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Does rhizosphere priming effect explain the greater soil respiration in well-watered and drought stressed maize?

Khatab Abdalla, Mutez Ahmed, and Johanna Pausch
University of Bayreuth, Faculty of Biology, Chemistry & Earth Sciences, Agroecology, Germany (khatab.abdalla@uni-bayreuth.de)

The projected global warming risks due to high emissions of greenhouse gases, mainly from anthropogenic activities, increases the need for an agricultural practice with high carbon sink capacity and low water requirements without compromising on environment and productivity. On one hand, it's well accepted that soil moisture directly affects microbial activity, whereas on the other hand, drought stress was recently postulated to increase root exudates, which in turn will accelerate soil organic matter mineralization "priming effects". Thus, the objective of this study was to investigate the interplay between soil moisture (well-watered and drought stressed) and maize (Zea mays L.) root exudates on soil CO_2 efflux. The experiment consisted of three treatments, which are well-watered, drought stressed maize plus a control (without plants) lysimeters (1 m^3), Soil CO_2 efflux, soil temperature and moisture content were measured weekly during the growing season (April to September) and monthly in the fallow period. Under well-watered conditions, the annual average of CO_2 efflux was 0.12 g CO_2-C m^{-2} hr^{-1}, which was 24.5 and 20% significantly higher than under drought stressed and the control, respectively. Moreover, well-watered treatment had significantly greater primed carbon than drought stressed maize. Soil temperature in deeper soil layers (25, 50 and 75 cm) correlated positively (with the CO_2 efflux, while soil moisture correlated negatively at the 5 cm and 25 cm. Overall, these results suggested that the root exudates decreased under drought conditions, which decreasing soil respiration. Drought tolerance varieties could be an option to decrease soil respiration and maintain productivity.