PROJECT: BeetCercoFACE2

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PROJECT TITLE

Effect of carbon dioxide (CO2) elevation on plant development and yield of sugar beet and its effect on the development of Cercospora leaf spot (caused by the fungus Cercospora beticola) – second year of BeetCercoFACE

CONSORTIUM

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SUMMARY OF THE REPORT

The project BeetCercoFACE2 was the second year in which we cultivated two sugar beet genotypes (a: susceptible, b: very slightly susceptible to Cercospora leaf spot) on one field under elevated CO_2-concentration (600 ppm) and on a control field under ambient CO_2-concentration. One part of the fields was sucessfully inoculated by the ascomycetous fungus *Cercospora beticola* which is reponsible for the disease Cercospora leaf spot (CLS) in sugar beet. The second part of the fields was treated with fungicide to prevent CLS. Sugar beet development was investigated by regularly measuring the beet diameter and the leaf area index. Moreover, an intermediate harvest was performed. Yield, dry matter content of leaves and beets as well as sugar content and impurities' content of the beets was analysed for intermediate and final harvest.

We found that beet biomass was significantly affected by the CO_2 level with higher beet yield under CO_2 elevation compared to ambient conditions: Both varieties reacted by an 1.4 times higher biomass in the fungicide treatment. The CO_2 elevation overcame to some extent the yield depression induced by CLS, especially for the susceptible variety. The sugar content was not significantly affected by CO_2 and ranged between 14.7% and 16.5%. These effects were already pronounced at the intermediate harvest which was conducted when first CLS sympoms were visible.

Moreover, we conducted a stable isotope ^{13}C pulse labelling at two time points during the beet development in order to understand storage pathways of recently assimilated C and the interaction with elevated CO_2 conditions. The photosynthetic activity was detected by multiple sensors as well as by drone images. The data of these investigations are still under evaluation.

Overall, this study will evolve results unique for Germany since sugar beet were not investigated in interaction with a pathogen under free air CO_2 enrichment conditions. We expect valuable insights on the dynamics of yield and CLS development under upcoming conditions.