

Chapter 6 - Organic matter

All soils will have organic matter (OM) within them. It is simply the portion of the soil that was once living in some form (or still is) living within it. Dead roots, grass leaves, bark, sticks, in fact anything organic that lays on the soil long enough eventually becomes organic matter.

Bacteria and fungus help to break down organic matter. They use this as a food source for energy as this is consumed and broken down it changes state from something recognisable (such as a tree leaf) to a brown sticky substance we know as humus.

There are many interactions involved in the process of breaking down organic materials into different substances but we can broadly look at three important ones. Initially the freshly deposited recognisable OM forms what is known as the litter layer. This can be found at the base of the plant but above the soil surface. As this litter layer is attacked and consumed by bacteria and fungus it starts to break down and becomes partially decomposed. At this stage the tougher, lignified parts of the plant (such as stolons, rhizomes and nodes on the grass plant) are the only semi-recognisable parts. Eventually, the OM will be broken down into humus. Humus is the very last stage of identifiable decomposition. At this point it is highly charged and holds at its surface many nutrients.

Organic matter provides many benefits to both the soil and the grass plant. Soils benefit from having improved structure (organic matter binds mineral particles together) and improvement in the levels of nutrients available for plant uptake (known as improved condition). The soil will also be able to hold a greater amount of water. OM is able to absorb and hold (due to its negative surface charge), high levels of water therefore increasing the soils water holding capacity. This is extremely helpful with free draining soils such as those classed as sand or sandy. The grass plant benefits because of the increased amounts of water and nutrients it is able to obtain to aid growth.

Thatch

Thatch is a layer of organic matter, consisting of all the layers and properties explained above, most important to turf grass lawns and those who manage them.



Thatch can be found above the soils surface but below the grass plants leaves. It is defined as a tightly intermingled layer of dead, dieing, and living plant material, consisting of stolons, rhizomes, stems, crowns, nodes, and leaves, in fact, all parts of the turf grass plant.

In small controllable amounts it is very beneficial, unfortunately, poor management of turf (over or incorrect use of water and fertilisers) can quickly lead to high levels of thatch and many subsequent problems. Contrary to popular belief, returning the cut leaves to a sward (mowing with a rotary mower) will not increase thatch levels as leaves are made up of more than 85% water, the leaf tissue shrinks and is decomposed readily. Initially after mowing the litter layer on the surface will increase but leaves (made up of cellulose) are quickly broken down and the nutrients contained within them are re-cycled back into to the soil.

To determine the thickness of the thatch layer, cut out a triangular shaped section of the turf and soil with a knife. Looking directly below the green leaf, measure the amount of dark brown root and stem tissue above the soil (see picture, thatch layer indicated between white lines). Replace the cut piece and use the knife to knit the piece of turf back into the turf surface.



The development and accumulation of thatch can be linked to a number of factors.

- (a) The growing habit of the turf grass plant (tufted, stoloniferous or rhizomatous – tufted producing the least amount of thatch)
- (b) The frequency of irrigation
- (c) The frequency of fertilisation
- (d) Soil conditions (the more compact and/or waterlogged, the greater the build-up)
- (e) Soil temperature (The lower the temperature the lower the rate of breakdown)
- (f) Poor management practices

Excess levels of thatch will bring problems to a turf grass sward.

- (a) The surface will feel spongy under foot
- (b) Water infiltration can be reduced
- (c) Provides an ideal food source and living environment for many turf grass fungus diseases
- (d) Increases the incidence of mower scalping
- (e) Promotes the growth and invasion of weeds, mosses and weed grasses such as Annual meadow grass (*Poa annua*)

The thatch layer benefits the lawn in small controllable amounts as it prevents moisture loss through evaporation, protects the important meristematic regions (areas of growth) such as the crown (found at the base) of the grass plant while also giving a 'cushioning' effect for laying, playing, walking or falling on.

The benefits of controlling thatch through maintenance operations such as scarifying, brushing & raking and top-dressing frequently include; keeping a firm dry turf surface, increasing in the depth of the grass rooting system and better distribution and penetration of irrigation or rain water.

There are two main types of thatch we are likely to come across the **fibrous** type (tough, dry, very wiry in feel, brownish in colour) typically found in acid situations and the more common **spongy** type (yellow/brown in colour, usually soft and waterlogged, sometimes has black streaks running through it and usually smells of eggs or stagnation – *hydrogen sulphide*). See black layer pages 45 – 46. This type will generally be found in heavily watered, over-fertilised areas or on heavy soils such as clay.

Glossary

Acid soil – Soils whose reaction is below that of pH 7 (Also see pH)

Adventitious root – A root that arises from any organ other than primary or seminal roots

Aeration, mechanical – See cultivation

Alkaline soil – Soils whose reaction is that of above pH 7 (Also see pH)

Annual, summer – Plant that completes its life cycle from seed in one growing season

Annual, winter – Plant that initiates growth during the autumn, lives over winter, and dies after producing seed the following season

Apical meristem – Terminal growing point

Auricle – Claw-like appendages occurring in pairs appearing at the base of the leaf blade

Bench setting – The high at which the bottom blade of a mower is set above a firm level surface

Blade – The flattened portion of the leaf located above the sheath

Brush – To move a brush against the surface of a turf in order to lift non-vertical stolons and/or leaves before mowing, with the end goal of producing an upright stand of grass

Bunch-type growth – Plant developing itself through tillering at or near the soil surface without the production of stolons or rhizomes

Carbohydrate – The plants food source, a compound of carbon, hydrogen and oxygen, as in sugar, starch and cellulose

Castings (Earthworm) – Soil and plant remains excreted by earthworms and deposited on the turf surface or in the burrow; forms a stable soil granule that can be objectionable on mown turf

Clippings – Leaves and in some cases stems deposited on the turf surface after mowing

Collar – Light-coloured band at the junction of the leaf blade and the leaf sheath

Coring – A method of turf cultivation by which soil cores are removed using hollow tines

Compaction – The compression of soil particles leading to unfavourable growing conditions for the turf grass plant

Creeping growth habit – Plant development by an extravaginal stem growth at or near the soil surface with lateral spreading rhizomes and/or stolons

Crown – A highly compressed stem located at the base of a vegetative aerial shoot

Culm – Flower stem of the grass plant

Cultivar – An assemblage of cultivated plants distinguished by any characters (morphological, physiological, and the like) that when reproduced sexually or asexually retain their distinguishing features.

Cultivation – Applied to turf, cultivation refers to the working of the soil and/or thatch without destruction of the turf grass surface; for example, coring spiking, or other means

Evapotranspiration – Loss of water/moisture from the turf grass leaf and the soil surface

Fun – Something I did not have much of while writing this book!

Irrigation, automatic – Hydraulic-electric control of water application in response to turf grass needs.

Irrigation, manual – Irrigation using hand set or hand valved equipment

Lateral shoot – A shoot originating from a vegetative bud in the axil of the leaf or from the node of a stem, rhizome or stolon

Layering, soil – Undesirable stratification within the surface horizons of a soil profile; can be due to construction design, top-dressing with different textured materials or inadequate mixing.

Leaching – Loss of nutrients (ionic form) through natural drainage of the soil's solution

Ligule – Membranous or hairy appendage on the adaxial side of the grass leaf at the junction of the leaf blade and leaf sheath

Liquid fertilisation – A method of applying fertiliser using liquid as the carrier. Applied as a solution.

Mat – A tightly intermingled layer composing of living and partially decomposed stem and root material and soil that develops below the thatch layer but above the soils surface

Micro organism – Minute living organisms such as bacteria or fungi

Monocot – Plant having one cotyledon in the seed; grasses are an example

Mowing frequency – The number of times a turf grass sward is mown per week, month or growing season.

Mowing height – The distance above the ground at which the leaf is cut by a mowers blade

Mulch – Any non-living material that forms a covering on the turf grass or soil surface

Nitrification – Formation of nitrates and nitrites from ammonia by soil micro organisms

Node – The joint of a stem; the region of attachment of leaves to a stem

Seminal root – The primary root

pH – per hydrogen or the negative logarithm of the hydrogen ion concentration of the soil

Root zone – A prepared mixture of minerals and organic matter used as a growth medium for turf grass

Settling, soil – A lowering of the soil surface resulting in a decrease of volume to a soil previously loosened by some form of cultivation (bare soil). Occurs naturally but can be accelerated by mechanically tamping or heeling in the surface after cultivations have taken place.

Sheath – The tubular basal portion of the leaf enclosing and wrapping around the stem

Slowly available fertiliser – Designates a rate of dissolution less than obtained for completely water soluble fertilisers; may involve compounds that dissolve slowly, materials that must be microbially decomposed, or soluble compounds coated with substances highly impermeable to water.

Soil modification – Alteration of soil characteristics by soil amendment; commonly used to improve physical conditions

Soil probe – A cylindrical soil sampling tool with a cutting edge at the lower end

Spiking – A method of turf cultivation in which solid tines or flat pointed blades penetrate the turf and soil surface

Stand – A number of established individual turf grass genus and species

Stolon – An elongated stem (or shoot) that grows along the surface of the ground and from which leaves and adventitious roots develop at the nodes

Stomates (Stoma, Stomata) – Openings in the epidermis of leaves and stems that function in the exchange of gases between the atmosphere and the plant

Sub-soil – The soil elevation established so that the top-soil placed on it will have the desired thickness and final grade or elevation

Texture, leaf – Texture imparted to turf by leaf width and arrangement

Texture, soil – The relative proportions of mineral matter found in soil

Thatch – A layer of un-decomposed or partially decomposed organic residues situated above the soil surface but below the turf grass leaves. Consists of all parts of the turf grass plant

Thatch control – The process of (a) preventing excessive thatch build up by accumulation by cultural manipulation and/or (b) removing excess thatch from a turf surface by either mechanical or biological means.

Tiller – A lateral shoot, usually erect that develops intravaginally from buds

Top-dressing – A prepared soil mix added to the surface of a turf and worked in by brushing, raking and/or irrigating to produce a smooth surface. Firms turf by working soil in among stolons and thatch forming materials. Also enhances thatch decomposition.

Tufted – See bunch-type

Turf – A covering of mown vegetation, usually turf grass, growing intimately with the an upper soil layer of intermingled roots and stems

Turf grass- A species or cultivar of grass, usually of spreading habit, that can be maintained as a mown turf

Turf grass community – An aggregation of individual turf grass plants that have a mutual relationship with the environment as well as among individual plants

Urea formaldehyde – A synthetic slowly soluble nitrogen fertiliser consisting mainly of methylene urea polymers of different lengths and solubility's; formed by reacting urea and formaldehyde

Variety – See cultivar

Vertical mower – A mechanical device with vertically rotating blades that cut into the face of the turf for the purpose of reducing thatch, and improving gaseous exchange.

Wear – The collective injurious effects of traffic (foot or mechanical) on the turf grass plant