



Temporal changes of rhizospheric, mycorrhizal and heterotrophic respiration during the growing season in maize stands

Giulia De Luca and János Balogh

Szent Istvan University, Institute of Botany and Ecophysiology, Hungary (dl.giulia523@gmail.com)

The arbuscular mycorrhiza is the most common symbiotic association between plants and fungi. Our aim was to quantify the amount of carbon transferred between the symbiotic partners and to determine the proportion of the heterotrophic, mycorrhizal and autotrophic components in the soil CO₂ efflux in maize stands. The experiment was set up on three separated small-scale field trials and consisted of three treatments. Plastic tubes were used to create the „tube” treatment which contained the heterotrophic components of soil respiration. We used stainless steel meshes with 40 micron sized pores to realize the „mesh” treatment which encompassed the heterotrophic and mycorrhizal components. The undisturbed areas between the maize plants represented the third – „total” - treatment with all three - heterotrophic, mycorrhizal and rhizospheric - components.

An automated open soil respiration system (SRS) equipped with ten measuring chambers was used to measure the soil CO₂ efflux of each treatment in all three parcels during the whole growing season of maize. Soil moisture, air and soil temperature were also measured by the system. RGB photographs were taken of the plots every week from which VIgreen index was derived to monitor the growth of plants.

Our experiment showed that 60-80% of soil CO₂ efflux is provided by heterotrophic, 10-30% by autotrophic and 8-10% by mycorrhizal components, although these values can vary in different phenological stages. The ratio of heterotrophic component was highest in the 2-4 leaf stage. Both the autotrophic (42%) and mycorrhizal (16%) components' proportion were highest, while the heterotrophic component reached its lowest point in the flowering stage, as expected.

Furthermore, the share of the components of soil respiration showed not only a phenological but also a diurnal change which was similar in the case of rhizospheric and mycorrhizal components.