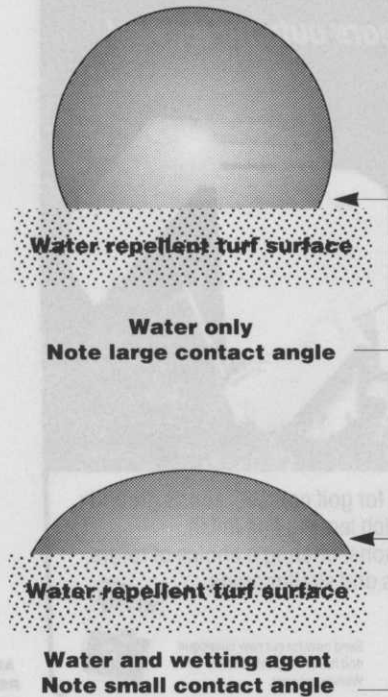


Wet, Wet, Wetter



Most greenkeepers are familiar with dry patch, a water-repellent turf condition which may develop on golf greens throughout the UK. Research work being conducted at the STRI has been aimed initially at defining the nature of dry patch and investigating the previously implicated causes of this turf condition. A recent survey of over 90 golf courses across the UK has shown the problem to be equally prominent on heathland, links and parkland courses. This appears to conflict with reports obtained from America and Australia, which have shown that water-repellency occurs most commonly on coarse textured sandy soils, as opposed to the fine textured loam or clay soils. Laboratory studies on soil taken from areas of golf greens showing symptoms of dry patch and adjacent unaffected areas have shown that the severity of dry patch in the UK is at least equal to if not greater than that recorded elsewhere in the world to date. Chemical and physical analyses have been completed on soils taken from both dry patch and unaffected areas of golf greens. However, the results obtained have shown no significant differences between the two samples with regard to macro or micronutrient levels, or particle size distribution.

In conjunction with the STRI, recent work at Liverpool Polytechnic using the electron microscope has identified a greater presence of sand grain/organic matter aggregates and fungal hyphae in soil taken from areas of golf greens affected by dry patch, compared with adjacent unaffected areas. The well documented presence of an organic coating on sand grains taken from dry patch soils needs further research to be confirmed in samples from the UK.

The separation and identification of compounds extracted from dry patch and unaffected areas, including humic and fulvic acids, is also being undertaken at Liverpool. Preliminary studies have shown distinct differences between the two soil types but the interaction is to further identify both the native and origin of these compounds.

Other work has indicated that although factors such as thatch, compaction and surface hardness may contribute to the severity of dry patch, they are not important enough problems on the greens studied with the project, for any one to be implicated as the sole underlying cause.

The primary aim of research during 1991 and 1992 is to elucidate the role of fungi in the development of dry patch in UK golf greens. It is envisaged that this work would involve a detailed microbiological investigation into the fungal flora

of golf greens.

When combined with results from direct observation and analytical biochemical techniques, the role of fungi in dry patch may be determined. Once the cause (s) of the phenomenon have been elucidated a structural control programme can be developed. Until then alleviation of the symptoms shown in dry patch affected turf can be effected by several methods, including the application of wetting agents, which has almost become standard greenkeeping practice in recent years. However, despite their widespread acceptance in greenkeeping management, their potential benefits when used to their maximum effect are often poorly understood.

What are wetting agents?

Wetting agents, or surfactants as they are sometimes known, are chemicals which improve the wetting properties of water when it is applied to the turf. Golf greens affected by dry patch are extremely water-repellent, i.e. difficult to wet, as can be seen by the turf plugs in Figure 1. If a running hose is placed on the turf surface (Figure 2) plain water is not able to penetrate into the turf surface (i.e. it "beads" up), due to the water-repellent (hydrophobic) nature of the dry patch condition. The application of a wetting agent will assist the penetration of water into turf affected by dry patch.

What wetting agents are available in the UK?

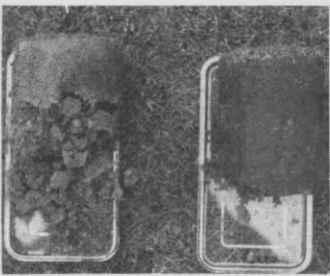
Currently, the greenkeeper is presented with a range of wetting agents which have manufacturers recommendations for use on fine turf. Synperonic NDB, a mild industrial detergent, has been used for many years. Several wetting agents such as Aqua-Gro and Hydro-wet were developed in the USA and have seen widespread usage in the UK. Wetta-soil, recently marketed in the UK, was developed in Australia and New Zealand, where dry patch is a major problem. Turfex is an all-British product specifically developed for use in the UK fine turf situations. Last year saw the introduction of several new wetting agents such as Organiflo, Zorbit and Agriland soil wetter. Thus, there are many different products to choose from when considering a wetting agent application.

How do wetting agents work?

They work in two ways; by reducing surface tension and direct effects on water repellent substances in the soil. The first commonly used

Neil Baldwin, Plant Pathologist at the Sports Turf Research Institute has been evaluating wetting agents over the last 3 years in both laboratory tests and field trials at STRI.

Catherine York is currently researching the biology and control of dry patch of UK golf greens, financed by the Royal and Ancient Golf Club of St Andrews. In this article they describe some of their research findings and explain what wetting agents are, how they work and how to make the most effective use of them in greenkeeping practice.



Normal turf (right) compared to dry patch. Note darker colour due to moisture and deep rooting in normal core and dryness, crumbling structure and poor rooting in dry patch core

wetting agent was Teepol, a mild detergent which aided water penetration by reducing surface tension. The use of Teepol was replaced by Synperonic NDB which also worked primarily by reducing surface tension as illustrated opposite.

Thus, if a wetting agent is used a smaller contact angle of the droplet on the turf surface is formed and consequently the applied water spreads over a greater surface area thereby wetting more turf. It is likely that most of the new wetting agents listed above also have this effect on surface tension to a greater or lesser degree. This effect on surface tension will enable water to rewet turf affected by dry patch and thus alleviate the symptoms which may be

evident. However, it is only by residual effects that the wetting agent may have in the soil, when it has penetrated the turf surface that the water-repellent tendency of dry patch areas may be overcome. Several wetting agents have been tested in this respect. Wetta-soil has been researched in Australia and New Zealand and has shown to be residual in the turf, as it binds to organic materials and will withstand successive wetting and drying cycles. Aqua-Gro has been similarly tested in the USA and is similarly absorbed onto soil particles. Turfex has been tested at STRI and, once it has rapidly entered the soil profile, it may bind to organic materials responsible for the dry patch condition. During subsequent irrigation the water-attractive condition created will be maintained. At present it is unclear whether the surface tension effect or the soil absorption effect is the predominant mode of action of wetting agents when applied to golf greens. Research at STRI is currently attempting to identify the primary cause of dry patch in the UK. If water-repellent substances of fungal origin identified as in similar studies in the USA, Australia and New Zealand, then soil absorption is likely to be important. However, initial results from STRI research have indicated that dry patch in certain instances may be caused by physical factors such as high spots, compaction due to foot traffic or thatch, in which case increased water infiltration through a reduction in surface tension is likely to be of primary importance.

Possible adverse effects of wetting agents application

The use of Teepol has now long been discontinued. This anionic material (anionic means its molecules have a strong negative electrical charge) was implicated as having long-term adverse effects on soil structure. Modern wetting agents are non-ionic (ie no electrical charge), do not affect soil structure and may therefore be used. It is of concern that many individual detergents and cleaning fluids are currently being offered to greenkeepers for use on their greens. Their use is ill advised and is not to be recommended under any circumstances.

Wetting agent application programmes

Research at STRI and elsewhere has been combined with greenkeeper experience to develop a series of recommendations for wetting agent application. Broadly, these recommendations may be summarised below:

- (1) If dry patch is a persistent problem, wetting agent applications should commence at the beginning of the growing season (say March/April) when the turf is still generally moist and dry patch is often not apparent. Whatever product is chosen it is essential to treat at this early season stage.
- (2) Wetting agents are most effective when combined with aeration using slit, solid or chisel tines to aid turf surface penetration.
- (3) Subsequent wetting agent application will then largely depend on how severe dry patch has been in previous years and prevalent weather conditions. On a typical golf course with moderate to severe dry patch, routine applications April - October at 4-6 week intervals, but more frequent in periods of drought, may be appropriate if combined with spot treating (see below).
- (4) As dry patch is often extremely localised on golf greens then spot treatment of isolated dry patches by hand is often the most effective method of wetting agent application. A solution of wetting agent may be applied using a watering can and the solution forced into the turf surface using a hose with a rose attachment. Alternatively hose-end dilutions are now available for use with Hydro-wet and Aqua-Gro which have seen widespread usage as they facilitate rapid and efficient spot treatments to be made.
- (5) With all wetting agent applications it is essential to water in the treatment immediately after application to prevent the possibility of scorch developing. This is most easily achieved by a short period of automatic irrigation or applying them during rainfall.

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