

PROJECT INFORMATION

Genetic improvement of rice for coastal agro-ecosystem

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Title of the Project

Genetic improvement of rice for coastal agro-ecosystem

Funding Agency

Institute

Total Outlay

1.0 crore

Duration

2020-30

Single / Multi-Institutional

Single

Principal Investigator

Dr Manohara KK

Co-Investigators

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Rationale

Rice is the principal food crop and the most important cereal cultivated in Goa and the adjoining west coast region of India. The region is characterized by diverse rice-growing ecosystems, including low-lying coastal saline fields (Khazan lands), rainfed lowlands, medium lands, and uplands, each presenting distinct production constraints. Coastal rice cultivation is increasingly threatened by soil salinity, seawater intrusion, tidal flooding, prolonged water stagnation, and the impacts of climate change, resulting in reduced productivity and instability in rice production. At the same time, farmers cultivating medium and upland ecosystems require high-yielding, climate-resilient varieties that are adapted to local agro-climatic conditions. The rich diversity of traditional rice landraces and wild relatives found along the coastal regions of India represents a valuable reservoir of genes for tolerance to salinity, submergence, waterlogging, and other biotic and abiotic stresses. However, rapid replacement of traditional varieties by modern cultivars, changing land use, and genetic erosion threaten the conservation of these unique genetic resources. Systematic collection, characterization, conservation, and utilization of these germplasm resources are therefore essential to strengthen rice breeding programmes and ensure long-term genetic security. Development of high-yielding rice varieties with tolerance to salinity and adaptation to coastal ecosystems is critical for improving the productivity and sustainability of rice cultivation in low-lying saline areas. Simultaneously, evaluation and identification of improved varieties and advanced breeding lines for medium and upland ecosystems will facilitate the introduction of superior cultivars capable of enhancing farmers' income and ensuring stable production under varying environmental conditions. Furthermore, multi-location evaluation of promising breeding lines across diverse coastal agro-ecosystems is essential to identify stable, widely adapted cultivars with consistent performance. Such testing generates reliable information on genotype × environment interactions and supports the timely release and dissemination of suitable varieties. The proposed project will therefore contribute to the conservation and utilization of valuable rice genetic resources, development of climate-resilient and high-yielding rice varieties, and identification of suitable cultivars for different rice ecosystems of Goa and the adjoining west coast region. The outcomes of the project are expected to strengthen regional rice breeding programmes, enhance climate resilience, improve rice productivity, and contribute to food and nutritional security as well as the sustainable livelihoods of farming communities in coastal India.

Research Gaps

1. Limited availability of region-specific rice varieties for diverse coastal agro-ecosystems Underutilization of coastal rice genetic resources 2. Insufficient genetic resources for improving coastal saline rice ecosystems 3. Lack of high-yielding varieties combining multiple stress tolerance traits 4. Limited systematic evaluation of improved rice varieties and advanced breeding lines under coastal environments 5. Need for multi-location validation and identification of stable rice genotypes 6. Genetic erosion and inadequate conservation of traditional rice diversity 7. Limited availability of climate-resilient rice varieties for coastal farming systems

Objectives

1. To collect landraces and wild relatives of rice from coastal parts of India. 2. To evaluate suitable high-yielding improved rice varieties and stabilized lines under medium and upland situations. 3. To breed high-yielding salinity tolerant rice varieties for coastal saline soils. 4. To take up multi-location testing of improved varieties and advanced breeding lines under different coastal rice ecosystem.

Activities

- Review of literature
- Survey and collection of rice germplasm from the coastal region.
- Evaluation of high-yielding medium duration rice varieties under rainfed shallow lowland ecology and evaluation of mid early rice varieties under upland rice ecology.
- Phenotyping of rice germplasm for salinity stress under natural salinity and under artificial condition.
- Phenotyping of advanced stabilized breeding lines under coastal salinity conditions.
- Multi-location testing for G X E studies.

Treatment Details

Advanced Breeding Lines

Fertilizer Doses

100;50;50

Variety

Multiple Entries

Replications
2.0
Observations to be Recorded
Yield and its attributing traits
GPS Coordinates of Field (Lat , Long)
15°29'53.43"N 73°54'58.88"E25
Expected Output
• High yielding salinity tolerant rice varieties with better grain quality. • Identification of novel donors for salinity tolerance for seedling and reproductive stage. • Development of mapping populations for gene mapping studies • Identification of Genes or QTLs. for utilization in the marker assisted breeding • Identification of varieties suitable for growing in medium and upland situation of Goa and adjoining regions.
Expected Outcome
1.Increased productivity and livelihood security coastal rice farmers. 2. Availability of novel genetic sources for coastal stress tolerance. 3.Enhanced conservation and utilization of coastal rice genetic resources 4.Improved resilience of coastal rice production systems
When the field was developed
Was existed at the time of establishment of Institute
What are crops being cultivated season-wise
Kharif - Paddy Rabi-Cowpea
Soil type
Clay Loamy
Soil pH, EC, OC
pH - 7.0 EC. OC- 0.8-1.0
Soil depth
20 cm
Soil NPK and Micronutrient status
N:135 kg P: 15-18 kg K: 140-150 kg
Common pests and diseases
Pests: Stem borer, Gundhy bug, Leaf folder, Diseases: Leaf blast, Bacterial leaf blight, Sheath blight