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Poster Communication Abstract – 5.40

MIRALO* - ANALYSIS OF MAIZE INBRED LINES FOR THE DEVELOPMENT OF HYBRIDS WITH EFFICIENT RADICAL APPARATUS

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root system architecture, selection criterion, maize germplasm, drought, root rot

The plant root system performs multiple vital functions, from the uptake of water and nutrients, to the plant anchoring to the ground. Maize is among the species with the highest photosynthetic efficiency, absorbing significant amounts of water and nutrients, and thus owning a well-developed and efficient root system is crucial. F1 maize hybrids with efficient root systems can be particularly adapted to environments with frequent dry and drought seasons, also avoiding attacks of mycotoxigenic fungi favored by such stresses. Preliminary investigations suggested that a fair amount of genetic variability for root system architecture is still present among F1 hybrid cultivars as well as in germplasm collections, which results in different water use efficiency (WUE) and drought stress tolerance. The evaluation of maize root system apparatus (RSA) led the development of some ideal root models (ideotype) that could be related to yield and stress tolerance. The objectives of MIRALO project are to explore variability for root architecture in Italian maize germplasm and to develop phenotypic and genomic selection criteria for obtaining resilient hybrids to be cultivated in Northern Italy.

MIRALO project focuses on the study of about 90 maize inbred lines (germplasm, GRM) derived from traditional local varieties grown in Italy

before the 1950s and about 250 inbred lines (elite lines, ELT) selected in more recent years within the CREA (Bergamo) breeding program. All genotypes are preserved at the CREA (Bergamo) genebank. In this study, GRM and ELT lines were evaluated for RSA in rhizotrones at UNIBO, under controlled condition. Based on the root system architecture, genotypes were classified into two main categories: shallow or deep RSA. In a winter nursery, inbred lines belonging to the two groups were crossed in partial North Carolina Model II mating design, so obtaining about 70 hybrids between expanded and about 70 between deep inbred groups. The hybrids will be evaluated again in rhizotrones for RSA, and in the field for agronomic traits and WUE in four locations, under two water regimes, during 2022 and 2023. A Fusarium verticillioides artificial inoculation assay on roots of plantlets of most promising hybrids will be performed to assess their possible root rot resistance.

MIRALO also aims to combine all data collected for root and agronomic traits with marker characterization in order to refine the selection criterion to be proposed for future breeding programs. As applied output, MIRALO is also expected to identify and release promising hybrid combinations with improved root efficiency and biotic and abiotic stress tolerance.

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