CEG@10
CELEBRATING 10 YEARS OF EXCELLENCE IN SCIENCE AND PARTNERSHIP
www.ceg.icrisat.org
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Launch of ICRISAT’s Center of Excellence in Genomics through CoE grant from Department of Biotechnology (DBT) Govt. of India

2007
Fourth course on Molecular Methodologies for Assessing and Applying Genetic Diversity in Crop Breeding
Indian National Science Academy- Young Scientist Award for legumes genomics work
Chickpea Genomics group
1st Nature Biotechnology paper on pigeonpea genome sequencing

2011
2013

Dr. Paco Sereme, Chair, Program Committee, Governing Board visiting groundnut molecular field trials
Press conference to announce chickpea genome sequencing in Krishi Bhawan, New Delhi

Renovation of CEG facilities

2013
Dr. Wendy Umberger, Governing Board Member observing high throughput genotyping platform
Celebrating decoding of peanut AA Genome published in PNAS
A glimpse of CEG team just before the publication of pigeonpea resequencing in Nature Genetics
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02 Reserach Achievements
**High Impact Research**

**Genomes sequenced**

- Pigeonpea *(Nature Biotech. 2012)*
- Chickpea *(Nature Biotech. 2013)*
- Groundnut *(Nature Genet. 2016; PNAS 2016)*
- Pearl millet *(Nature Biotech. 2017)*
- Mungbean *(Nature Comm. 2014)*
- Sesame *(Genome Biol. 2014)*
- Longan *(Gigascience 2017)*
Molecular mapping of 50 traits in chickpea

**Drought tolerance**
Root traits such as root length density, root length, root surface area, yield, harvest index, 100 seed weight, number pods per plant, biomass, specific leaf area, delta carbon ratio, days to flowering, days to maturity

**Heat tolerance**
Pods per plant, heat tolerance index, yield, biomass, harvest index, days to flowering, days to maturity

**Salinity tolerance**
Pod number, seed number, seed yield, shoot dry weight, harvest index, 100 seed weight

**Ascochyta blight**
Seedling resistance and adult plant resistance

**Helicoverpa**
Leaf damage rating (flowering), unit larval weight, Helicoverpa larvae/10 plants, days to first flowering

**Fusarium wilt**, **Botrytis grey mould**, **Protein**

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Molecular mapping of ca. 20 traits in pigeonpea

**Hybrid related traits**
Obcordate leaf shape, Fertility restoration

**Seed purity kits**
CMS seed purity, Hybrid seed purity

**Yield related traits**
Flowering time, Days to maturity, Pods per plant, 100 seed weight, Plant height, Seeds per pod, Seed yield per plant, Primary branches, Secondary branches

**Quality trait**
Protein content

**Biotic stress**
Fusarium wilt, Sterility mosaic disease

**Abitic stress**
Drought

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Molecular mapping of ca. 20 traits in sorghum

**Yield components traits**
Seed weight, seed size, panicle harvest index, harvest index

**Nutritional traits**
Iron and zinc content

**Biotic stresses**
Stem borer, leaf diseases (Anthracnose, leaf blight)

**Drought tolerance related traits**
Transpiration efficiency, response to VPD, leaf canopy, leaf size, leaf angle through lea scanning, harvest index

**Fodder traits**
Fodder yield and quality

**Special traits related to adaptation**
Biological nitirification inhibition (BNI)
Molecular mapping of ca. 40 traits in groundnut

- Resistance to viral and bacterial diseases: Tomato spotted wilt virus (TSWV), peanut bud necrosis (PBND), bacterial wilt
- Drought tolerance related traits: Transpiration efficiency, SCMR, leaf area, leaf dry weight, shoot dry weight, harvest index
- Yield component traits: Seed weight, seed size (length and width), pod yield, shoot dry weight, number of fruit branches, shelling percentage, haulm weight
- Physiological traits: Leaf length, specific leaf area, total leaf weight, shoot weight, iron deficiency in soil
- Quality and nutritional traits: Oil content, fatty acid content (oleic, linoleic, palmitic, arachidic etc.), Fe and Zn content, fresh seed dormancy, aflatoxin contamination
- Resistance to fungal diseases: Rust, early leaf spot and late leaf spot

Molecular mapping of ca. 40 traits in pearl millet

- Yield and yield-related traits: Flowering time, plant height, panicle length, seed weight, panicle harvest index, grain harvest index, grain number per panicle, harvest index, biomass, grain yield under moisture stress and irrigated conditions
- Grain and forage quality traits: Grain Fe and Zn content, In-vitro organic matter digestibility, metabolizable energy, neutral detergent fiber (cellulose, hemicellulose, lignin), nitrogen on dry matter basis, gas volume, sugar content on dry matter basis, fresh and dry stover yield
- Biotic constraints: DM resistance (12 pathotype-isolates), blast resistance, and rust resistance
- Abiotic constraints: Terminal drought tolerance related traits such as tiller number, panicle diameter, total biomass dry weight, leaf dry weight, root dry weight, shoot dry weight, stem dry weight, leaf area, specific leaf weight, transpiration efficiency, transpiration rate, absolute transpiration, leaf rolling, delayed leaf senescence, low VPD transpiration rate, high VPD transpiration rate and salinity
- Other traits: Heterotic gene pools for hybrid parental lines and, general and specific combining ability for grain yield under drought stress and irrigated conditions

Decision support tools and databases

- CicArVarDB
- BMC Bioinformatics, 2014
- Plos One, 2015
Research Impact in Fields

Dr. Howard Shapiro, Chief Agricultural Officer, Mars Inc. visiting molecular breeding field trials

Dr. Peter Carberry and team visit pigeonpea fields
Research Impact in Fields

Sh. Krishna Byre Gowda, Hon’ble Minister of Agriculture, Govt. of Karnataka visits field trials

Dr. Victor Nwosu, Program Manager Mars Inc.

Dr. Tony Cavalieri, Senior Program Officer, Bill & Melinda Gates Foundation visiting chickpea molecular breeding field trials
Research Impact in Fields

The then Governing Board members visiting molecular breeding field trials

Dr. Baozhu Guo, USDA-ARS and Dr. Steve Brown, President, The Peanut Foundation, USA
Research Impact in Fields

Improved lines with enhanced yield in chickpea

1% higher yield under rainfed and 24% higher yield under irrigated condition.

Improved lines for foliar disease (rust and late leaf spot) resistance and improved oil quality in groundnut

Improved lines for high oleic acid in groundnut

Improved lines for striga resistance, drought tolerance and shoot fly resistance in sorghum

Efficient hybrid breeding in pigeonpea

Pearl millet

1. HHB 67 improved-second cycle improvement, 2. HHB 146 improved, 3. Double QTL ILs high grain Fe & Zn density and DMR, 4. HHB 146
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03 Project Meetings

*95 projects worth USD 96 million
Launch of Blue Sky research project on conversion of 3 line hybrid breeding system to 2 line hybrid breeding system

Launch meeting of the USAID project on pigeonpea improvement
Launch meeting of Aflatoxin genomics project from Mars Inc.
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04 Capacity Building

* 11 Training courses
* 300 scientists trained
* 200+ students/post-docs/visiting scientist
More than 3.5 million datapoints generated by CEG in last 9 years

More than 45.9 Tbp sequencing data generated by CEG in last 5 years

8th course on Application of Molecular Markers in Crop Improvement

Trained >300 Scientists from different institutes of India and abroad
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05 Conferences and Workshops

* Organized 10+ conferences/workshops/symposia with 2500+ participants
951 delegates from 55 countries in InterDrought-V Conference

Prof. M. S. Swaminathan delivering presentation on Genomics and Zero Hunger Challenge
Climate Smart Agriculture Workshop

Dr. T. Mohapatra, Director General, ICAR

IV International Conference on Next Generation Genomics and Integrated Breeding for Crop Improvement
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06 Partnership with a Purpose

* 180+ partners from 35 countries and 6 continents
Launch of Intertek Lab in Hyderabad

Partnership with Asia-Pacific Association of Agriculture Research Institutions
CGIAR - ICRISAT and India - ICAR partnership
Dr. Xun Xu (President of BGI Research and Executive Director of China National Genebank) and other officials of BGI-Shenzhen and CNGB.
Partnership with Govt. of Karnataka, India

Partnership with Shandong Academy of Agricultural Sciences, China
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C E L E B R A T I N G 1 0 Y E A R S O F E X C E L L E N C E
I N S C I E N C E A N D P A R T N E R S H I P

07 High Quality Publications

* 353 papers in 113 journals (including 9 papers in Nature journals)
Several high-profile publications
Trends in number of publications, cumulative impact factor and total citations
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08 Visits and Interactions
Dr. Debby Delmer, the then Governing Board member

Sh. Radha Mohan Singh, Hon’ble Union Minister of Agriculture and Farmers Welfare, Govt. of India

Dr. Nigel Kerby, Governing Board Chair interacts with CEG group

Prof. Andreas Garner, Director, IPK- Gatersleben, Germany
Presenting the genome sequence of Prof. M.S. Swaminathan on his 90th birthday in presence of His Excellency Mr. K Rosaiah, Governor, Tamil Nadu State, Dr. David Bergvinson Director General, ICRISAT

Dr. Mangala Rai former Director General, Indian Council of Agricultural Research, India
Dr. Gary Atlin, Senior Program Officer, Bill & Melinda Gates Foundation, Seattle, USA

The then CEO and Board Members of CGIAR

Dr. SK Pattanayak, Secretary and delegation from Ministry of Agriculture & Farmer’s Welfare, Govt. of India
Dr. Harsh Vardhan, Hon’ble Minister of Science and Technology, Govt. of India
Dr. Harsh Vardhan, Hon'ble Minister of Science and Technology, Govt. of India at Indo-German Science & Technology Annual Meeting

At Khalifa Centre for Genetic Engineering and Biotechnology, UAE University

Dr. Rob Bertram, Chief Scientist, USAID’s Bureau of Food Security
Sh. Kanna Lakshminarayana, the then Hon’ble Minister of Agriculture, Andhra Pradesh

Dr. Bruce Albert, former President of US National Academy of Sciences and author of famous book-Molecular Biology of Cell

Dr. Craig Venter, Executive Chairman of the Board of Directors of Human Longevity, Inc.
The Vice Chancellor and delegates from University of Western Australia

Dr. SK Pattanayak, Secretary, Department of Agriculture Cooperation & Farmer’s Welfare, Govt. of India
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09 Recognition through Awards
* 42+ Awards & Fellowships
Shanti Swarup Bhatnagar Prize - 2015, the most coveted award from Council of Scientific & Industrial Research (CSIR) on behalf of the Govt. of India

Thomson Reuters Research Excellence India Citation Award

Jawaharlal Nehru Award for P.G. Outstanding Doctoral Thesis Research in Agricultural & Allied Sciences

BioClues Award
Doreen Margaret Mashler Award

National Academy of Agricultural Sciences Young Scientist Award

Young Scientist Award by the Indian National Science Academy

Telangana Academy of Sciences Fellowship

Young Scientist Award by Dr. K.V. Rao Scientific Society
First grant as Principal Investigator

Fellowship by National Academy of Sciences, India

IPGI Leadership Award from the Peanut Foundation
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10 News, Print and Social Media
Rajeev Varshney
Program Director, Research Program – Genetic Gains, and Founding Excellence in Genomics, International Crops Research Institute for
BY RISHI K. MASALAV
ASPB Student Ambassador and Research Student, Department of Plant Biology, University of Gazi

Rajeev Varshney grew up in the small town of Buldhana, Uttar Pradesh, India. Since his father was a school teacher, he always loved books, so he decided to pursue a career in agriculture. However, when he was just a boy, he was diagnosed with a rare genetic disorder that affected his vision. Despite this, he continued to excel in his studies and eventually became a research scientist at the University of Western Australia, where he was a student in Agricultural Sciences. His research focused on crop improvement and he graduated with a Ph.D. in Plant Science. Today, he is a leading expert in crop genetics and is working on developing new varieties of crops that are more resilient to climate change. He is also an advocate for the importance of agriculture and is working to increase awareness of the importance of crop genetics in the developing world.

Press conference

Green TV India
Clue to pearl millet’s heat tolerance may help fight climate chaos

by Jerome Rognon | @CropResearch | ICRI SAT

Wednesday, 30 September 2017 05:45 IST

Genomic technologies ensure food and nutritional security
Eminent scientist Mahender Thudi of the International Crop Research Institute for Semi-Arid Tropics (ICRISAT), Hyderabad, has said that genomic technologies are vital for the food and nutritional security of the country.

Chickpea Genome Map May Help Farmers Improve Yields

An international team of scientists has mapped the genome of chickpea, the second most widely grown legume crop after wheat.

Chickpeas on the map of champions in the genome world: Challenges, rewards... and ‘Rajeavs’
Scientists re-sequence genome of 292 pigeonpea varieties

Agri scientist Rajeev Varshney conferred award

Indian scientists sequence Pigeon Pea genome

Pigeon pea genome sequence could boost yields

BusinessLine

Indian, Chinese scientists crack pigeon pea genome
Global research team decodes genome sequence of 90 chickpea lines

In a scientific breakthrough that promises improved grain yields and quality, greater drought tolerance, and disease resistance, and enhanced genetic diversity, a global research team has completed high-quality sequencing of not one but nine genotypes of chickpea.
180+ Partners from 35 Countries in 6 Continents