

Root distribution in intercropping systems – a comparison of DNA based methods and visual distinction of roots

ABSTRACT

This study was performed to i) compare root distribution of legume/nonlegume intercrops determined by qPCR and amplicon sequencing (Metabarcoding) to root growth of the individual species determined visually, and ii) compare the qPCR and amplicon sequencing techniques as a method for quantifying root growth of individual species grown in mixtures. Red beet (*Beta vulgaris* L. cv Detroit) and lucerne (*Medicago sativa* L. cv Creno) were grown in one-meter-high transparent tubes. Root competition was studied by direct observation on the tube surface determining root intensity (RI), root wash and extraction followed by determination of root length density (RLD), and DNA-based methods. Intercropping decreased lucerne RI strongly, whereas the RI of red beet was not affected. The determination of RLD did not allow us to distinguish species in mixed samples. However, both DNA methods showed apparently a tendency to overestimate the fraction of lucerne roots compared to the direct root observations. The discrepancy between methods was explained by the fact that visual methods provide estimates of root length while the DNA methods provide estimates of root mass. In conclusion, DNA-based estimates of species fractions in mixed root samples give valuable information on root interactions in mixed crops.