

Mycorrhizal aspects in slope stabilisation

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In order to re-colonise and stabilise slopes affected by superficial soil failure with plants essential requirements have to be met:

- the plants must grow
- the plants must survive sustainably
- plant succession must start and continuously develop

These requirements, however, are anything but easy given, particularly under the often hostile environmental conditions dominating on bare and steep slopes.

Mycorrhizal fungi, the symbiotic partners of almost all plants used in eco-engineering, are said to improve the plants' ability to overcome periods governed by strongly (growth) limiting factors.

Subsequently, results of investigations are presented of mycorrhizal effects on different plant and soil functions related to eco-engineering in general and soil and slope stabilisation in particular.

Generally, inoculation yielded higher biomass of the host plants above as well as below ground. Furthermore, the survival rate was higher for mycorrhized compared to non-mycorrhized plants, particularly under extreme environmental conditions. However, the scale of the mycorrhizal impact may be species specific of both the plant host as well as the fungal partner(s) and often becomes evident only after a certain time lag.

Depending on the plant-fungus combination the root length per soil volume was found to be between 0 and 2.5 times higher for inoculated compared to non-inoculated specimens. On an alpine graded ski slope the survival of inoculated compared to non-treated *Salix herbacea* cuttings was significant after one vegetation period only for one of the three added mycorrhizal fungus species. However, after three years all of the inoculated plantlets performed significantly better than the non-inoculated controls.

The analysis of the potential for producing and stabilising soil aggregates of five different ectomycorrhizal fungi showed high variation and, for the species *Inocybe lacera*, no significant difference compared to untreated soil. Furthermore, inoculation of *Salix appendiculata* with ecto, arbuscular, and the combination of the two mycorrhizal types revealed different effects in respect of aggregate stabilisation as well as above and below ground biomass production of the host plant. Only the ecto-mycorrhized plants significantly increased soil aggregate stability compared to non-inoculated willows. Significantly higher production of host plant biomass was restricted to roots and the inoculation with arbuscular mycorrhiza.

Additionally, there are successional processes in mycorrhizal communities in the way that perennial plants do have other fungal partners in their juvenile, prime, and senescent living phase, respectively. It was found that, particularly, in the initial phase of the re-colonisation and development of a protective vegetation cover, the lack of relevant (ecto-) mycorrhizal fungi considerably decelerate or even stop succession processes.

Conclusively, with regard to support and accelerate plant growth and the re-colonisation and stabilisation of slopes within the scope of eco-engineering measures it is necessary to select the fungal species based on sound information. This may include ecology and sociology as well as the potential for aggregate formation depending on the plant species used.