

# Drought stress: growth, water consumption and water use efficiency of sugar beet genotypes

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## Objectives

Sugar beet growth and yield formation are affected by drought stress. The objective of our study was

- to identify the period with the highest water demand of sugar beet,
- to quantify genotypic differences in water use efficiency (WUE),
- to analyze the yield response of different genotypes in various environments.

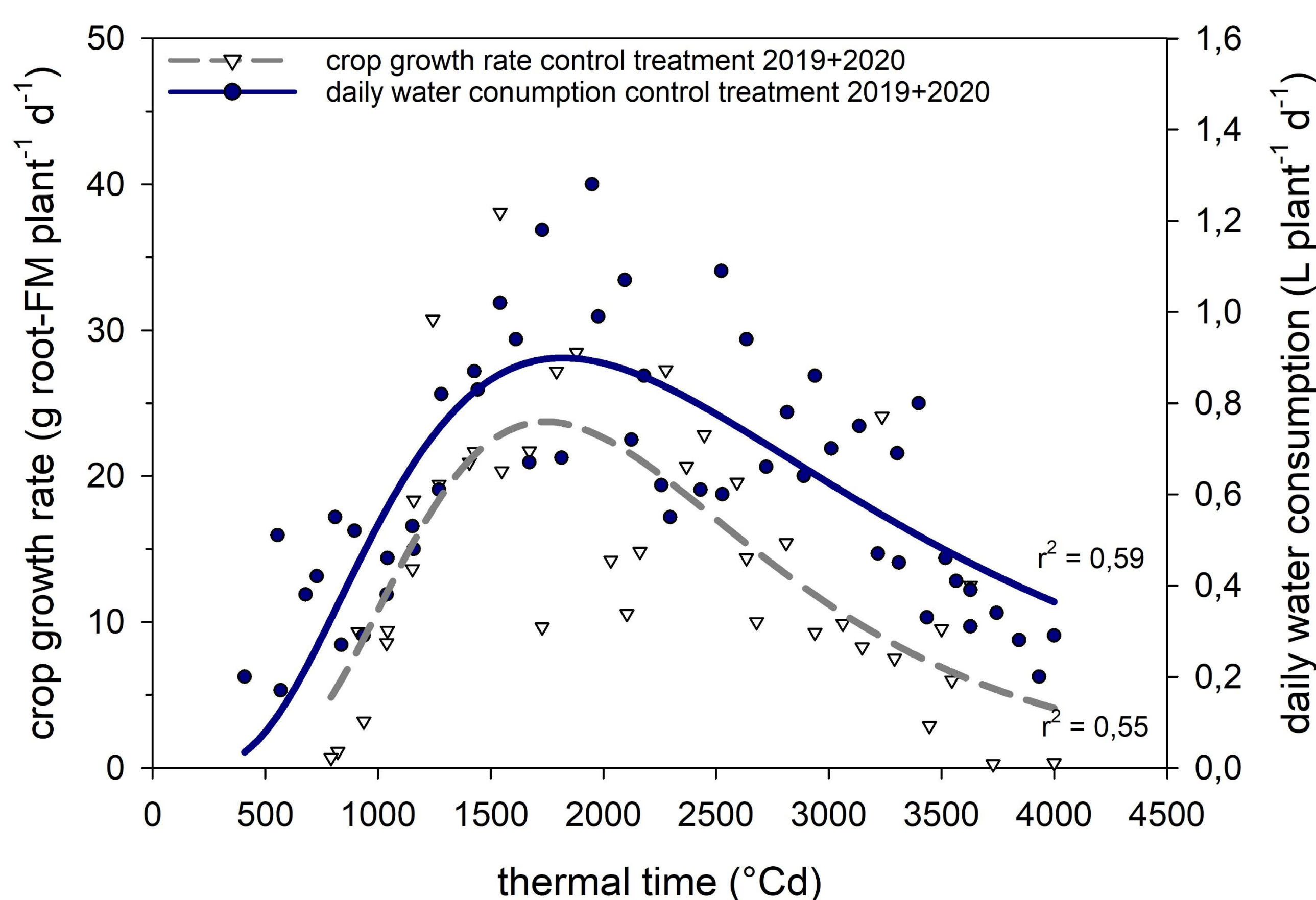


Fig. 1: Crop growth rate of the root and water consumption as a function of thermal time (mean temperature x days) greenhouse trial, control treatment with sufficient water = 100% WHC

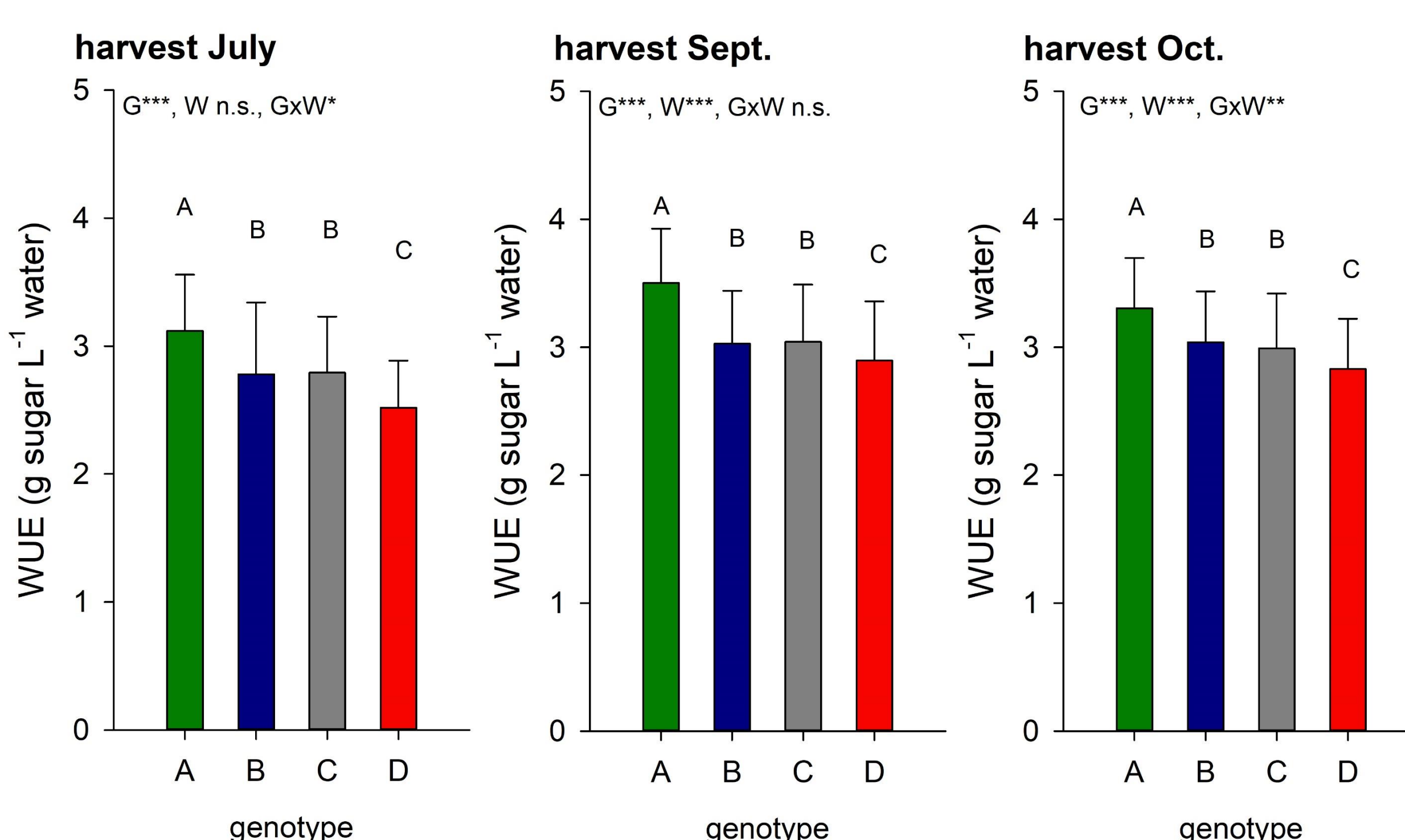


Fig. 2: Water use efficiency (WUE) of sugar beet genotypes with different harvest dates greenhouse trial, mean of 4 water treatments (control, drought in June, in August, in June + August).

## Conclusions

- The highest water demand of sugar beet is in the period of highest growth rates: ca. 1600° Cd ~ June/July.
  - Genotypic differences in the WUE seem to be determined by the sugar yield potential and were not influenced by the harvest date.
  - Although the yield level under drought stress was lower than under irrigated conditions, the genotype ranking was the same regardless of water supply (no relevant interaction).
- For the development of sugar beet genotypes adapted to environments with varying water supply, breeding should select for a high sugar yield potential.

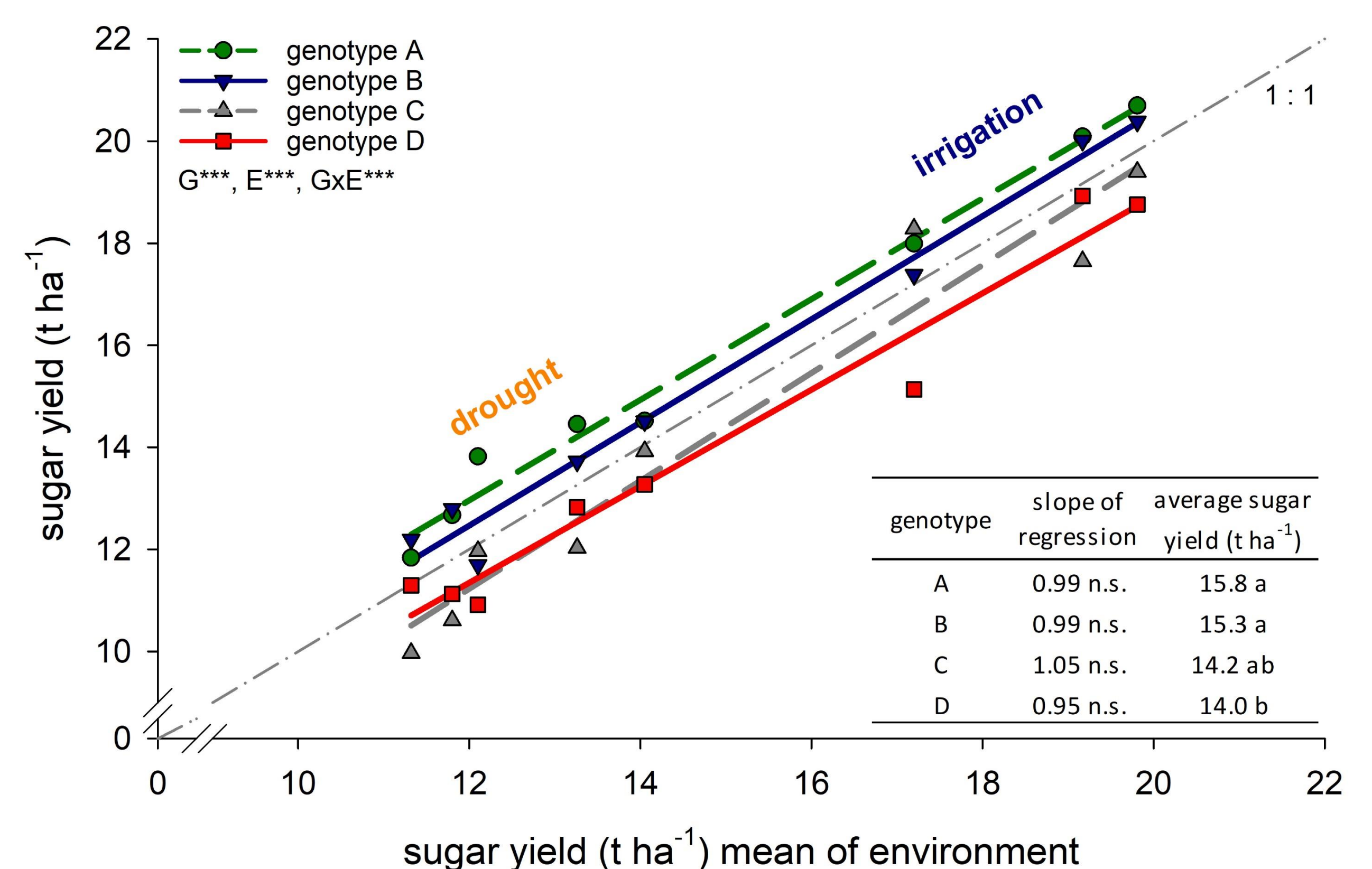


Fig. 3: Sugar yield of four genotypes in relation to the environmental mean; 8 sites in Italy, France and Germany with and without irrigation (drought stress) in 2018 and 2019 environment = site x year x treatment



## Material & methods

Greenhouse trials in 2019 + 2020: 4 genotypes, 5 reps; drought stress was simulated at different growth stages by reducing the irrigation to 50% of the water holding capacity (WHC) for 4 weeks.

Field trials in 2018 + 2019: sites in I, F, D with 4 genotypes in 4 reps; blocks with and without irrigation (drought stress)