, linked to powdery mildew resistance gene, *er*. This has been deployed in marker assisted selection aiding varietal development (*Journal Genetics Breeding*, **55**: 343).
- Using Eco-TILLING approach among various ecotypes of rice weed, *Monochroia vaginalis* detected causal mutation in acetolactate synthase gene leading to sulfonylurea resistance. This helps in understanding the mechanism of occurrence of herbicide resistance in weeds (*Pesticide Biochemistry and Physiology*, **88**: 143).

3. Application of ICT in agriculture

- ***AICSIP Information System:*** It is an online system for management of AICRP on Sorghum trials (Copyright Registration No. SW-7971/2014 India), which is under implementation since kharif season of 2011 at ICAR-Indian Institute of Millets Research, Hyderabad
- ***AICRP on Maize Automation System:*** It is an online system where AICRP trial preparation, monitoring, data submission, retrieval and analysis are automated (copyright application process is going on). This is under implementation with AICRP on Maize at ICAR-Indian Institute of Maize Research, Ludhiana from kharif 2017.
- ***DSS on germplasm:*** It is a SQL server based online system where characterization information on over 400 maize germplasm are available. It is an userfriendly system, where user can search germplasm in a customized manner with search output having trait details and photos of the shortlisted germplasm.
- ***Bharti MAKKA:*** A bilingual mobile app, Bharti MAKKA (Maize Agro-Knowledge and Knowhow App) has been developed with comprehensive information on various aspects of maize cultivation, crop management and mechanization useful for all stakeholders, more particularly for maize farmers has been developed.

4. Leadership role under national challenge

- An alien and invasive pest, fall armyworm (*Spodoptera frugiperda*) invaded India in May 2018 threatening maize cultivation predominantly, but other crops were also in threat. Under my leadership ICAR-IIMR took a lead in development of management protocol and awarenss against this invasive pest. The package of practices for management of FAW in different maize types and QC specifications for pheromone traps as developed by ICAR-IIMR in collaboration with partners was adopted by the DAC&FW, Ministry of Agriculture & Farmers Welfare, Govt. of India (give the FN… dt…) and disseminated across the country. These were key in managing the insect effectively. Further, since the insect was alien in India ICAR-IIMR in collaborations with its ICAR partners, *viz*.,

ICAR-RC on NEH and ICAR-NBAIR; AICRP on Maize; and Department of Agriculture of various states sensitized stakeholders on management of FAW through 616 training programmes, where 196 programmes were organized by IIMR and/or its AICRP on Maize partners benefitting 17,490 stakeholders. Out of these, two training programmes, *viz*., 'Maize Production Technology and Management Strategies for Fall Armyworm' sponsored by Directorate of Extension, Ministry of Agriculture and 'Integrated Pest Management for Major Crop Pests and Diseases in Developing Countries' sponsored by Feed the Future-India Triangular International Training Program are notable. AICRP centres functioning under various SAUs held consultative interface meetings with State Government officials to ensure coordinated response for effective action in response to the rapid outbreak of FAW. AICRP on Maize centres had a total of 88 such interface meetings/surveys since 2018. Furthermore, under Covid 19 pandemic ICAR-IIMR in collaboration with FAO organized six virtual training programs on "Integrated pest management for maize crop with special reference to fall army worm" under the FAO project TCP/IND/3709 on "Time-critical measures to support early warning and monitoring and sustainable management of the Fall Armyworm in India benefitting 597 personals. ICAR-IIMR prepared extension folder titled "Identification and management of fall armyworm (*Spodoptera frugiperda*)" in English and translated to Hindi and Punjabi languages and distributed to various stakeholders. State Departments and AICRP on Maize centres prepared folders/leaflets/pamphlets on the identification and management of FAW and issued advisories based on the folders and advisories developed by ICAR-IIMR. ICAR-IIMR collaborated with the University of Michigan and Scientific Animations without Borders (SAWBO), to translate animated video on 'FAW Identification, Scouting and Management' into 11 different Indian languages (Hindi, Punjabi, Gujarati, Telugu, Kannada, Tamil, Odiya, Bengali, Manipuri, Mizo and Nagamese). The myriad efforts of the institute to curb FAW outbreak, extended to stake holders of maize in collaboration with its ICAR partners, central and state Govt. has been elaborated in the technical bulletin 'Fight against fall armyworm *Spodoptera frugiperda* (J. E. Smith)'.

5. Sequence/SNPs registered

- *Rice*: EF532938-EF533641 (703 sequences)
- *Monochoria vaginalis*: AB266517-AB266530 (14 sequences)
- *Sorghum*: KF533110, KF546320-26, KF555627-28, KF597299-300, KF640650-61, KF776513-17, KJ544884-KJ544889, KJ572406-KJ572410, KF776513-KF776517 (45 sequences)
- *Sorghum*: 50809 genome wide SNPs (http://www.ncbi.nlm.nih.gov/SNP/snp_viewBatch.cgi?sbid=1061880; http://www.ncbi.nlm.nih.gov/SNP/snp_viewTable.cgi?pub=2405)
- Microorganism:
  OP249498- *Kosakonia radicincitans* strain N1 16S ribosomal RNA gene, partial sequence
  OP247564-*Enterobacter ludwigii* strain mEl_Ldh 16S ribosomal RNA gene, partial sequence
  OP247565- *Kosakonia radicincitans* strain mKr2_Ldh 16S ribosomal RNA gene, partial sequence
  OP247566 - *Enterobacter cloacae* strain mEc_Ldh 16S ribosomal RNA gene, partial sequence
  OP247567-*Enterobacter roggenkampii* strain mEr_Ldh 16S ribosomal RNA gene, partial sequence
  OP247568-*Bacillus subtilis* strain mBs_Ldh 16S ribosomal RNA gene, partial sequence
  OP247569- *Bacillus altitudinis* strain mBa_Ldh 16S ribosomal RNA gene, partial sequence

LIST OF PUBLICATIONS

A. Research papers

1. Soujanya LP*, Sekhar JC, Chikkappa GK, Ratnavathi CV, Venkateswarlu R, Yathish KR, Suby SB, Sunil N and **Rakshit S**. 2023. Role of morphological traits and cell wall components in imparting resistance to pink stem borer, *Sesamia inferens* Walker in maize. *Front. Plant Sci*.**14**:1167248. doi: 10.3389/fpls.2023.1167248
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240. Sunil N, Rekha B, Soujanya PL, Sekhar JC, Vadez V and **Rakshit S**. 2018. Use of LeasyScan: An Efficient Phenotyping Platform for Identification of Potential Maize Germplasm at Early Stage In: 13th Asian Maize Conference and Expert Consultation on Maize for Food, Feed, Nutrition and Environmental Security held at Ludhiana, Oct 8-10, 2018. pp. 6
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244. Kumar N, Suby SB, Parihar CM, Jat SL, Gambhir G, **Rakshit S** 2020. A study on earthworm population and microbial activity in their casts in long-term tillage and residue management practices. In: National Seminar on 'Maize for Crop Diversification Under Changing Climatic Scenario' held at Ludhiana from Institutes' Feb 9-10, 2020.
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250. Ganapathy KN, **Rakshit S**, Gomashe S and Patil JV. 2013. Variation for amino acid composition in grain sorghum cultivars. In: Global Consultation on Millets Promotion for Health and Nutritional Security held at Directorate of Sorghum Research, Hyderabad, Dec 18-20, 2013. pp.105.
251. Ganapathy KN, Gomashe S, **Rakshit S** and Patil JV. 2013. Diallel analysis for grain yield and its components in elite sorghum genotypes. In: Global Consultation on Millets Promotion for Health and Nutritional Security held at Directorate of Sorghum Research, Hyderabad, Dec 18-20, 2013.pp.296.
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253. Gomashe S, Ganapathy KN, **Rakshit S** and Patil JV. 2013. Photoperiod response and stability analysis in sorghum. In: Global Consultation on Millets Promotion for Health and Nutritional Security held at Directorate of Sorghum Research, Hyderabad, Dec 18-20, 2013. pp.347.
254. Ganapathy KN, **Rakshit S**, Sunil Gomashe and Patil JV. 2013. Assessment of genetic structure among sorghum mini-core collections and elite genotypes using SSR markers. In National conference on crop improvement and adaptative strategies to meet challenges of climate change, 22-24 Feb. 2013, University of Agricultural Sciences, Bangalore, India, pp 106.
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259. Ganapathy KN, **Rakshit S**, Gomashe SS and Patil JV. 2013. Variation for amino acid composition in grain sorghum cultivars. In: Compendium of Papers and Abstracts: Global Consultation on Millets Promotion for Health and Nutritional Security (eds. Rakshit S, Das IK, Shyamprasad G, Mishra JS, Ratnavathi CV, Chapke RR, Tonapi VA, Dayakar Rao B and Patil JV, Directorate of Sorghum Research, Hyderabad, Dec 18-20, 2013. Pp 105-108.
260. Gomashe SS, Ganapathy KN, **Rakshit S** and Patil JV. 2013. Photoperiod response and stability analysis in sorghum. In: Compendium of Papers and Abstracts: Global Consultation on Millets Promotion for Health and Nutritional Security (eds. Rakshit S, Das IK, Shyamprasad G, Mishra JS, Ratnavathi CV, Chapke RR, Tonapi VA, Dayakar Rao B and Patil JV, Directorate of Sorghum Research, Hyderabad, Dec 18-20, 2013. p 347.

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264. Sunil Gomashe, **Rakshit S**, Ganapathy, K. N., Elangovan M., Seetharama. N. and Patil J. V. 2010. Assessment of variability and characterization of selected sorghum germplasm. Research and Development in Millets: Present status and future strategies in National Seminar on millets-Nov. 12, 2010 at Hyderabad, Andhra Pradesh, India, pp.96
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268. Dey SS, Behera TK, Munshi AD, Pal A and **Rakshit S**. 2008. Gynoecy in bitter melon (Momordica charantia) for exploiting hybrid vigour. 1Cucurbitaceae 2008, Proceedings of the IXth EUCARPIA meeting on genetics and breeding of Cucurbitaceae (Pitrat M ed), INRA, Avignon (France), May 21-24th, 2008, pp 539-542.
269. Rakshit A, Vashisht V, **Rakshit S** and Dadlani M. 2007. Polyacrylamide gel electrophoresis for testing genetic purity in hybrid cotton (Gossypium sp.). In: Bharatiya Vigyan Sammenaln-2007, Bhopal, Nov. 23-25, 2007. p 31.
270. Yadav Y, Rizvi AH, Manohar M, Verma AK, Sharma P, Nath P, Dwivedi VK, **Rakshit S**, Yadav SS. 2007. Molecular basis of genetic diversity in chickpea (*Cicer arietinum* L.). In: National Symposium on "Legume Research: Recent Trend & Future Prospectsin Post Genomic Era", Meerut, Jan. 13-14, 2007. p 160.
271. **Rakshit S**. 2006. Eco-TILLING in genome studies. In: National Convention on Knowledge Driven Agricultural Development: Management of Changes, New Delhi, Mar. 24-26, 2006. pp 38-39.
272. **Rakshit S**, Takahashi Y, Matsumura H. and Terauchi R. 2005. Eco-TILLING: potential application in mutation detection and mapping. In: International Conference on Plant Genomics and Biotechnology: Challenges & Opportunities, Raipur, Oct. 26-28, 2005. p 13.
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274. Singh NN, Zaidi PH and **Rakshit S**. 2002. Production advances in rainfed agriculture-maize. In: 89th Indian Science Congress, Lucknow, Jan. 3-5, 2002. pp 11-12.
275. **Rakshit S**. 2000. Genomic localization of a major ascochyta resistance locus in chickpea. In: 3rd International Crop Science Congress, Hamburg, Germany, Aug. 17-22, 2000. p 93.
276. **Rakshit S**. 1999. New approach in use of chitinase and β-1,3-glucanase in disease resistance. In: National Symposium on Crop Pest and Disease Management: Challenges for the Next Millennium, Rahuri, Nov. 27-28, 1999. pp 7-8.
277. Mishra SK, **Rakshit S**, Dasgupta SK, Kala YK, Sarmah P, Tyagi MC and Sharma B. 1998. Current status of powdery mildew resistance in pea. In: National Symposium on Management of Biotic and Abiotic Stresses in Pulse Crops, Kanpur, Jun. 26-28, 1998. pp 126-127.
278. **Rakshit S**, Singh VP and Sahi JP. 1998. Induced variability for yield attributing traits in mungbean. In: National Symposium on Management of Biotic and Abiotic Stresses in Pulse Crops, Kanpur, Jun. 26-28, 1998. p. 190.

279. **Rakshit S**, Mohapatra T, Mishra SK, Dasgupta SK Sharma RP and Sharma B. 1998. Molecular tagging of powdery mildew resistance gene er in pea (Pisum sativum L.). In: Second Annual national Convention of ADNAT on DNA Technologies: Forensic & Other Applications, Hyderbad, Feb. 23-24, 1998. p 43.
280. **Rakshit S**, Dasgupta SK, Mishra SK and Sharma B. 1997.Differential induction of chitinase in resistant and susceptible varieties of Pisum sativum following infection with Erysipe pisi. In: International Conference on Integrated Plant Disease Management for Sustainable Agriculture, New Delhi, Nov. 10-15, 1997, p. 288.
281. **Rakshit S**, Mishra SK, Dasgupta SK and Sharma B. 1997. Standardization of β-1,3-glucanase assay in pea (Pisum sativum L.) with reference to powdery mildew disease. In: National Symposium on Recent Advances in Diagnosis and Management of Important Plant Diseases, Kanpur, Dec. 19-20, 1997. p 86.

SCIENTIFIC LEADERSHIP POSITIONS

1 Director, Indian Institute of Maize Research – from 2017-till date
2 Principal Investigator, Grain Sorghum Breeding, All India Coordinated Sorghum Improvement Project (AICSIP) – from 2012-17
3 Nodal Officer, All India Coordinated Sorghum Improvement Project – from 2010-14
4 Member, Institute Management Committee, Indian Grassland and Fodder Research Institute, Jhansi (ICAR) – 2013-19
5 Member Secretary, QRT, Directorate of Sorghum Research, Hyderabad (ICAR) – 2012
6 Member, Agriculture & Forestry Section, Indian Science Congress Association – 2011, 2013
7 External reviewer of research project, Indian Council of Forest Research & Education – 2009
8 Member, Sub-Committee on Transgenics in Crop Plants (Maize), Department of Biotechnology, Govt. of India – 2007
9 Nodal Officer, DUS Testing in maize under PPV&FRA (2006-08)
10 Member, X Plan Working Group for Agricultural Research and Education, Indian Council of Agricultural Research – 2001

PROFESSIONAL TRAININGS ATTENDED

1 Master Class on Agricultural Research Leadership and Management, World Fish, Penang, Malaysia from Oct 28 to Nov 3, 2017
2 Executive Development Programme, a RMP Programme from July 28 to Aug 01, 2017 at NAARM, Hyderabad
3 Management Development Programme on Leadership Development, a pre-RMP programme from Dec 01-12, 2014 at NAARM, Hyderabad
4 Training on “Molecular Marker Technology in Crop Improvement” from May 18-29, 2009 at CEG, ICRISAT, Hyderabad
5 Winter School on “Advances in Design and Analysis of Agricultural Experiments” from Jan. 14 to Feb. 03, 2009 at IASRI, New Delhi
6 Trainers training programme on “Plant Genetic Resources Management” at NBPGR, New Delhi from Feb. 13 to Mar. 05, 2003
7 Training on “Techniques in Plant Genetic Engineering and Molecular Breeding” at the NRC on Plant Biotechnology, New Delhi from Nov. 05-25, 2002
8 Training on “Testing of Distinctness, Uniformity and Stability for Plant Variety Protection” at Division of Seed Science & Technology, IAR, New Delhil from Oct. 04-10, 2002
9 Master Class in “Microbial & Plant Molecular Genetics” at Monash University, Victoria, Australia from Nov. 15 to Dec. 04, 1998
10 Training programme on “Advances in Statistical Genetics and Biostatistics” at IASRI, New Delhi from Jul. 31 to Aug. 14, 1998

PROFESSIONAL TRIAINGS ORGANIZED

1 Training on “Training programme on Maize Breeding and FAW Management” – 2019
2 Training program on “Basics of sorghum breeding and AICSIP data management” – 2013
3 Training program on “DUS testing in maize” – 2006

COURSES TAUGHT IN WORKSHOPS

1 Fourth international training course on “Sorghum Hybrid Parents Improvement and Seed Production”, ICRISAT – 2013
2 Training program on “Basics of sorghum breeding and AICSIP data management” – 2013

3 Short course on "Managing IP Under PVP and PGR", Directorate of Sorghum Research, Hyderabad – 2013
4 Winter school on "Molecular Breeding Approaches for Genetic Enhancement of Oilseed Crops", Directorate of Oilseeds Research, Hyderabad – 2012
5 Winter school on "Innovative Approaches for Increasing Productivity in Oilseed Crops: a Crop Improvement Perspective", Directorate of Oilseeds Research, Hyderabad – 2008
6 Winter school on "Advances in Biometrical Techniques", Indian Statistical Research Institute, New Delhi – 2008

EXTERNALLY FUNDED RESEARCH PROJECTS

1. 'Popularization of Biofortified maize hybrids in Himalayan states and central India with special reference to north eastern region for sustainable nutrition security' from 11.03.2021 to till date as Coordinator, funded by DBT with total funding of Rs. 243.78 lac
2. 'Bio-prospecting of genes and allele mining for abiotic stress tolerance in sorghum' from 22.06.2011 to 31.03.2014 as CC-PI, funded by NAIP with total budget of Rs. 216.09 lac
3. 'Development of stem borer resistant transgenic maize' from 22.08.2005 to 28.11.2008 as PI, funded by ICAR NTPC with total budget of Rs. 58.14 lac
4. 'Studies on physio-genetic mechanism of excess soil moisture tolerance in maize' from 02.08.2002 to 31.08.2005 as Co-PI, funded by NATP-CGP with total funding of Rs. 18.43 lac.
5. 'Strengthening of DUS test centers under Central Sector Scheme for implementation of PVP legislation' from 01.08.2005 to 24.01.2007 as Nodal Officer and 25.01.2007 to 31.03.2008 as Co-Nodal Officer, funded by DAC.PPF&FRA, with total funding of Rs. 64.75 lac.

INTERNATIONAL EVENTS ORGANIZED

1. 13th Asian Maize Conference, held at Ludhiana from Oct. 8-10, 2018
2. Global Meet on Millets for Health and Nutrition Security, held at Hyderabad from Dec. 18-20, 2013

NATIONAL EVENTS ORGANIZED

1 National Seminar on "Maize for Crop Diversification under Changing Climatic Scenario" at Ludhiana from Feb 09-10, 2020
2 Sorghum Annual Group Meets from 2009 till date on yearly basis in which 150 participants (approx.) participate
3 Diamond Jubilee Symposium on '100 years of Mendelian Genetics & Plant Breeding – Retrospect and Prospect', New Delhi 2001

INTERNATIONAL VISITS/ASSIGNEMNTS/EXPOSURE

1 Participation in "Master Class on Agricultural Research Leadership and Management" at World Fish, Penang, Malaysia from Oct 28 to Nov 3, 2017
2 2nd Bi-annual Planning Meeting of CGIAR Research Programme on Dryland Cereals at ICRISAT from Oct 25-28, 2014
3 CGIAR Research Program on Dryland Cereals R4D summit at ICRISAT from Feb 14-15, 2014
4 Meeting on Developing sorghum research country strategy – India for HOPE project at ICRISAT on Dec 12, 2012 and delivering a talk on "Scope for expanding sorghum area in post-rainy season and other niches"
5 Dissemination workshop of the ACIAR-funder project at ICRISAT on Jan 19-21, 2013Presentation on "Recent Gains and Research Achievements" during international meeting on "Maintaining Cereal Productivity Under Climate Change Through International Collaboration", New Delhi – Nov. 18-20, 2013
6 Oral presentations on "G x E Interaction in Sorghum from Multi-environment Trials Data" and "Genetic Gains in Sorghum: Progress and Way Ahead" in fourth international training course on "Sorghum Hybrid Parents Improvement and Seed Production", ICRISAT – Oct. 09, 2013
7 Representing Indian sorghum program during "ICAR-ICRISAT Partnership Research Plan 2013-15" at ICRISAT – May 10, 2013
8 Representing Indian sorghum program in "Dissemination workshop of the ACIAR-funder project" – Jan. 19-21, 2013
9 Presentation on "Scope for Expanding Sorghum Area in Post-rainy Season and Other Niches" and chairing session on "Changes Required in the Draft Paper and the Scope of Partnership Activities for India and ICRISAT" in the Meeting on "Developing Sorghum Research Country Strategy" at ICRISAT – Dec. 12, 2012
10 Visit of Purdue University, USA under NE Borlaug Fellowship – Jul. 13 to Sep. 14, 2011

11 Participated in training on “Molecular Marker Technology in Crop Improvement” at ICRISAT – May 18-29, 2009
12 Participation in Plant & Animal Genomes XIII Conference, San Diego – Jan. 15-19, 2005
13 Post-doctoral work at Iwate Biotechnology Research Center, Japan – Jun. 01, 2003 to May 31, 2005
14 Deputation work on molecular marker programmes in chickpea at J.W. Goethe-Universitat, Frankfurt am Main, Germany – Jun. 15 to Sep. 14, 1999
15 Participation in Master Class on “Microbial & Plant Molecular Genetics” at Monash University, Victoria, Australia, and to visit CLIMA and University of Western Australia, Perth for bilateral collaborative research meeting – Nov. 12 to Dec. 11, 1998

MEMBERSHIP IN PROFESSIONAL SOCIETIES

1 Indian Society of Genetics and Plant Breeding, New Delhi
2 Indian Science Congress Association, Kolkata
3 Maize Technologists Association of India, New Delhi
4 Society for Millet Research, Hyderabad

LANGUAGE PROFICIENCY

Reading, writing and speaking: English, Hindi and Bengali