PROJECT: FUTURE-LEGUME

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PROJECT TITLE

Effects of FUTURE atmospheric elevated CO2 on LEGUME nutrition, growth and molecular profiling

CONSORTIUM

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SUMMARY OF THE REPORT

Nowadays humanity is facing one its biggest challenges: climate change. One of the main offenders is increased CO_2 emissions. In 2016, atmospheric CO2 reached levels of 400 µmol mol^{-1} and is predicted to rise to 550 µmol mol^{-1} by 2050. It is now irrefutable that elevated CO_2 (e CO_2) will impact the nutrition of the foods which we will consume in the future, particularly legume crops which provide a large share of the global population diet, also being a crucial source of protein and minerals for human nutrition.

Regarding this EPPN 2020 program the purpose of the performed work was to study the genetic variability of two crop species grown at ambient CO_2 (aCO_2, 400 µmol mol^{-1}) or eCO_2 (600 µmol mol^{-1}) under BreedFACE (Forschungszentrum Jülich, Germany) experimental facility in Campus Klein Altendorf. Searching of genotypes which have greater yield at eCO_2 could support in adaptation to the future CO_2 environment levels. Although intraspecific difference in responses to eCO_2 has been found in several species, intraspecific differences in crop yield responses to eCO_2 under field conditions have occasionally been documented. In this study, the responses of leaf photosynthesis, growth and yield parameters to eCO_2 were examined in several genotypes of common bean and soybean under field conditions. Consequently, eCO_2 significantly stimulated leaf photosynthetic net CO_2 assimilation rate, but decreased light induced fluorescence transients in both species. Moreover, CO_2 enrichment significantly increased plant leaf area, aboveground dry biomass and seed yield in both species. Bean seed yield at eCO_2 range from 0.75 to 2.12 times (mean 1.34) that at aCO_2 in different varieties, and soybean seed yield at eCO_2 range from 1.07 to 1.86 times (mean 1.51) that at aCO_2 in the different varieties. The change in the number of pods at eCO_2 was the primary determinant of the response of seed yield ranging from 0.88 to 1.89 times (mean 1.37), and 1.03 to 2.56 times (mean 1.71) in common bean and soybean genotypes, respectively. Our results indicate that significant variation in the response of seed yield to eCO_2 under field conditions does exist among varieties of common bean and soybean, and that variation in the response of pod and seed number may be more important than variation in photosynthetic response.