

Genetic diversity and population structure of rice varieties grown in the Mediterranean basin. Spanish population as a case

Concha Domingo, Juan L Reig-Valiente, Juan Viruel, Ester Sales, Luis Marqués, Manuel Talón

Instituto Valenciano de Investigaciones Agrarias (IVIA). Spain

Since its domestication, rice expanded from tropical regions towards northern latitudes with temperate climate in a progressive adapting process to different photoperiod and temperature conditions. This process originated a wide range of diversity that constitutes a valuable resources for crop improvement. Reaching Europe, rice was cultivated along the Mediterranean basin. Rice breeding activity in Spain started more than one hundred years ago, when ancient cultivars with unknown origins were already cultivated. Since then, and as a result of the introduction of new germplasm within a directed breeding program, rice plant ideotype in Spain changed towards more productive plants with smaller stature and higher panicle number. Based on SNP markers, we have reconstructed the phylogenetic relationships and genetic diversity among 217 rice varieties mainly cultivated in temperate regions which possess an enormous variety of agromorphological and physiological characters. The collection encompasses modern elite and old cultivars, as well as traditional landraces covering a wide genetic diversity available for rice breeders. The genomic profiles of these cultivars were constructed using a panel of 2,697 SNPs with deep coverage throughout the rice genome, obtained by genome sequencing of 14 cultivars representative of the whole collection. The population structure analysis showed a strong substructure in the temperate rice population, which is consistent with the grain type and the origin of the cultivars. The analysis of medium-grain cultivars, the most widely cultivated type in Spain, showed the phylogenetic relationships and genetic diversity among them, revealing gene flow and higher rates of admixture between cultivars, probably as a consequence of local breeding activities. We investigated the population structure and the degree of relatedness within Spanish germplasm in the context of a wider population that cover rice from different origins. The results of this study answer questions about the origin of the ancient cultivars grown in Spain or the influence of foreign germplasm in the ongoing rice breeding program.