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Mejoramiento a través de Ambientes o Zonas Agroecológicas en Colombia

Sierra Daza, Juan Jesús; Vargas, José A.; Amesquita, Nelson

El cultivo de arroz en Colombia se siembra desde el nivel del mar hasta altitudes de 1250 metros, abarcando una diversidad de ambientes o zonas agroecologicas (LLanos, Centro, Caribe Seco, Caribe Húmedo). La caracterización por variables climáticas muestran una diferencia amplia en temperaturas máximas, mínimas y brillo solar, a demás presentan diferencias dentro de cada zona de un semestre agrícola a otro. Por ejemplo dentro de la zona centro, la meseta de Ibagué y el Valle del Cauca, presentan condiciones óptimas de temperatura y horas brillo solar para un normal desarrollo y crecimiento de la planta de arroz, lo cual se refleja en las mayores producciones o niveles de productividad del país. Otra, como el caribe húmedo, presenta la temperatura máxima y mínima más alta del país, afectando el normal desarrollo de la planta, reflejado en una reducción del periodo vegetativo en todas las variedades y disminución de la productividad de la zona. Uno de los objetivos del programa de mejoramiento genético de FEDEARROZ es entregar nuevas variedades que a demás de tener alto rendimiento y resistencia a enfermedades, posean una amplia adaptabilidad acompañada de una buena estabilidad para las características de rendimiento y calidad. Para lograr lo anterior, desde 1998 se empezó a trabajar en la estrategia de mejoramiento a través de ambientes o megambientes, es decir, alternar la siembra de generaciones segregantes por zonas agroecologicas diferentes y así, obtener en generaciones avanzadas, líneas F6 con una mejor adaptabilidad y estabilidad para rendimiento y calidad de molineria. Como resultado, se han obtenido líneas promisorias de alto rendimiento (superior a Fedearroz 50) con buena adaptabilidad y estabilidad en producción y calidad en todas las zonas agroecologicas (llanos, caribe seco, caribe húmedo, centro y valle del cauca) e igualmente se ha ampliado la base genética, logrando desarrollar un Banco de germoplasma que agrupa parentales con las siguientes características; alta resistencia al volcamiento (tipo Fedearroz 50), estables en llenado de grano, buena calidad de molineria, senescencia lenta, sanidad foliar ,Resistencia o tolerancia al virus de Hoja Blanca , Tolerancia a la Bacteria Burkholderia , Resistencia o tolerancia a Piricularia y resistencia a helminthosporium en hoja. Lo anterior ha constituido el desarrollo de una importante base genética para el futuro del programa de mejoramiento de FEDEARROZ.

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CIAT'S Phenotyping Platform to Accelerate Development of Improved Rice for Limited Water and Nitrogen

Jagadish, Rane; Campo, Elias Manrique; Zuluaga, Cesar; Umemura, Yoshimi; Dedicova, Beata; Ishitani, Manabu; Martinez, César; Tohme, Joe
International Center for Tropical Agriculture

Ecoefficient and climate resilient rice varieties will be the key for sustainable agriculture particularly when globe warming and environmental foot prints of agricultural technologies are increasingly evident. While there is no significant increase in key resources, conventional approaches to develop a new set of rice cultivars needs to be complemented by the advanced technology to meet the ever increasing global demand for food. The solution for the problem lies in genotypes tolerant to abiotic stresses such as limited water and less nitrogen. Hence, CIAT has enhanced its efforts to identify genotypes tolerant to these abiotic stresses by adopting transgenic and non transgenic approaches. With screening protocol established for drought screening at seedling stage and reproductive stage, CIAT is now phenotyping hundreds of single copy homozygous transgenic lines of upland rice cultivar of LAC through optimized rice transgenic and phenotyping pipeline. Facilities to screen for drought tolerance at CIAT have been scaled up with mobile rainout shelter. Precise boom irrigation and soil measurement systems are being used to quantify and manage the magnitude of soil moisture stress. Recently, CIAT has also developed technology to automatically capture infrared images for phenotyping plants for cooler leaf canopy. CIAT has also established an evaluation platform for Nitrogen Use Efficiency (NUE) in rice and using it for evaluation of gene technology that can reduce the cost to farmers as well as environments. We are looking forward to scale up our capabilities to screen rice genotypes for other important abiotic stresses such as high temperature tolerance. The CIAT's plant phenotyping platform will facilitate gene discovery, validation of genes/markers and

multilocation evaluation with an objective to evolve ecoefficient cultivars of rice by adopting high throughput technologies. The technologies developed at CIAT are expected to meet regional and global demand for plant phenotype data that can complement efforts to identify and validate promising genes as well as molecular marker approaches for rice improvement.

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The CIAT Transformation Platform & the Rice Pipeline

Dedicova, Beata[1]; Tabares, E.[2]; Delgado, G.[2]; Falla, D.[2]; Recio, M.[2]; Hernández, M.[2]; Ospina, J.[2]; Chavez, L.[2]; Umemura, Y.[2]; Ishitani, M.[2]; Tohme, Joe[2]
[1]International Centre for Tropical Agriculture; [2]International Center for Tropical Agriculture

CIAT has been working with transgenic events of rice for more than a decade and has scaled up its facilities recently. It has been uniquely placed to evaluate the gene technology with a generic permission from National Biosafety Committee of Colombia. The CIAT has now established the Transformation Platform to host all the in house or collaborative research projects demanding work with the transgenic plants. An ultimate goal is to provide transformation facility, expertise and knowledge for complementing conventional crop improvement technology with advanced ones. Currently, we are able to transform several variety of the Japonica rice. The base line protocol for the Indica variety is available as well. Rice transformation protocols were developed and improved with at least two selection systems. Our current capacity with the antibiotic selection is app. 2500 transgenics and 250-500 single copy events per year. Following analysis are routinely performed for the each batch of the transgenic plants :PCR, Sothern analysis and determination of copy number of the different trangenes. The expression analysis of the GOIs are routinely done. T 1,2,3,4 generation of the rice transgenic plants are growing and are tested in the Biosafety screen houses and in the confined field. Work at the CIAT Transformation Platform is complying with the QA (Quality Assurance) standards, we are performing QC (Quality Control) of the each construct used for the transformation experiments. Integrated LIMS system will be implemented this calendar year and all the activities in the platform comply with International and Colombian Biosafety rules.
