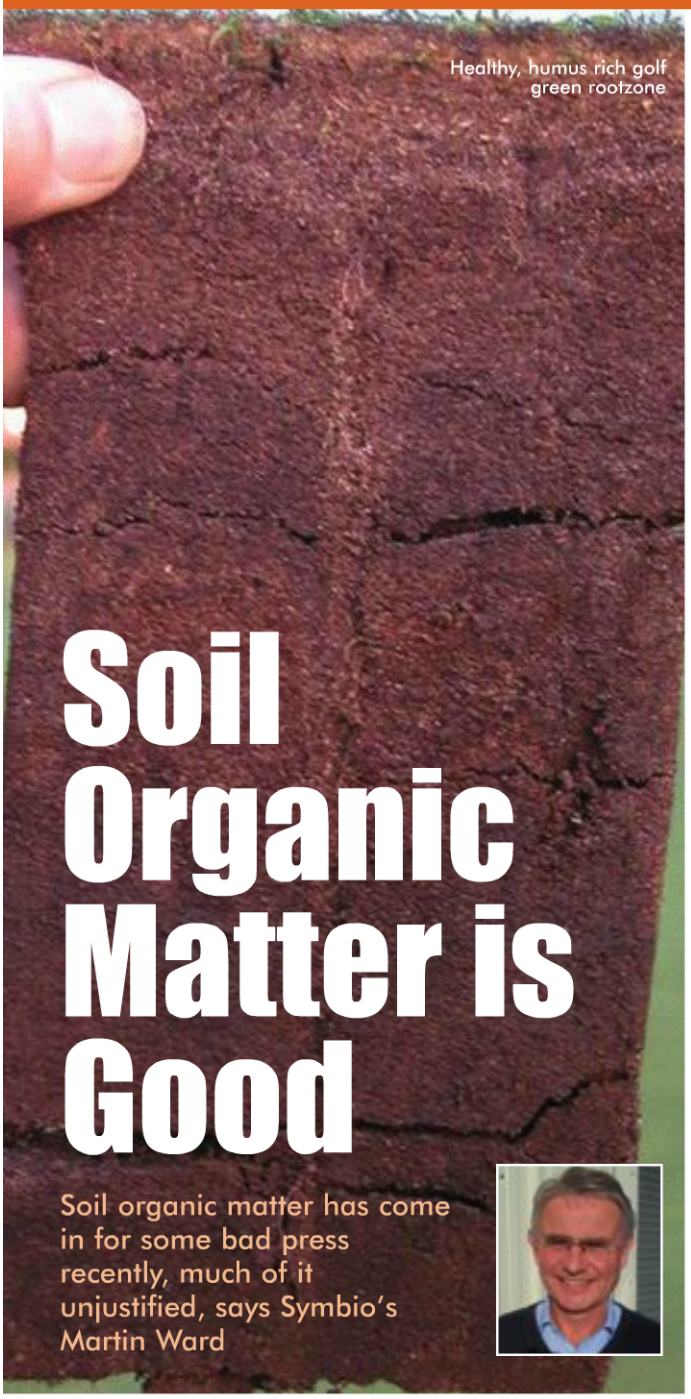
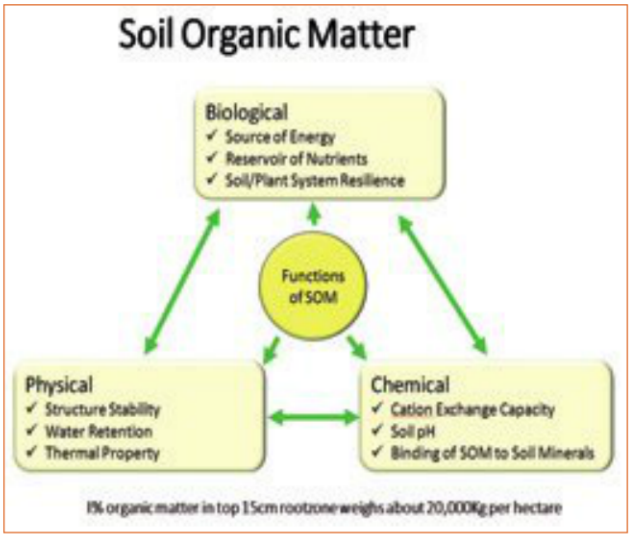


Healthy, humus rich golf green rootzone

Soil Organic Matter is Good

Soil organic matter has come in for some bad press recently, much of it unjustified, says Symbio's Martin Ward



Organisations providing "organic matter" tests often give the impression that there should be a maximum level of organic matter in a rootzone to give good playing characteristics. This is often interpreted as all organic matter is bad, which is not correct. In the following article, we look at all the benefits soil organic matter brings to your sward and playing surface.

The first point to make is that thatch should not be confused with all the good organic matter in the soil. Unfortunately, the loss on ignition test that is used to measure organic matter is a simple measure of carbon, and it not only measures thatch, but also roots, organic fertilisers, partially degraded humus and humic compounds, humus, the microbial biomass, which can be up to 3 tonnes per hectare. I suspect very few turf managers would worry about an organic matter reading of 5% if it was all roots and humus.

Strictly speaking, thatch should not be called soil organic matter, but organic material. In managed sports turf systems, thatch is almost the only source of the beneficial soil organic matter which is the nutrient store and engine room of the rootzone. If the soil is the stomach of the plant, then soil organic matter is the stomach lining without which there would be no natural plant growth.

In a healthy rootzone, there are four types of organic matter - living, dead, very dead and extremely dead. The living comprises roots and soil organisms, but it is the dead organics we will concentrate on here. The dead component comprises thatch, which should only comprise about 10-20% of the total organic matter. Thatch takes a few weeks to two years to break down into what is known as the very dead or active fraction, which is organic matter still decomposing, and makes up 35-50% of the total. This fraction supports much of the biological activity in the rootzone. The extremely dead portion is humus which contains very little organic content but is essential for healthy plant growth and makes up a further 35-50%, and can take up to thirty years to become completely mineralised.

There are a lot of misconceptions about the role of soil organic matter, but it actually drives the physics, chemistry and biology of a healthy rootzone. Put in perspective, 1% soil organic matter in the form of humic

"In a healthy rootzone, there are four types of organic matter - living, dead, very dead and extremely dead"


Old chemically managed green - hollow core space with oxidised iron


Organic matter in top 15cm averages 2.5%


Organic matter in top 15cm averages 1.9% thatch converted to humus

compounds weighs about 20,000kg per hectare in the top 15cm of rootzone, so it is present in quantities that has a massive effect on soil and plant health

For a golf green, humic compounds in soil organic matter should be approximately 2%-2.5% of the rootzone to maintain structural stability, but note that humus has very different properties from the peat that is often incorporated into newbuilds to provide organic matter.

The problem with physically removing thatch and diluting it with topdressing - apart from the disruption, expense and loss of income - is that thatch is the only natural source of the material which creates humus, humic compounds, humic, fulvic and other essential organic acids.

So, why is it so important to convert thatch into beneficial organic matter to drive the physics, chemistry and biology of the rootzone?

Physical and soil structure

Soil organic matter plays a key role in the structural stability of the soil. Soil without soil organic matter compacts very easily and suffers from poor aggregation. Conversely, healthy soil maintains pore spaces and has much improved oxygen transfer and water infiltration rates. Soil organic matter also retains moisture in times of drought. Roots grow in the spaces between soil particles, which further enhances the physical benefits of correct soil organic matter content.

Chemistry and nutrient retention

The nutrient holding capacity of natural sand rootzones is almost exclusively down to the soil organic matter content. Clay and humus are the negatively charged particles in soil which hold onto cations, the positively charged ions like calcium, potassium, magnesium and ammonium. USGA greens and modern winter sports pitches are usually built with zero clay and almost no humus, which is why they have very low cation exchange capacity and leach nutrients for fun. However, when thatch degrades, it forms humus and increases the CEC of the soil, thereby holding on to a greater proportion of available and soluble nutrients.

"In practical terms, the degradation of thatch and conversion to humus and humic compounds provides the turf manager with a host of practical benefits"

The active and stable fractions also contain a lot of the nutrients that were locked up in the living plant and which bind onto the humus before it is released slowly to fuel plant growth.

The third and, in many cases, most important role is that when humic compounds are formed a lot of humic and fulvic acids are produced, which buffer the pH, creating the biological and chemical conditions which favour perennial grasses.

Biology and the life in your soil

The combination of good soil biology and good levels of soil organic matter provides a myriad of benefits to the turf manager. Virtually all natural processes in the soil are interlinked. When one element is missing, troubles start. Many turf managers' skills are taken up by managing the symptoms of excessive thatch, compaction, disease, poa annua, dry patch and high inorganic fertiliser use which result from poor quality rootzones

Organic matter supplies the carbon needed by soil microorganisms to grow, thatch is primarily food for the fungi and actinomycetes in your rootzone; fungi and bacteria degrade thatch and start the process of converting it to humus, humic substances and organic acids.

Fungi and bacteria are essential to protect the plant against disease, with a number of mechanisms to protect the grass, including toxin production in the presence or pathogens, competitive exclusion for nutrients and forming protective barriers around the plant.

Organic substances in soil have a direct physiological effect on plant growth. Some, like phenolic acids, are phytotoxic that kill pathogenic fungi (phenols are found in disinfectant soap), whilst others, such as auxins, enhance plant growth.

The organic matter content also determines the type of grass you can grow. Perennial grasses need a balanced fungal bacterial mix in the rootzone, which can only be achieved when there is sufficient soil organic matter to support a strong, diverse fungal population.

In practical terms, the degradation of thatch and conversion to humus and humic compounds provides the turf manager with a host of practical benefits, saving work time and costs whilst improving the playing surface.

Thatch levels are reduced and the friability of the rootzone improves; this means less physical disruption and hollow coring is needed to remove thatch and improve drainage, as you can see from the pictures of different rootzones taken after trials at Reaseheath College.

With improved drainage and airspace, roots are able to grow through the entire rootzone, not just down the core or tine holes, improving water and nutrient uptake and creating a healthier plant.

When the thatch is degraded, it feeds the fungi which are needed to maintain a healthy population of perennial grasses, thus allowing a stress free conversion from poa annua to rye, fescue or bents to further improve the playing surface.

In short, good soil organic matter is essential for sustainable production of healthy, perennial grass playing surfaces, and can make the turf manager's job much easier and more enjoyable.