PhD Thesis Defense

On **Friday February 28th 2025 at 11.00 am**, in the classroom **G**, Via Santa Sofia 100

<u>Sebastiano Seminara</u> (XXXVII cycle)

Will discuss his PhD theses titled

DEVELOPMENT OF MOLECULAR MARKERS FOR TRACEABILITY AND BREEDING IN SWEET ORANGE

Thesis Abstract

Sweet orange (*Citrus sinensis* (L.) Osbeck) is one of the most widely cultivated fruit crops globally, valued for its economic, cultural, and nutritional importance. This doctoral thesis focuses on the application of whole-genome sequencing tools to identify molecular markers that can be employed for traceability and in future breeding plans. In this context, one objective was to establish DNA-based markers using single nucleotide polymorphisms (SNPs), for true-to-type analysis aimed at distinguishing sweet orange clones and ensuring varietal authenticity from farm to consumer. Moreover, whole-genome sequencing data coupled with phenotypic data recorded in two consecutive years, were employed for a genome wide association study (GWAS) to identify candidate genes and molecular markers associated with key phenotypic traits. Overall, the research activities focused on: (i) an extensive review of the sweet orange varietal landscape, along with the cutting-edge genomics and biotechnological tools that shape conventional and innovative breeding approaches (new plant breeding techniques, NPBTs); (ii) the identification - and validation using High-Resolution Melting (HRM) analysis - of SNP markers specific for the traceability of the major sweet orange groups cultivated worldwide and for 11 blood orange accessions grown in Italy; (iii) the set-up of a GWAS analysis conducted using a germplasm collection including a total of 117 blood and blond orange accessions. This research represents a significant advancement in the DNA-based traceability of sweet oranges, offering molecular tools for ensuring product authenticity and promoting consumer confidence in high-value orange products. In addition, the GWAS findings offer valuable insights into marker-assisted breeding, enabling the early selection of varieties with superior characteristics.

Advisors: Co-advisor:
Prof. Stefano Giovanni La Malfa   Prof. Mario Di Guardo