

ICAR-NBPGR

Newsletter



ICAR-National Bureau of Plant Genetic Resources
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Largescale evaluation of genetic resources of horsegram (*Macrotyloma uniflorum*).

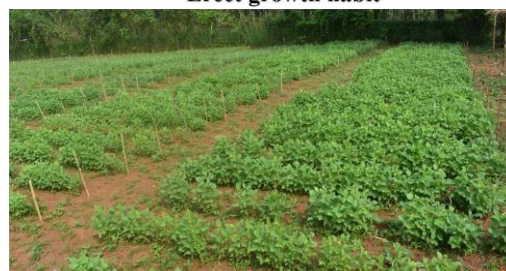
Under the ICAR-DBT Programme on “Characterization and Evaluation of Genetic Resources of Minor Pulses for Crop Improvement”, a total of 2144 accessions of horsegram germplasm collected from different regions of India and across the border were evaluated during *rabi* 2019-20 at NBPGR Regional Station, Thrissur. The horsegram accessions were evaluated in augmented design with 7 check varieties (AK 21, AK 38, HGGP, PHG 9, DPPI 2278, PAIYUR 1, BIRSA KULTHI) in 23 blocks. The genotypes were assessed based on 19 morphological traits (8 quantitative and 11 qualitative traits). For detailed report please refer at Germplasm characterization and evaluation section.



Erect growth habit



Variation in seed coat colour



Field view of Horsegram



Superior accessions

Fig 1. Morphological variability in horsegram accessions grown at RS, Thrissur

PGR ACTIVITIES

EXPLORATION AND GERMPLASM COLLECTING

Due to ongoing COVID-19 pandemic, no explorations were undertaken during this period.

BC-Cuttack had curated about 200 voucher specimens for herbarium using alcohol+ HgCl₂ to prevent pest attack. Twenty-seven herbarium specimens were identified and labeled.

GERMPLASM EXCHANGE

National Supply

A total of 2,549 samples of various crops were supplied to researchers or users from various institutes/organizations across the country following Material Transfer Agreement.

PLANT QUARANTINE

Import Quarantine:

A total of 930 imported samples were processed for import quarantine. The numbers were very less due to the prevailing COVID-19 pandemic. Out of those, 31 samples were found infected with various kinds of pests such as fungi and nematodes. All infected samples were salvaged through physio-chemical methods and released to indenters. Important interception was *Aphelenchoides besseyi* in paddy seeds imported from The Philippines. Prophylactic and salvaging treatments such as hot water treatment was given to imported paddy samples (251), pesticidal dips treatment to vegetative propagules (26) and 10% Tri-sodium orthophosphate treatment (15), depending on the requirement. A total of 413 accessions of exotic germplasm comprising *Phaseolus* spp. (412) and *Pisum sativum* (1) were grown in post-entry quarantine greenhouses and observed for virus-like symptoms. After post-entry quarantine growing, inspection and testing, 30 accessions of soybean were rejected due to presence of various viruses of quarantine significance for India.

Seed health testing

A total of 331 indigenous samples were processed for pest-free conservation in NGB. X-ray radiography was conducted for 155 samples to observe hidden infestation of insect pests. A total of 64 samples was found infected with different pests, out of those, 7 were rejected while rest were released for pest-free conservation and cryo-preservation in NGB.

GERMPLASM CONSERVATION

BC-Cuttack:

A total of 152 acc comprising *Cajanus cajan* (24), *Pisum sativum* (11), *Pisum arvense* (5), *Lens culinaris* (18), *Cicer arietinum* (16), *Brassica rapa* var. *toria* (36), *Brassica rapa* var. *Yellow sarson* (8), *Linum usitatissimum* (33) and *Eruca sativa* (1) collected from parts of Madhya Pradesh was deposited for LTS in National Gene Bank through NBPGR-RS, Ranchi. Also, fodder species (37) collected from parts of West Bengal were conserved in MTS at IGFR and the same set has been supplied for long term conservation in the National Genebank.

A total of 553 acc comprising M & AP (241), *Ocimum* spp. (34), *H. sabdariffa* (21), *Cajanus cajan* (3), tuber/aroids (27), horticultural crops (6), wild *Oryza* spp (178), wild *Abelmoschus* (33), *Costus speciosus* (6), *Hedychium* spp. (3), *Zingiber zerumbet* (1) are being maintained in the FGB/experimental plots of the centre for conservation purpose. Stubbles of wild rice (165) belonging to 19 wild *Oryza* spp. were also maintained for conservation in the Field Genebank.

GERMPLASM CHARACTERIZATION/ EVALUATION

Headquarter

During *rabi* 2019–2020, while working for seed increase and characterization of pea, an atypical morphotype was identified. Based on study of distinct morphology and physiological characters, this morphotype was identified as a unique and rare. Imbibition behavior study clearly indicated that water absorption and weight gain of the seeds were highest in EC0414478 accession as compared to checks used in the study.

A total of 500 diverse cowpea accessions were assessed for identification of pre-harvest sprouting (PHS) tolerance. Seeds of cowpea are being protected inside the pods, uncertain rain at the time of physiological maturity makes them vulnerable to PHS that causes loss in grain quantity and quality. Wide variation for PHS tolerance and fresh seeds germination (FSG) among accessions were observed, and 17 genotypes were found to be tolerant to PHS. Seed germination in a pod, a measure used to evaluate PHS, varied from 5.18% in IC257422 and 6.23% in EC724498

(highly tolerant to PHS) to 94.13% in IC261229 (highly susceptible to PHS) (Fig 2). The α -amylase activity at 48 and 72 h after germination was positively correlated with the FSG and PHS. Identified accessions have been validated after multi-location harvest.

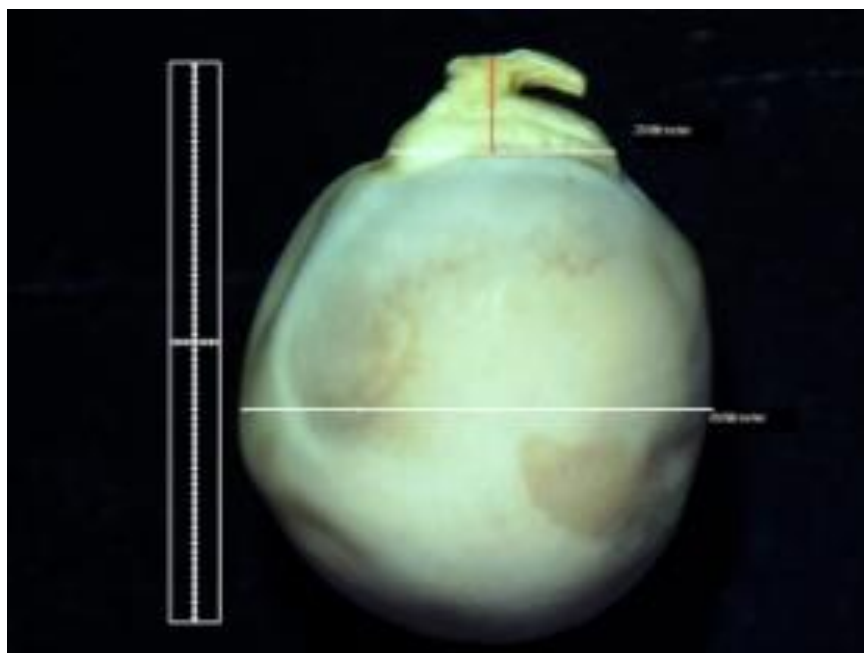


Fig: 2 A unique pea accession, EC0414478 with unique seed morphotype

BC-Cuttack:

A total of 64 acc comprising 34 acc of *Ocimum* viz. *O. tenuiflorum* (8), *O. basilicum* (4), *O. citriodorum* (9), *O. gratissimum* (11), *O. kilimandscharicum* (2); *Cajanus cajan* (3), *Dioscorea* spp. (18), *Costus speciosus* (6)

and *Hedychium* spp. (3) were multiplied/regenerated, and the same has been characterized for herbage and oil yield. Further biochemical evaluation is in progress. Observation on agro-morphological traits of 35 acc comprising chili, green gram and black gram was recorded for further analysis and identification of superior genotypes.



Fig 3: Representative accessions for PHS resistance and tolerance

RS-Thrissur:

In continuation to the coverage, the evaluation at largescale for horsegram was taken up at RS, Thrissur.

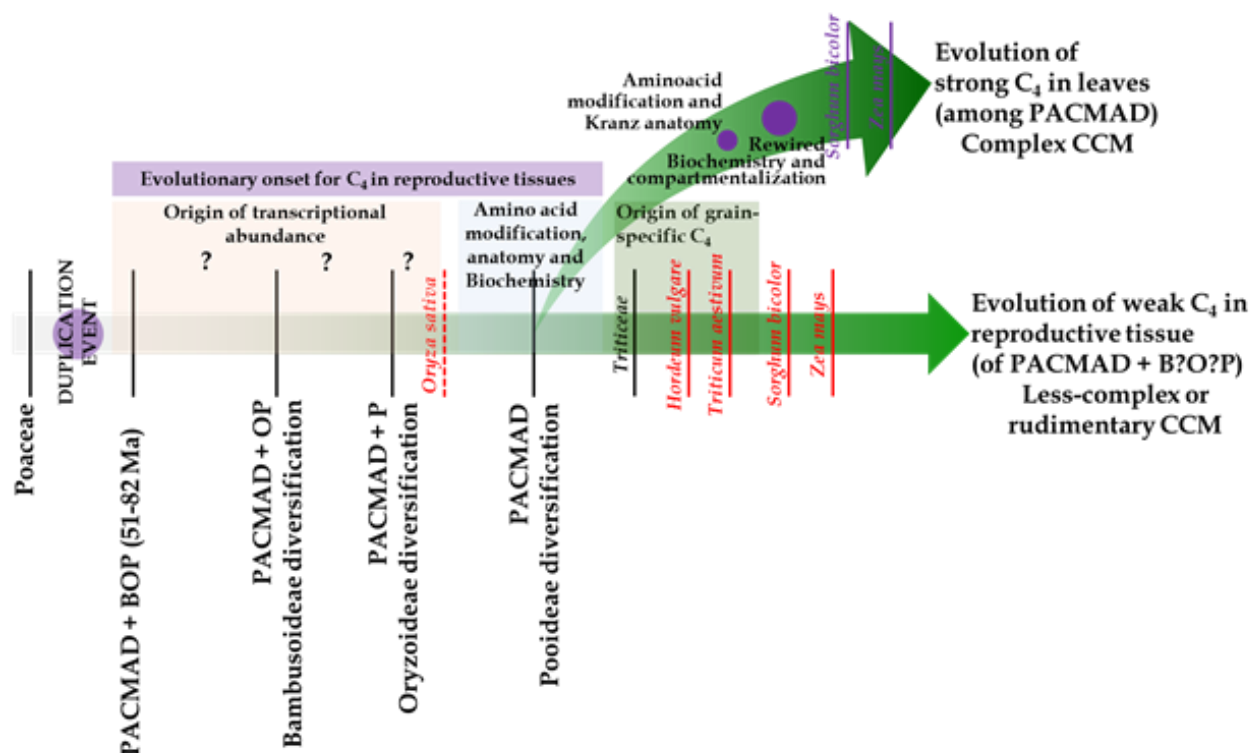
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The highest number of pods per plant obtained for the best check DPI2278 (132) was surpassed by 23 accessions. IC553492 (251), IC320969 (201), IC55062 (184), IC470167 (181) and IC139423 (180) were the highest pod yielding accessions. A total of 47 genotypes out yielded the best check PHG9 with 12g and the highest yielding accessions includes IC553492 (27.11g), IC342125 (20.84g), IC139423 (20.45g), IC470170 (19.79g) and IC470167 (19.67g). Twenty-one accessions excelled over the check AK 21 with highest hundred seed weight of 5g and the accessions includes namely, IC15724 (5.81g), IC360587 (5.64g), IC360588 (5.54g), IC372629 (5.51g) and IC361192 (5.44g). Seed coat colour polymorphism has been noticed among the genotypes and the whole germplasm were grouped into 16 seed colour categories.

The genotypes were also screened against YMV resistance in the field epiphytotic condition, with respect to 1-9 arbitrary scale for biotic stress susceptibility. 7 genotypes viz., IC43515, IC123026, IC123027, IC123028, IC139371, IC139374 and IC139392 were found free of any symptom even at pod maturation stage indicating high resistance against YMV.

GENOMIC RESOURCES AND BIOINFORMATICS

Differential gene expression pattern for C_4 photosynthetic pathway genes between foliar and non-foliar (peduncle and developing grains) photosynthetic tissues in three rice genotypes viz., Apo (EC734333), BAM4234 (EC497171), and Crossa (IC575838) were studied using RNA-seq based transcriptome approaches. Of the six genes studied, C_4 -specific copies for the two genes *aat* (aspartate aminotransferase) and *ppdk* (pyruvate, orthophosphate dikinase) were identified to be significantly differentially expressed in the developing grains, when compared to the leaves in all the three rice genotypes studied. Based on the recent report hypothesized for the requirement of a rudimentary or weak C_4 pathway with minimal genetic changes, to evolve further for an efficient C_4 pathway, keeping in view of the complexity of the trait and the report on weak CAM evolved prior to the evolution of the strong CAM. In a similar line of thought, it is proposed for an evolution of a weak C_4 pathway in non-foliar (reproductive) tissues at first in the BOP clade, upon post-optimization process, led to the evolution of an efficient C_4 pathway in the foliar tissues of the PACMAD clade, of the Poaceae.



A model proposed for the evolution of a weak C_4 pathway in non-foliar tissues of the BOP clade, prior to the evolution of an efficient C_4 pathway in foliar tissues of the PACMAD clade.

OUTREACH ACTIVITIES

On-farm Conservation

Webinar involving all the germplasm conservator farmers on the topic “Agro-biodiversity conservation in homesteads – Issues and solutions” was conducted on June 5, 2020. Custodian farmers of the localities were participated and discussed with the staff at RS, Thrissur. Their concerns were recorded and documented in strengthening the on-farm conservation.



Webinar involving all the germplasm conservator farmers on the topic “Agro-biodiversity conservation in homesteads – Issues and solutions” on June 5, 2020.

Dr. M. Latha, PS and OIC, RS, Thrissur had delivered two online lectures to UG students of TNAU, Combatore, briefing on the role of ICAR-NBPGR, its activities and the genetic resources of *Vigna* species.

BC-Cuttack had distributed two promising rice varieties (3kg each of CR Dhan-502 and CRDhan-504) developed by ICAR-NRRI, Cuttack to the farmers of Radhakrishnapur village. Advisory services were provided to the farmers of Itipur village of Cluster-18, Khurda district, Odisha for rice transplantation, weed management, optimum use of straw including preparation of bio-compost.

HRD ACTIVITIES

Drs. K. Pradheep and A. Suma, have attended the online training programme on “Science communication for smart scholars” organized by ICAR-CIFE, Mumbai, during 5-18 and 7-21 May 2020, respectively.

Dr. Jameel Akhtar had attended two-week e-course on ‘Crop pest diagnosis (English) v2.0’ organized by CABI academy, Nosworthy Way, Wallingford, Oxfordshire - OX108DE, UK during the reporting period

PERSONNEL NEWS

Retirement:

Dr. Rekha Chaudhury, Principal Scientist, Tissue culture and Cryopreservation Unit, ICAR-NBPGR, New Delhi, got superannuated on 30th April, 2020.

Dr. B. Sarath Babu, Principal Scientist & Officer in charge, Hyderabad got superannuated on 31st May, 2020

Dr Meena Shekhar, Principal Scientist (Plant Pathology), Division of Plant Quarantine, got superannuated on 30th June 2020, from HQ.

Joining:

Dr. Bhaskar Bajar, Scientist joined NBPGR on 4th April, 2020.

ICAR-National Bureau of Plant Genetic Resources

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Mandate

To act as the nodal institute at national level for acquisition, management and genomics based profiling of indigenous and exotic plant genetic resources (PGR) for food and agriculture and to carry out related research and human resources development for sustainable growth of agriculture

- Management and promotion of sustainable use of plant genetic and genomic resources of agri-horticultural crops and supportive research
- Coordination and capacity building in PGR management and policy issues governing access and benefit sharing
- Molecular profiling of varieties of agri-horticultural crops and GM detection technology research

Objectives

To plan, organize, conduct and coordinate exploration and collection of indigenous and exotic plant genetic resources.

- To undertake introduction, exchange and quarantine of plant genetic resources.
- To characterize, evaluate, document and conserve crop genetic resources and promote their use, in collaboration with other national organizations.
- To develop information network on plant genetic resources.
- To conduct research, undertake teaching and training, develop guidelines and create public awareness on plant genetic resources.

