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Beneficial root endophytic fungi change growth and oil composition of sweet basil in heavy metal contaminated soil

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Heavy metal pollution in the soil is toxic to animals, humans and aquatic life. Their tendency to accumulate in the food chain has led to stricter environmental regulations in the past decades. Little is known about the interaction between contaminated soil, plants and the rhizosphere. Root endophytic fungi such as arbuscular mycorrhiza (AM) fungi and *Piriformospora indica* belong to the rhizosphere and are associated with a huge variety of plant species. Both symbioses improve plant productivity by enhancing nutrient supply and conferring resistance and tolerance to biotic and abiotic stresses. The effect of the AM fungus *Rhizophagus irregularis* and the beneficial fungus *P. indica* on sweet basil was tested in a pot experiment with soil contaminated with lead (Pb) and copper (Cu) under defined greenhouse conditions. The AM fungus *R. irregularis* mediates an increase in shoot and root dry weight of sweet basil plants when the soil is contaminated with Pb or Cu, as well. Mycorrhization of sweet basil roots decreases in contaminated soil with Cu, but not with Pb. The Pb content in the shoot is decreasing with AMF, but not the Cu content. In contrast, sweet basil inoculated with *P. indica* shows a decrease in shoot Cu content. Furthermore, AMF have a dramatic effect on the content of the essential oils linalool and eucalyptol even on contaminated soils. Therefore, we conclude that beneficial fungi can be used to improve the quantity and quality of sweet basil also under conditions, which are stressful for the plant, such as heavy metal contaminated soils.

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