

Ken Barber puts thatch under the microscope and comes up with some ideas to minimise its effects.



Thatching a plot



Above: A core sample taken from a predominately sand based green, which over the last five years, has received little thatch management

Thatch accumulation is one of the most common turf related problems experienced by today's Course Managers, yet this is not something new. However, because of the ever increasing demands placed on golf courses throughout the year, effective thatch management is essential. Without this, there is a point whereby the long term quality of greens suffer, especially if committees within a club demand that management programmes such as hollow coring or top-dressing greens are carried out early spring or late autumn when the benefits are minimal.

The hard facts are - if thatch is not correctly managed, clubs can expect to play on temporary greens at some point during the winter, and not just because they are covered in frost, but because they retain excessive moisture and are more suited to growing rice than turf!

Thatch is more often the result of poor turf management than a problem that must be managed. If thatch levels are allowed to get out of control, putting surfaces can quickly deteriorate. Members then demand to know why they have to play on temporary greens most or part of the winter. Then at the first signs of summer, the greens turn brown, usually as a result of dry-patch, and the irrigation is turned on to keep them alive. This ineffectual form of management only increases expenditure and will certainly not decrease thatch.

Methods of controlling thatch will vary from one Head Greenkeeper to the next and this is not just dependent on the structure of the greens. However, it is important to have a

clear understanding of the basic components of thatch - what causes it, the effects on turf health and vigour as well as methods of control.

What is thatch? Thatch is the accumulation of organic residuals, consisting of, and intermingled with, dead, living or partly decomposed roots, stems and shoots, which develop between the soil surface and the actively growing green vegetation. Thatch only becomes a problem when its density causes grass plants to grow on top of the thatch layer rather than on the soil surface.

What is mat? Thatch intermingled with mineral matter, usually as a result of topdressing. Around six millimetres of mat is advantageous as it promotes weed free, drought tolerant, free draining turf, which provides a cushion against the daily wear and tear caused by golf and maintenance traffic.

What causes excessive thatch? Thatch increases when the rate of shoot production exceeds the rate of decomposition.

There are several influential factors which will contribute or accelerate an increase in thatch levels and consequently management practices will vary from club to club, depending on resources, cultural practices and, ultimately, the knowledge and experience of the Head Greenkeeper. One or several of these factors may be linked i.e. soil characteristics, grass species, soil pH, fertility input, irrigation practices, even microbial populations.

The characteristics of a soil will, no doubt, have some influence. For example high percent sand greens, by

their very nature have low CEC (cation exchange capacity), and more often than not, low microbial populations essential in thatch decomposition. However, the benefits may compensate for the negatives with this method of construction, which is being favoured more and more throughout Europe. The operating costs of high percentage sand greens may be a little higher, but if built correctly and sound management practices are implemented, those costs can be redeemed through a full contented membership and maximising premium green-fee rates as the greens are free draining and playable throughout the winter.

Soil greens retain nutrients longer, generally have higher CEC and microbial counts, but are still vulnerable to thatch accumulation, although this is more likely as a result of compaction, reduced oxygen supply to the roots, or excessive fertility input.

The type of grass species and cultivars will effect a management regime, based upon the growth habit and aggressiveness of the desirable grass species. Bents, in particular the creeping bents, have a vigorous growth habit and the new varieties of creeping bent such as A-4 or G-6 are reputed to be so aggressive they out-compete annual meadow grass.

At the other end of the scale there are the less aggressive growing species, such as the fine fescues, which can produce significant thatch layers due to their leaves, nodes and crowns being extremely resistant (high lignin content) to decomposition. Although, with fine fescues, thatch levels take longer to accumulate than do other more vigorous growing grass species, their recovery rate is slow and therefore any mechanical de-thatching operation should be less severe than with other grasses.

The soil pH can have an adverse effect on thatch development and as the pH decreases thatch is likely to increase - this is primarily due to acid soils having a negative effect on

microbial populations, thus reducing the potential for decomposition.

High application of nitrogenous fertilisers will promote excessive thatch through the production of lush, succulent shoot growth. The application of fertilisers containing the ammonium form of nitrogen, for example, sulphate of ammonium, are likely to increase acidity, while nitrate containing fertilisers such as potassium nitrate may cause the soil to become more alkaline.

Excessive irrigation practices can cause soils to become waterlogged, resulting in reduced oxygen levels and thus inhibit microbial populations. There is also the potential of plant nutrients being lost through leaching.

What effects will thatch have on turf quality? Excessive thatch will decrease the vigour of turf grasses by restricting the movement of water, gas exchange, nutrient availability, cold and drought stress tolerance, pesticide movement and degradation, and is likely to increase pest and disease incidence.

Soft, spongy greens can quickly become saturated, while the soil immediately below, can, in some cases, remain dry. An increase in thatch levels will reduce root depth and as a result grasses become more susceptible to changes in temperature. This can contribute to causing a hydrophobic condition ("dry patch"), whereby soils may not necessarily be compacted but are hard to re-wet. This is thought to be associated with certain disease pathogens producing a waxy coating or secretion surrounding soil particles or thatch, thus preventing water penetration.

Thatch will have a negative effect on diffusion, the exchange of gases, oxygen (O₂) and carbon dioxide (CO₂) between the soil air spaces and the atmosphere, which will ultimately effect root development - with a reduction in oxygen and possibly an increase in carbon dioxide (CO₂ toxicity) root tips will die and older roots can become non-functional.

Thatch can effect the movement of nutrients by preventing penetration through to the soil. Water soluble nitrogen sources are more likely to be lost to volatilisation, while non-mobile fertilisers, such as phosphorus may not penetrate the thatch layer.

Excessive nitrogen levels will induce rapid, succulent shoot growth, which is prone to scalping by mowing equipment and is frequently more of a problem on heavily thatched greens. Root growth, disease resistance, temperature, drought and wear tolerance is reduced as nitrogen levels are increased.

The fate and efficiency of pesticides can be effected by excessive thatch which can act as a second canopy layer through which pesticides must pass and which can physically bind the pesticide, reducing its ability to reach the target area. This could possibly

reduce leach loss but may also reduce pesticide efficiency. Once a thatch becomes hydrophobic it can reduce pesticide efficiency by inhibiting penetration or causing runoff.

Thatch will harbour many types of disease pathogens waiting for environmental conditions suited to their active growth. They survive as resting structures or as saprophytes (organisms which live on dead organic matter) in thatch. For many turf grass pathogens thatch provides the perfect moist environment, but some say that most turf grass pathogens are air-borne and therefore thatch cannot necessarily increase disease incidence. However, evidence proves that excessive thatch reduces turf grass health and vigour and therefore must surely increase disease incidence.

Options to control thatch. The prevention of excessive thatch is managed by cultural practices through either mechanical or biological means.

Biological control is linked to maintaining a healthy environment in order for micro-organisms to decompose thatch. It is important to remember that thatch accumulates over a period of time and the more vigorous species such as bent grass may produce excessive thatch in just two or three growing seasons. So from the early days of establishment, it is important to understand the growth habit of the grasses you are managing, as this will dictate the kind of management regime you implement. If you inherit a thatch related problem, then it is advisable not to attempt eradicating the problem in one season, but to programme a series of operations over a period of one or two years, ensuring that any operation is carried out when environmental conditions favour thatch removal i.e. grasses are actively growing, thatch is moist and temperatures are adequate to support active growth and a rapid recovery.

As previously mentioned, thatch can be produced through various physical or environmental conditions, and the resulting characteristics of the thatch can alter from soft and holding water, like a sponge, to dense and tightly bound, preventing moisture penetration. Totally different management programmes may be required.

However, increasing the oxygen to the soil environment will go a long way towards solving the problem. Fifty percent of thatch related problems could be resolved simply by aeration. Unfortunately however, the more disruptive the form of aeration, the better the results.

Hollow coring is undoubtedly the quickest and most beneficial way in which to reduce excessive thatch, as this not only physically removes organic matter, but permits gas exchange, vital in maintaining a healthy microbial environment. Necessary in thatch decomposition. It

Right: A change in the management regime can be clearly seen with recent hollow coring and top-dressing. Note the new white roots growing beyond the tine hole.

Below: Hollow coring a green with one of the many aerating machines which simplify this important task



also assists with the movement of pesticides, nutrients and water through to the soil layer - how many times have you seen healthy white roots growing in tine holes or slits? Because hollow coring is disruptive to putting surfaces and subsequently upsetting to golfers, we tend to restrict this operation to one or two occasions per year. However, although not quite as effective, there are other forms of aeration which can also be beneficial in thatch reduction. These include the use of solid, chisel and slit tines, designed more to relieve compaction and permit air and water movement than physically remove thatch. Slit tines (thin bladed knives) can be used on a regular basis, not only for the benefits already mentioned, but also pruning tillers, yet causing minimal surface disruption.

Consideration for the long term quality and condition of the golf course must always come first, and this means course maintenance programmes should not be dictated by club competitions - ideally the reverse should happen. Hollow coring greens at the end of March or October will be far less beneficial in reducing thatch and recovery time will be slow, rather than when actively growing in April, May or September (this will naturally vary according to the part of the country you are working).

If well informed and given the choice, it is likely that members would rather have two weeks of disruption during the growing season than two months or so of playing competitions on temporary greens during the winter. Communication to members/visitors via the club diary and noticeboard that, subject to weather, the greens are to be hollow tined during the first week of May and the last week of September (earlier in the north of the country) then competitions and society bookings can be planned accordingly - "To be pre-warned, is to be prepared."

Top-dressing greens, either as a separate programme or in conjunction with a coring programme, will dilute thatch and assist in producing an environment more conducive to plant growth. The number of occasions greens are top-dressed is dependent on the growth habit of your particular grasses. Assuming that the underlying soils are of the desired specification, it is important that the top-dressing material is compatible (similar size and composition) with the root zone to avoid layering.

Irrigation management is reliant on the ability of water movement from



the surface through to the root zone effectively and for moisture to be retained in the macro and micro-pore spaces. Irrigate when there is least wind, preferably early morning. The aim should be to wet the soils without exceeding infiltration and percolation rates. Research shows that roots do not "go in search of water." However, roots only grow in moist soil and continually grow into new areas that have not yet dried out. So, in practice, this means that if only the upper layers of the root zone remain moist, roots will be confined to these areas. If, by probing into the soil, it is revealed that the soil is dry a few centimetres below the surface, this will largely be due to root uptake and the root system will continue to shrink as it removes the moisture. By assessing the moisture content within the first 15 - 20 centimetres of the soil profile using a soil probe, will ensure adequate moisture for healthy root development.

Fertility regimes will vary from course to course and will be dependent on the Head Greenkeeper's ideals and philosophies. However, it is important to avoid excessive applications of nitrogen and monitor nutrient availability and pH reading via soil tests.

Controlling thatch is essential to maintaining healthy turf and problems relating to thatch accumulation can be avoided if sound management programmes are implemented - REMEMBER - Be pro-active rather than re-active and "don't let the thatch grow beneath your feet."

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