GENETIC STUDIES ON BIODIVERSITY AND EVOLUTION IN RICE

By

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B.Sc. Agric. Sc. (Genetics), Tanta Univ. 2003
M. Sc. Agric. Sc. (Genetics), Kafr El-Sheikh Univ. 2010

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ABSTRACT

Mahmoud fazaa Abdel-Magied Mohamed Omar: Genetic Studies on Biodiversity and Evolution in Rice. Unpublished PhD. Thesis, Department of Genetics, Faculty of Agriculture, Ain Shams University, 2017.

A set of two hundred and fifty-eight rice accessions divided into five groups were evaluated under normal and stress conditions. The study was divided into two parts:

1) Assessment of genetic biodiversity, which include phenotypic evaluation, genetic parameters, correlation coefficient estimation and morphological clustering for all the studied accessions.

2) Estimation of the genetic structure and divergence by utilizing marker assisted selection (MAS), SSRs to tag favorable QTLs, molecular profiling for establishing phylogenic tree to detect the origin/evolution among all the tested accessions.

Eight primers (RM 315, RM 318, RM 166, RM 302, RM 201, RM 234, RM 526 and RM 144) revealed different levels of polymorphism to tag the related traits of interest as tolerant to abiotic stress, resistant to biotic stress and yield-related traits. Two primers (RM 190 and RM 278) were monomorphic. The percentage of the polymorphism was nearly 80 %. The size of detected fragments ranged from 105–325 bp. A total of 186 bands were scored from the amplification products with the ten SSR primers. Genetic diversity analyses were conducted on the basis of the scores with 176 unique bands. Phylogenic tree for the fifteen selected rice accessions from each group were established according to the molecular data and based on ten SSRs. A marked genetic diversity was observed in the five groups and the origin genotypes from the five groups were (Sakha 101, IR 03N137, IR 83142-12, IR 87856-10-AJY-1-B, HHZ 12-Y4-

DT1-Y2 and IR 1552), respectively which showed higher levels of diversity and hence can be used as donors for the effective conservation, utilization and providing favorable genes and valuable germplasm in rice breeding.

Key words: Rice, Genotypes, Biodiversity, Evolution, SSRs.

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INTRODUCTION

Genetic biodiversity and evolution in rice have the potential of revealing new insights about genetic pathways, and creating new opportunities to meet both anticipated and unforeseen challenges in rice breeding strategies. Genetic biodiversity is considered as the foundation of the genetic improvement in rice and finding out knowledge of multiple facets about rice genetic diversity from phenotype to molecule which is essential for the effective conservation, utilization and providing favorable genes and valuable germplasm in rice breeding **(IRRI, 2006).**

The accessible genetic biodiversity whether natural or induced is a prerequisite for understanding the biological and evolutionary process of a particular set of rice genotypes represented in a given geographical region or during the long-term domestication and cultivation under various ecological niches **(IRRI, 2010).**

Genetic biodiversity is showing the genetic changes that result in specific characteristics and which might make breeding new varieties more straightforward. On the other hand, the limitations of continuous application of traditional breeding methods in rice has resulted in the utilization of the uncharacterized genetic diversity. So, characterization of genetic biodiversity and discovery of favorable genes to be integrated into new varieties are vital to achieve advanced breeding materials.

Among all crops, rice is exceptionally well endowed with genetic resources and advanced genetic tools that make it a model of genomic system and genetic biodiversity. Genetic erosion of several crops has already occurred leading to the world's dependence for food on just a few species. Rice, maize, and wheat – account for 69% of the calories and 56% of the proteins that people derive from plants. Rice, *Oryza sativa* L. (2n=24) is the third largest cereal crop of the world.