

EXPLORING DROUGHT RESISTANCE IN TEMPERATE RICE FOR A SUSTAINABLE RICE PRODUCTION IN ITALY

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During the last two centuries rice in Italy developed essentially as a water demanding crop, completing the growth cycle under submersion. Reduced water availability due to climate changes, especially if occurring during critical phases of the plant growing cycle, dramatically affects crop yield and quality.

This study aims at understanding the mechanisms leading to drought resistance in temperate japonica rice. Drought resistance is a complex phenomenon comprising a number of morpho-physiological processes at different plant developmental stages, resulting in the capability to withstand scarce water input and/or lack of water for longer periods while maintaining yield stability. The root-system architecture plays a crucial role in conferring drought tolerance. A deep root system able to absorb water at depth is the most relevant trait contributing to drought avoidance in upland conditions.

In this work, the existing biodiversity in a collection of 100 temperate japonica rice varieties will be characterised in terms of drought tolerance through the most advanced genomic tools coupled to phenotypic evaluations in growth-controlled and in field conditions. The collection includes traditional and modern accessions representing the genetic diversity of the Italian rice germplasm and a set of foreign varieties from temperate areas adapted to Italian climatic conditions. A phenotypic screening for root morphological features will be performed in controlled greenhouse conditions, while growth and yield performances will be field-evaluated under standard (submergence) and water-limited (aerobic soil) conditions.

In parallel, the same set of varieties will be genotyped using a high density 600K SNP panel. Genome-wide association analysis will then be carried out to identify new alleles and molecular markers to pinpoint the genetic determinants controlling drought resistance in Italian rice.