

PROJECT TITLE

Systems Phenotyping of Genetically Diverse Oat Lines to Elucidate Drought Response And Resistance Mechanisms

CONSORTIUM

P 1	Nadia Kamal		
P 2	Kilian Pfatrish		

SUMMARY OF THE REPORT

Oat (*Avena sativa*) is a nutrient-dense cereal crop with a comparatively low carbon footprint and reduced input requirements. However, its production is constrained by sensitivity to water stress, making the development of drought-tolerant varieties essential for ensuring stable yields under increasingly variable climatic conditions (Kamal et al., 2022; Zhang et al., 2021). This project investigated drought responses in ten genetically diverse oat genotypes using the high-throughput phenotyping platform FitnessSCREEN at Helmholtz Munich. Plants were grown under controlled greenhouse conditions and subjected either to well-watered or long-term but reversible drought treatment. The automated weighing and irrigation system enabled exact and reproducible water supply regimes. At the same time, 3D multispectral scanning provided a comprehensive time series of structural, spectral, and vegetation index traits, spanning from the seedling stage to maturity. Manual phenotyping during and after harvest complemented the dataset with detailed morphological, physiological, and yield-related measurements.

Clear drought treatment effects and significant genotypic variation were observed across traits related to growth, biomass production, senescence dynamics, and water use efficiency. Several genotypes displayed strong drought sensitivity, whereas others showed only minimal performance reductions and high adaptive capacity. The resulting dataset provides a robust foundation for subsequent multi-omics analyses, including transcriptomics, metabolomics, and proteomics, using tissue samples collected during the experiment. Integrating these omics layers with high-resolution phenotypic profiles will support the identification of key molecular pathways and candidate genes underlying drought-response mechanisms within *Avena* species.