

# FRIENDLY FUNGI

## Mycorrhiza fungi assist grass plants

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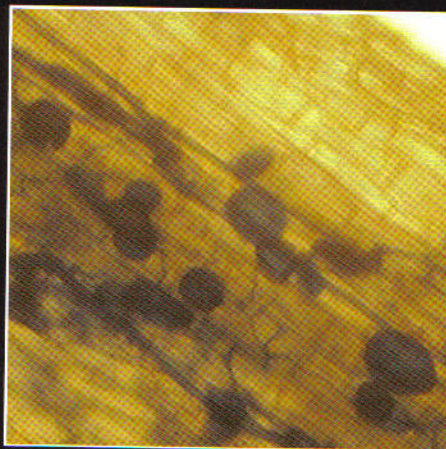
Turf managers have most often associated fungi with plant diseases in the past, though there are in fact different fungal groups that provide benefits to plants and their soil, by being antagonistic to pathogens or by working together for the better of both organisms.

One of these is a group of so-called 'friendly' fungi, named mycorrhiza, which exists naturally in the soil in undisturbed environments but diminishes, or is lost, in disturbed or managed soils under turf. When in close proximity to plant roots, the mycorrhiza fungi link up with the roots and then work symbiotically with the plant, to the mutual benefit of both

Image © Iowa State University



Photograph 1: Ecto-mycorrhiza on tree roots. The mycelia can clearly be seen forming a network of fine filaments fanning out from the plant roots. This type of mycorrhiza does not form any associations with turf grass, but are useful to trees when being transplanted to new sites and thereafter local mycorrhiza species will provide assistance.



Photograph 2: Endo-mycorrhiza in plant roots, only visible through a microscope in a cross section of the root. This type of mycorrhiza is present in most grasses, especially in drier conditions. It is also known as vesicular arbuscular mycorrhiza (VAM) and is usually only present in low numbers in managed turf grass situations.

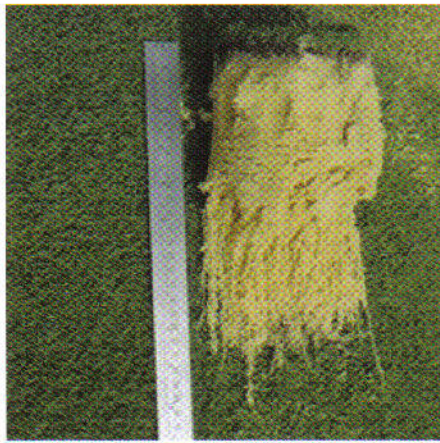


Photograph 3: Grass root zone not inoculated with any mycorrhiza product

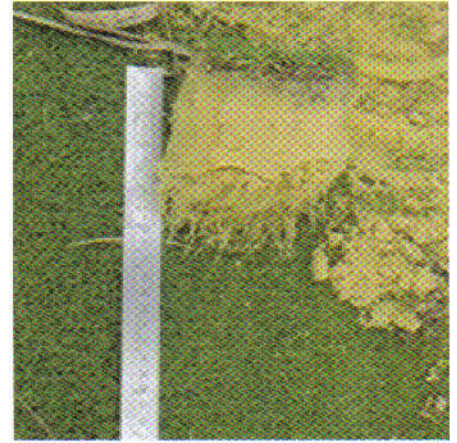




Photograph 4: Grass root zone inoculated with a granular mycorrhiza product



Photograph 5: Granular mycorrhiza amendment in the reconstruction of a sand-based golf green



Photograph 6: Non-treated sand-based golf green

*Mycorrhiza spores and propagules can be strategically applied in various forms to aid the establishment and recovery of turf, especially in soils that are relatively sterile or depleted in nutrients*

There are various types of mycorrhiza, which form different forms of association with different plant groups. For example, a type of mycorrhiza that forms external attachment to the roots of predominantly woody species is ecto-mycorrhiza. Sometimes these ecto-mycorrhiza structures can be seen with the naked eye, especially on trees such as pine or silver birch, when a rooted plant is taken out of a pot (see photograph 1).

However, grass plants form attachments with endo-mycorrhiza that result in the growth of the mycorrhiza structure inside the roots of the plants, therefore they are not visible to the naked eye, only under a microscope (see photograph 2).

**Plant benefits of mycorrhiza**

Mycorrhiza influences the growth habit of grass by stimulating the plant to root and, therefore, enhances the performance of the rooting structure in all its activities. This results in:

1. More efficient nutrient adsorption (especially N and P) from the soil
2. Improved water uptake and water use efficiency
3. Increased grass tolerance to saline and polluted soils
4. A more robust plant that is more able to withstand stress

When a good root system is established in the grass plant then, obviously, the general vigour and robustness of the plant is increased. However, there can be other secondary benefits such as improved drainage (due to increased root channels in the soil) and, probably most importantly, a greater efficiency in the use of soil nutrients and therefore a rationalisation of fertiliser applications, especially at plant establishment.

**Applying mycorrhiza**

Whilst mycorrhiza is naturally occurring, when turf is managed the mycorrhiza is generally lost and so, most often, levels of mycorrhiza in the rooting zone are either low or non-existent. Therefore, at critical

periods in the establishment or renovation of the turf, it is strongly advantageous to assist the plant roots by applying a mycorrhiza inoculant into the root zone.

Mycorrhiza spores and propagules can be strategically applied in various forms to aid the establishment and recovery of turf, especially in soils that are relatively sterile or depleted in nutrients.

On the other hand, in situations where turf is well established, with plenty of nutrients or water available and the plant is well rooted with no obvious rooting stress the application of a mycorrhiza product is likely to demonstrate little or no benefit.

Where predominantly sand-based surfaces are constructed, or regularly topdressed, it is relatively easy to demonstrate the benefits of adding a mycorrhiza product in a trial situation. Photographs 3 and 4 illustrate this in a demonstration trial conducted by grounds staff at Birmingham University.

The golden rule when applying any mycorrhiza is to ensure that it reaches the roots of the grass plant, as it has to be in close proximity to the root so that it forms an association. This is easy when applied in a rooting zone for new seed or where fresh turf is being established. However, in established turf, the method used for application is to sweep the applied product into aeration holes. Therefore, application at the time of hollow coring or tining in spring or autumn is the best approach.

**Best uses of mycorrhiza products**

As already mentioned, it is not universally beneficial to apply a mycorrhiza inoculant to turf in all situations but, instead, to use it strategically where there are likely to be rooting issues or it is desirable to give the newly established plants a competitive advantage.

Therefore the situations where the addition of mycorrhiza is likely to show most benefit are:

1. In the seed bed when sowing
2. Under newly laid turf

3. Worn and stressed areas
4. Included in divot mixes
5. Drought-prone turf
6. After de-compaction or turf aeration

As photographs 5 and 6 show, at least where sand-based greens are concerned, a mycorrhiza inoculate demonstrates itself as a cost effective investment. This is true for not only the establishment of the grass but also its ability to take up greater amounts of the fertiliser that is applied to the soil, before it is lost through the soil profile.

Unlike bacteria, which are more sensitive to extremes of pH, the performance of mycorrhiza fungi is more closely related to the ability of the plant to grow. Therefore, if the conditions are right for grass growth then mycorrhiza will be able to form an association with the roots, provided it is placed in the rooting zone of the grass plant, either at establishment or at aeration.

**Summary**

Although mycorrhiza is not a 'silver bullet' for all problems it has its uses in a modern turf management strategy. The encouragement of soil microbial systems, that includes the application of mycorrhiza, is a useful biological tool in efficient turf management that allows a manager to use their turf inputs more efficiently, encourage a more robust and tolerant plant whilst also minimising their use of other synthetic products. Each turf manager needs to assess their situation and need, but good quality, appropriate advice is available if required.

**Common questions answered**

**Q:** Can mycorrhiza be used to overcome rooting problems in established turf?

**A:** Yes it can, but only once the original cause of the rooting problem has been addressed. It is not a miracle cure that overcomes all problems, but rather an aid to recovery and establishment, providing the original reason for decline has been alleviated.



## *Once grass is established and does not encounter further rooting problems or stress conditions then there would be no further need to apply a mycorrhiza*

**Q:** *How does the mycorrhiza attach to the grass root?*

**A:** All plants give off chemicals from their roots (called exudates) and the mycorrhiza spores and propagules sense this and are stimulated to form an attachment with the roots. Then the mycorrhiza influences the physiology of the plant to stimulate greater rooting, thereby benefitting the plant whilst the mycorrhiza is able to grow and reproduce using assimilates from the plant.

**Q:** *Do all grass species benefit from mycorrhiza application?*

**A:** To a greater or lesser extent, yes. Generally grasses that prefer drier conditions demonstrate best performance with mycorrhiza, and the conditions of the rooting zone has more effect than the grass species. Some studies have shown that annual meadow grass has reduced associations with mycorrhiza but, as most meadow grass in fine turf is at least a partial crossed with the perennial type (*Poa reptans*), then using mycorrhiza to limit meadow grass is not a sound recommendation.

**Q:** *Can a mycorrhiza product be applied like a fertiliser to the surface of established turf?*

**A:** Not really. It is far less effective because

the mycorrhiza propagules need to be in close proximity to the grass roots to be able to form a linkage. Therefore, applying it to the surface of the turf is far more 'hit and miss' than making sure it is placed in the rootzone.

**Q:** *Can I use a mycorrhiza product alone, instead of a fertiliser?*

**A:** A mycorrhiza product might be used as a partial substitution for fertiliser at establishment, or as a pre-seeder, because it encourages the plant to root to find further nutrients. However, after initial establishment, the grass plant will require further nutrition and, if this cannot readily be obtained from the rootzone, then fertiliser needs to be applied. However, the greater root system will be able to use the fertiliser more efficiently so, in many situations, fertiliser use can be rationalised.

**Q:** *Isn't mycorrhiza fungus killed by fungicides?*

**A:** Some fungicides will have a negative effect on mycorrhiza, but not all (further information available). However, there are different target areas for mycorrhiza (soil) and fungicides (leaf) and also, usually, different times of year of application. So, therefore, this is not usually an issue and advisors should be able to assist with

appropriate advice.

**Q:** *Is there an optimum time of year to apply mycorrhiza, or times to avoid?*

**A:** If the climatic conditions are right for the grass to grow then mycorrhiza can form an association with the roots. However, cooler conditions, when plants stop rooting and also when frosts are likely, are not favourable times to apply mycorrhiza and, although it depends on locality, December to February are usually times to avoid.

**Q:** *Is it necessary to keep on re-applying mycorrhiza?*

**A:** Usually no, it depends on the situation. Once grass is established and does not encounter further rooting problems or stress conditions then there would be no further need to apply a mycorrhiza. However, if the plant is constantly being challenged by very shallow soil or poor rooting conditions and the root dies back annually, then annually re-applying mycorrhiza at aeration will be of benefit.

**Further technical information on professional use of mycorrhiza and associated products are available from Technical Specialists at ALS and Novozymes Biologicals:**