



Soil biodiversity and plant production

Plants utilise associations with soil microorganisms in the same way that animals utilise gut and skin microorganisms to aid their digestion and resistance to diseases. Recent advances in molecular genetics have revealed a remarkable diversity of fungi and bacteria associated with plant roots. Some of these microorganisms promote plant growth through enhancing plant nutrition. Other microorganisms increase plant fitness by protecting them from herbivores and pathogens. Some microorganisms also cause disease.

Mycorrhizal fungi

Mycorrhizas are ancient symbioses between plants and fungi. Fossils indicate that the earliest land plants hosted fungi in their tissues even before they evolved roots. Mycorrhizal fungi provide plants with necessary mineral nutrients and, in return, they obtain plant-derived sugars. The mutual advantages of these symbioses are clear from their tremendous diversity and abundance. Over 90 % of all plant species form at least one of the four major types of mycorrhizal symbioses:

- Arbuscular mycorrhizas are dominant in warm tropical rain forests, grasslands, savannahs, deserts
- Ectomycorrhizas, dominate temperate and boreal forests,
- Ericaceous mycorrhizas are common in boreal forests and heathlands. and orchid mycorrhizas.

This pattern reflects the variation in the ability of different types of fungi to acquire essential nutrients from minerals and organic matter in the soil and plants appear to associate with those types of fungi that can help them most efficiently to acquire nutrients from the soil environment. Mycorrhizas can also directly influence water uptake.

In addition to increasing plant nutrition, mycorrhizas influence plant production through their influence on soil formation and nutrient cycling. In fact, a large fraction of the organic matter in soil is represented by the mycelium of mycorrhizal fungi and, therefore, mycorrhizas account for much of the microbial carbon stored below ground.

Human activities, such as agriculture, forestry and urbanisation can eliminate many beneficial mycorrhizal fungi from soils; whereas earthworms greatly enhance plant infection by mycorrhizas in agroecological production systems. Although little is known about the functions of the many fungal species associated with plant roots, different species are known to vary greatly in their effects on host plants. Furthermore, high inputs of chemical fertiliser, can cause some species of mycorrhizal fungi to lose their beneficial effects, or even decrease the growth of their hosts. Consequently, caution should be taken when artificially inoculating plants with mycorrhizal fungi. Mycorrhizal inoculants are commercially available; however, their widespread application, especially in natural systems, is controversial because of unintended risks associated with the introduction of exotic species. These potentially harmful effects on native communities can be minimised if the fungal inoculum is prepared using local strains of fungi. Inoculation with efficient strains of mycorrhizal fungi has been shown to benefit the growth of many types of cultivated plants.

to be continued...

Soil Lovers say: Individual Plants Generally Host Dozens Of Fungal Species In Their Root Systems.