Abstract

The increased global nitrogen (N) fertilizer use leads to environmental pollution. Biological N fixation offers an alternative for sustainable agriculture by mixed cropping of legumes and non-legumes to promote N transfer. Arbuscular mycorrhizal fungi (AMF) facilitate N transfer by forming common mycorrhizal networks (CMNs). However, tracking N transfer via CMNs remains challenging. This study employed $K^{15}NO_3$ due to low natural abundance. The objectives were to evaluate CMNs role in facilitating N transfer from white clover (*Trifolium repens* L.) to Welsh onions (*Allium fistulosum* L.), and investigate AMF and rhizobia co-inoculation effect in white clover to improve N transfer. Plants were grown involving AMF (*Rhizophagus* spp.) and rhizobia (*Bradyrhizobium japonicum*) for 60 days in growth chambers using three-compartment pots with 34 µm meshes. Sterile Akadama soil mixed with basal fertilizers was used. $K^{15}NO_3$ was applied only in white clover. This study found 14.00–21.25% mycorrhizal colonization in white clover, while 46.75–67.50% in Welsh onions. White clover biomass and nutrient uptake decreased under AMF inoculation alone than rhizobia. Conversely, Welsh onions' biomass and nutrient uptake increased under AMF and/or rhizobia. N transfer from white clover to Welsh onions was significantly increased under AMF inoculations (2.67–4.24 mg pot^{-1}). N transfer was low due to nodule absence, limited AMF colonization, and lower $K^{15}NO_3$ uptake. CMNs in +AMF +Rhi and +AMF -Rhi significantly increased N transfer to compartment 2, while compartment 3 increased under +AMF –Rhi than control. Co-inoculation of AMF and rhizobia in white clover did not significantly improve N transfer rate.

Keywords: common mycorrhizal networks, $K^{15}NO_3$, mixed cropping, N transfer