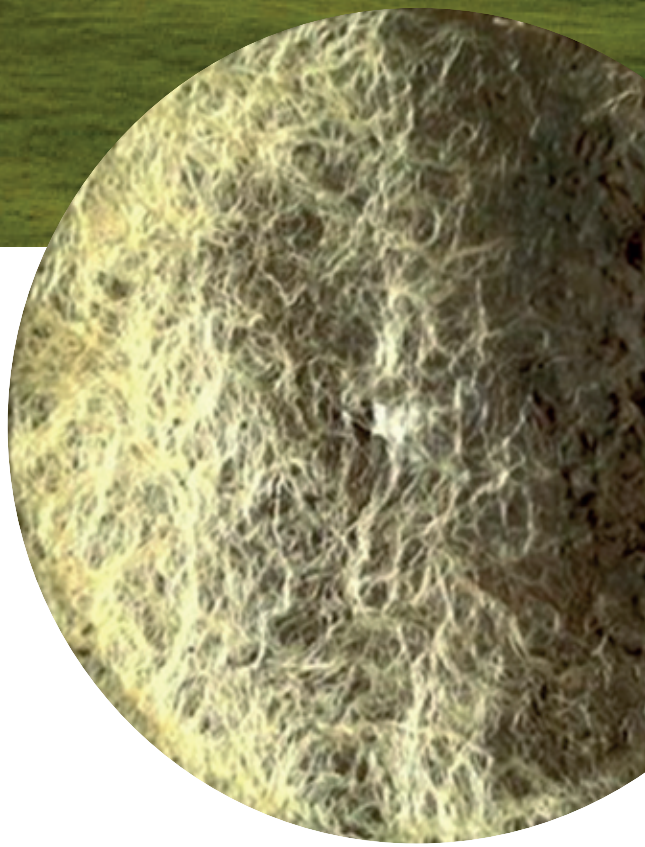


Grow in times

Reduce the cost of construction

Symbio's Martin Ward says that, if we could halve the time taken to grow in new sports pitches, golf courses or bowling greens, the cost of construction would be substantially reduced and income generated to pay off the costs sooner

The specifications for most sports turf construction focuses on the physical elements of particle size, percolation rates and drainage. The physical elements are very important for the long term management of the sward, but do not address the plants requirements for rapid early growth.

Unfortunately, many agronomists and architects overlook the basic chemical nutrition and microbial elements required by the grass plant when specifying the materials to be used during the construction phase, leaving the grow in manager to force the grass with excessive inputs of fertiliser and water.

Rootzone preparation

Many turf professionals who have grown in a pitch or golf course will be familiar with the need for heavy fertiliser inputs to make up for chemical and biological deficiencies in the rootzone. It is quite disheartening for a turf manager or agronomist to look at the chemical soil analysis of a newly sown pitch or green and find it with a very low cation exchange capacity (CEC) and almost totally devoid of the essential nutrients - calcium, magnesium, potassium and phosphate - and the organic matter needed to support the biology necessary for healthy plant growth.

Get the chemistry right

It is much easier to get the correct chemical balance in the rootzone before sowing or turfing, by simply mixing the nutrients with the rootzone material at source, than it is to try and push granular amendments through tine holes in densely sown grass.

Golf Club Spillern in Austria has had success using the methods described.
Inset: roots with mycorrhizae (left) - roots without mycorrhizae (right)

The rootzones used for most new sport turf construction are almost completely devoid of the biology that supports grass growth in the natural environment

The importance of Cation Exchange Capacity

CEC measures the ability of the soil to hold on to the positive ions of key nutrients. Alkaline nutrients with positive ions include calcium, potassium and magnesium, whilst acidic nutrients with positive ions include hydrogen (which determines pH), ammonium and iron. Many sands used in construction have a CEC of less than 2 meq+/100g, whereas the ideal for a turf rootzone is above 10. This means that a lot of the fertiliser applied just leaches away and is wasted.

CEC is raised by increasing the negative ions in the soil. In natural soils, this is achieved by increasing humus or clay. Clay is not wanted and humus is in short supply in turf rootzones, unless you incorporate a lot of organic matter. To maintain the drainage properties, the most common way is to add zeolite mixed into the rootzone. Zeolites, like humus, have a CEC of between 150-250 meq+/100g, so mixing zeolites at 5-10% into the rootzone is a quick and relatively inexpensive way of creating beneficial CEC before sowing. If budgets do not stretch to adding 5%, any addition will be beneficial in the short and medium term.

Base Saturation

On almost every chemical soil analysis, you see the base saturation calculations. This measures the proportions of the alkaline nutrients calcium, potassium, magnesium and sodium. Most agronomists agree that a Ca:K:Mg ratio of about 7-10:2:1, with exchangeable calcium at a minimum of about 700ppm, is favourable for good grass growth. The rootzone can be analysed before construction and these essential elements, together with phosphate and trace elements, may be mixed into the rootzone before building to ensure the correct balance is present from the start and prevent excessive applications of fertiliser to the newly growing grass.

Preseeding Nutrition

Young plants need proteins and carbohydrates to grow, in addition to NPK and trace elements. They grow best when low salt, slow release organic fertilisers are used. Some elements, like calcium, potassium and magnesium and the trace elements iron, manganese etc. have to be applied in mineral form; however, nitrogen and phosphate can be applied mostly in slow release organic form as a preseeder fertiliser.

Organic fertilisers can be mixed so that a mixture of organic sources are used combining the proteins and carbohydrates from vegetable sources, e.g. molasses, with the slow release organic substrates from composted animal manure. Both sources of organic nutrient act as an excellent substrate for the soil microbiology that must also be added.

Traditionally, high levels of phosphate are applied but, for the last twenty years, it has been shown that grass grows best when inoculated with mycorrhizal fungi at relatively low levels of available phosphate between 7.5 and 15ppm.

If mineral fertilisers are used, it is best to use those with a low salt index.

Post seeding nutrition

The amount and type of nutrient required depends very much on grass species, climate and the time allowed for the grow in. In the next section, we will be looking at ways to create the correct biology for perennial grass growth and the best fertilisers to promote healthy biology are primarily organic fertilisers rich in humic and fulvic acids, or low salt index mineral fertilisers plus biostimulants.

It is, of course, possible to force grass with high levels of nitrogen and phosphate, but this creates rapid thatch production and also the conditions for subsequent poa annua invasion, giving long term pain for a short term gain. When appointing contractors to grow in a pitch or golf course, care should be taken to ensure the correct nutrition is specified for the long term benefit of the sward and rootzone. This will save thousands of pounds in the long term maintenance of the sward.

When the physics and chemistry are in good order, we can introduce the beneficial soil biology.

Creating the correct soil biology

The rootzones used for most new sport turf construction are almost completely devoid of the biology that supports grass growth in the natural environment. In a previous article, we looked at the correct biology needed in the rootzone for continued perennial grass growth, *https://www.pitchcare.com/magazine/effect-a-stress-free-change-to-fine-grasses.html*.

The main microbial components of a healthy rootzone and sward are:-

Bacteria - which live mostly on root exudates and provide a barrier to disease, recycle nutrient and create friable soil whilst converting ammonium to nitrate

Fungi - which degrade cellulose and lignin, convert thatch to humus and produce toxins against plant diseases. For rapid grass growth, the most important form mycorrhizal associations with the plant.

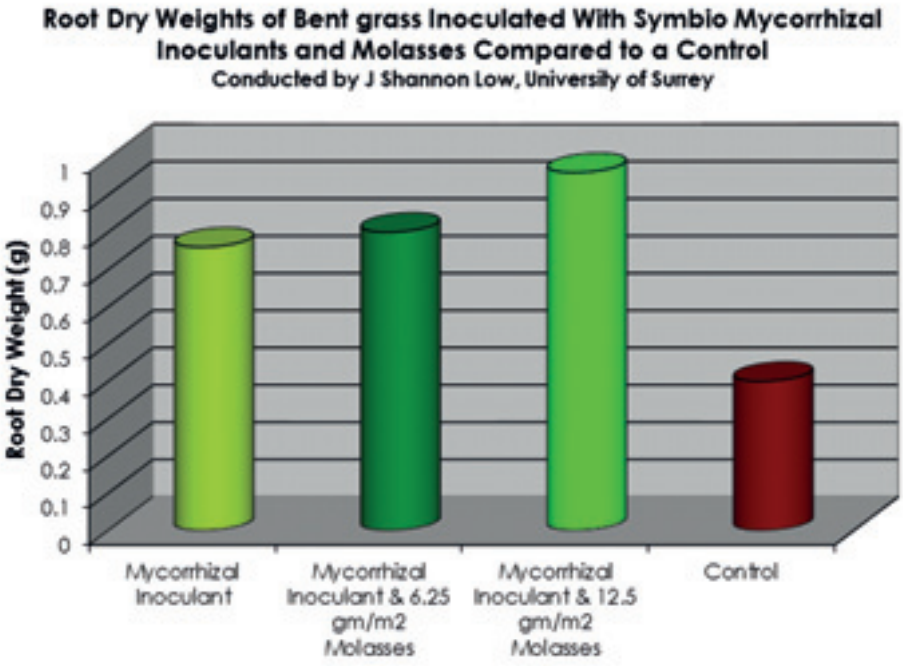
Protozoa - which eat bacteria and produce ammonium

Nematodes - which eat fungi and bacteria and create space for root hairs while producing ammonium

Mycorrhizal Fungi

Some fungi form mycorrhizal associations with the plant and are the most important for rapid grass growth. Myco=fungi and rhizae=root, i.e

Roots without mycorrhizae (top) in contrast to roots with mycorrhizae (bottom)



> **Inoculating the roots of newly sown grass with mycorrhizal fungi have been shown to more than double the early growth rates, substantially reducing the grow in time**

they are fungi that act like roots. These fungi act as an extended root system massively increasing the root area of the plant, allowing it to take up more water and nutrient to speed up its growth. Mycorrhizal fungi also have the ability to produce enzymes that solubilise nutrients, especially phosphate, and make locked up nutrient available to the plant.

Mycorrhizal fungial spores, or propagules, are available in granular, powder or liquid form and can be added to the rootzone either as part of a granular inoculant or applied to the surface of the rootzone immediately before seeding or turfing, or as a seed coat or added to hydroseeding solutions.

Inoculating the roots of newly sown grass with mycorrhizal fungi have been shown to more than double the early growth rates, substantially reducing the grow in time.

Mycorrhizal fungi live on the roots of the grass so do not need any other organic matter or biostimulants to survive. Once the grass is inoculated with mycorrhizal fungi, it should stay colonised by these friendly fungi. Mycorrhizae can be killed by systemic fungicides, but are more often reduced by over fertilisation, especially excess phosphate.

Soil Bacteria and Fungi

There are many thousands of different bacteria and fungi that live on the plant roots and in the soil. They all perform many functions and are essential for nutrient uptake and retention, plant hormone production, defence against disease, good soil structure, humus creation and buffering pH. Perennial grasses grow best when colonised by mycorrhizal fungi in low phosphate with an approximately equal amount by weight of soil bacteria and fungi in the rhizosphere.

A complete range of microbes can be applied by adding aerobic compost to the rootzone material to give an 80:20 or 70:30 ratio of sand:organic matter, but this is a temporary solution and may adversely effect drainage. The best way to apply a broad spectrum of bacteria and fungi, protozoa and nematodes suited to the pH of the rootzone is to apply compost tea, immediately before seeding and monthly thereafter through the growing season. Where the application of compost tea is not possible, then a restricted range of bacteria and fungi can be applied as an inoculant.

Biostimulants

Sand based sports turf rootzones are not designed to support soil microbiology, so microbial food has to be applied. The recent article *https://www.pitchcare.com/magazine/biostimulants.html* explains how biostimulants work and which one to choose once the sward is established but, for rapid grow in, different combinations are needed.

In the early stages of growth, especially if sown in spring or autumn when there is less light for photosynthesis, the plant and microbial community needs a ready supply of protein and carbohydrate, humates and humic and fulvic acid, which can be obtained from molasses based fertilisers, which are also excellent food for soil bacteria and humic and fulvic acid compounds.

Fungal food can be obtained from liquid seaweed and fish hydrolysate, which also provide essential trace elements and plant hormone elicitors.

The immediate financial benefit of following the above suggestions is that the surface can be brought into play faster and generate income. There are a number of longer term benefits to consider.

Excessive mineral fertiliser applications appear to work well enough in the short term, but create the conditions for poa annua and heavy thatch growth, this means higher costs for thatch removal and overseeding, topdressing, fungicides and seed. These elements will continue to be required, but in lower amounts, so over the lifetime of the facility these extra costs will be substantially reduced.

Initial high inputs of phosphate, iron, and other mineral salts become locked up in the soil, eventually they form layers and root breaks which, in turn, require either intensive aeration or biological intervention to break down.

Apart from the subsoil preparation, the same techniques can also be used for the rapid transformation when overseeding and converting poor swards to good quality perennial grass playing surfaces.

In short, if you can take the standard specifications for rootzone materials and create the correct chemistry and biology for healthy plant growth, you will achieve an excellent playing surface more quickly that is both easier and less expensive to manage in the long term.


Martin Ward

Symbio is dedicated to researching solutions to restoring the natural biological activity in soils and growing media essential to ensure the long term sustainability of food production and amenity plant resources for the world's increasing population.

E: martin@symbio.co.uk
T: 01428 685762
W: www.symbio.co.uk