Consiglio Nazionale delle Ricerche

CNR IRET

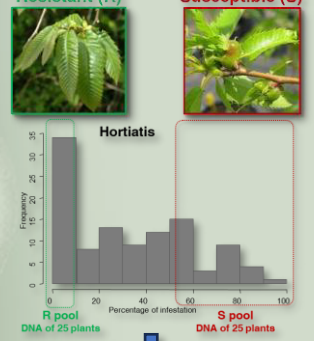
CNR IRET Conference Rome, February 18th-19th 2025

Ex-situ collections of *Castanea sativa* provenances as genetic sources of resistance to abiotic and biotic stress

Resistance to Asian Chestnut Gall Wasp

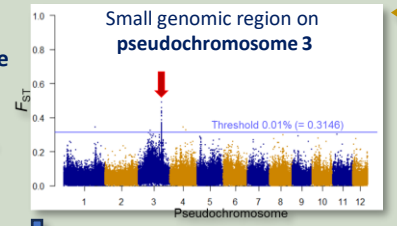
Castanea sativa
Provenance Hortiatis (Greece)
High number of plants **resistant**

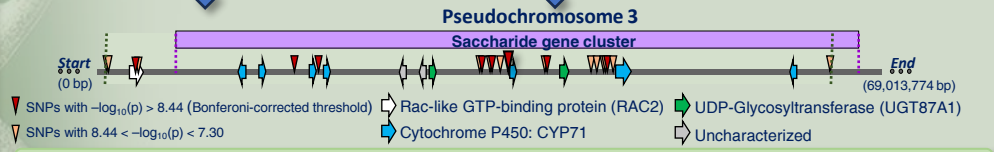
Resistant (R) **Susceptible (S)**



- **DNA Pool sequencing (Pool-GWAS)**
- Alignment with ***C. mollissima* reference genome**
- **Pool comparison** with POPOOLATION2
- **F_{ST} analysis** on 1 kpb windows
- **Fisher exact test** on individual SNPs

21 significant SNPs associated to resistance

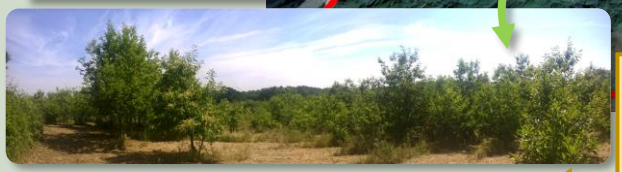


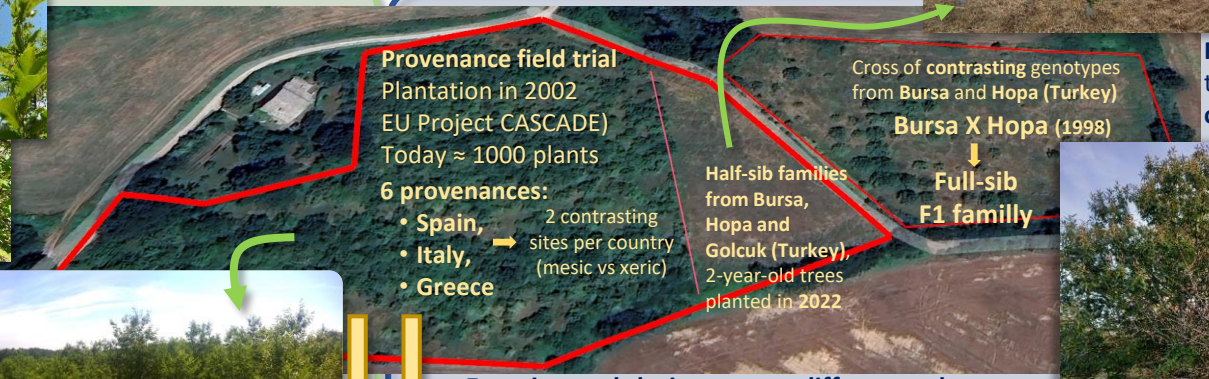


- **Unique genomic region associated to Asian Chestnut Gall Wasp resistance**

Identification of a Unique Genomic Region in Sweet Chestnut (*Castanea sativa* Mill.) That Controls Resistance to Asian Chestnut Gall Wasp *Dryocosmus kuriphilus* Yasumatsu.
Muriel Gaudet; Paola Pollegioni; Marco Ciolfi; Claudia Mattioni; Marcello Cherubini; Isacco Beritognolo
Plants 2024, Volume 13, Issue 10, 1355

Castanea sativa ex-situ common garden field CNR IRET

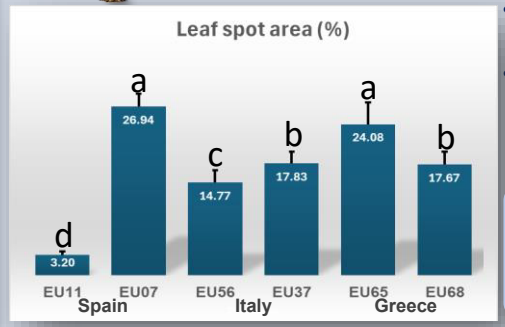




Experimental design to test differences between provenances:

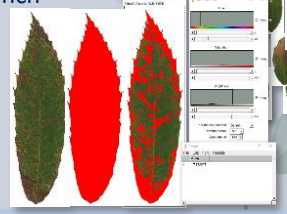
10 random plants / provenance = 60 plants
12 leaves / plant = 720 leaves.

- **Leaves** sampled on **October 10, 2024** on **2 opposite sides each plant**:
- **3 branches randomly** sampled at the **top, middle and bottom of the plant**.
- The **2nd** and the **7th leave** of **the year's shoot** were collected on each branch



- Leaf digital images analysed **with *Image J*** to determine the **ratio of infected leaf area.**
- **Kruskal-Wallis test and Wilcoxon Post-hoc test for multiple comparison**

Kruskal-Wallis; Factor Provenance, $p < 2.2e-16$
Wilcoxon tests; $p < 0.05$, Benjamini-Hochkberg adjust..



- **Significant variation in leaf spot susceptibility among provenances**
- **Spain provenance EU11** showed a markedly lowest level of **leaf spot susceptibility.**

- **Suitable plant material to study mechanisms of leaf spot resistance at genetic/genomic level**

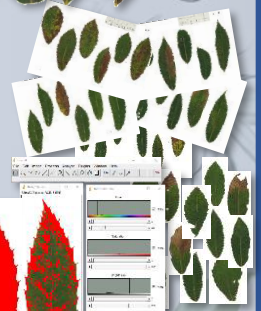
Resistance to leaf spot disease (Fersa)

Fersa: Parasitic **fungi,** *Mycosphaerella maculiformis*, that **cause leaf spot**. **Emerging diseases of European chestnut.**

- **Differences** in **extent of leaf spot necrosis** was observed **among provenances**.

Typical spots on chestnut leaves

Microscope enlargement of spots



Relevance of experimental fields

Isacco Beritognolo, Marcello Cherubini, Luca Leonardi

Muriel Gaudet