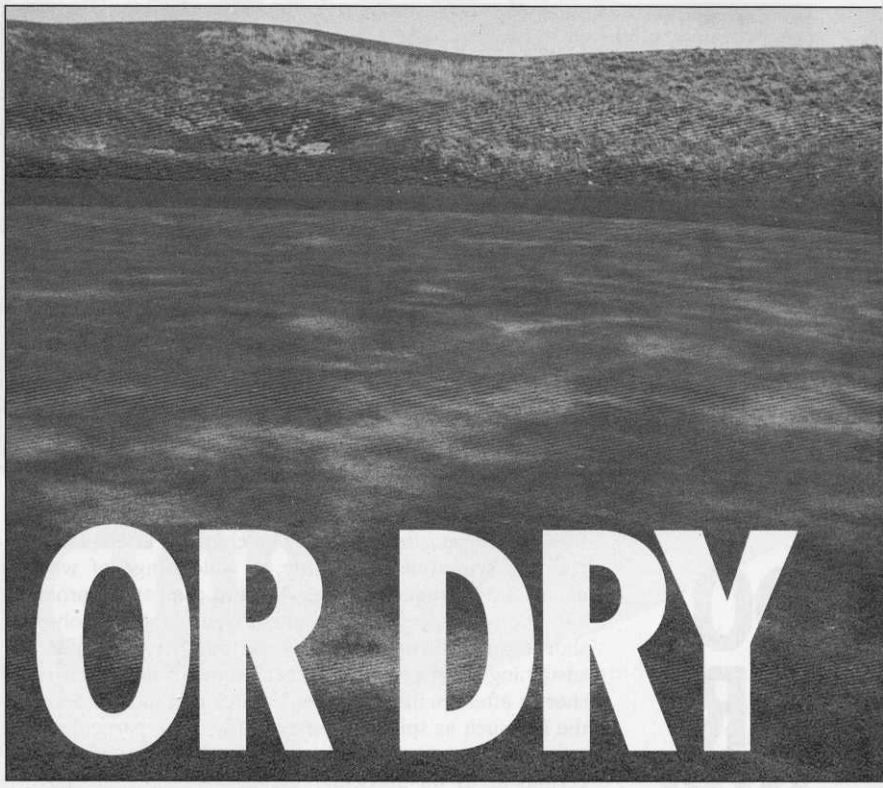
Over the last three years, KATE YORK, research officer at the STRI, has been researching the biology and control of dry patch as it affects golf greens in the UK, supported by funding from the Royal and Ancient Golf Club of St Andrews. Dry patch is a term used to describe a turf condition which is characterised by the presence of underlying water-repellent soil. This article is the first of two showing how our knowledge of dry patch in the UK has increased, with reference to results obtained from an extensive questionnaire survey and provides a practical guide for the greenkeeper on how best to manage dry patch on the greens.



DO OR DRY

How to manage dry patch on the golf course

Symptoms of dry patch first become apparent during the spring, but usually develop to a maximum through the summer months when it is generally most severe.

The localised circular to irregular shaped areas of the golf green affected by dry patch range in size from small, isolated patches to a general effect, as can be seen in the photograph. The turf present in affected areas generally shows signs similar to those of drought stress, ie. the turf wilts and is unable to return to an upright position following compression by, for example, foot traffic. The botanical composition of the sward and its appearance is one way of determining areas of the golf green affected by dry patch. Due to the low moisture content of soil in affected areas, the relatively shallow rooting annual meadow grass (*Poa annua*) tends to die out, leaving the deeper-rooting, darker green Agrostis spp. and Festuca spp. to dominate affected areas. Under extreme conditions of high summer temperatures and low water availability, the grass in affected areas will eventually die out resulting in unsightly bare patches.

The photographs overleaf show the condition of the soil in both unaffected areas and those affected by dry patch on the same green. In the first photograph, the soil appears dark due to its high moisture content, which 'holds' the soil together following the removal of the soil core. In areas affected by dry patch the soil moisture content is severely reduced and the soil takes on an almost dust-dry appearance, which causes the soil profile to crumble when a soil core is removed (second picture).

An extensive questionnaire survey has enabled us to determine the extent and severity of dry patch on UK golf courses. The questionnaire was divided into several subject areas including presence/severity of dry patch, greens maintenance and the use of wetting agents. Eighty-five percent of courses included in the survey indicated a problem with dry patch. Due to the total number of parkland courses within the UK, it is not surprising that over 60% of affected courses included in this survey were parkland. However, although a fewer number of heathland and links courses were surveyed, the percentage of these courses with dry patch was 82% and 100% respectively. The results obtained from the survey indicated dry patch had only been a problem on the majority of courses for 2-5 years (up to 1991), although we know that dry patch has been recognised on certain courses for over 20 years. It is possible that the symptoms have only recently become apparent due to changes in maintenance practices, eg. reduced irrigation, even though in fact the soil may have been water-repellent for many years.

Eighty-seven percent of completed surveys confirm the common belief that dry patch generally affects older, more mature greens. However, the results showed that just over 10% of courses surveyed indicated the presence of dry patch on greens which were less than ten years old. Severity of dry patch on individual greens was recorded as the percentage area exhibiting symptoms. On the majority of courses included in the survey, between 5-25% of the green's surface was affected by dry patch, but in extreme cases up to 75% of the surface showed dry patch symptoms. The results of the survey indicated that in the majority of cases, once dry patch had been identified, there appeared to be no annual increase in the extent of the symptoms, i.e. dry patch does not appear to 'spread' like fungal diseases are known to do.

Applications of high sand content top dressings have frequently been suggested as a likely cause of dry patch development. Many courses do use these top dressings, but if they were causing this condition it might be expected to occur as a blanket effect across the entire greens' surface, rather than as the patchy distribution which is actually observed. However, it is true that if by some means a water-repellent material is being deposited in the soil, sand grains will be 'covered' more readily than smaller soil particles, due to their lower surface area:volume ratio and express the symptoms of water-repellence more rapidly.

Both thatch and root breaks have also been suggested as causing dry patch, however, neither appears to be a significant problem on affected greens included in the survey. Thatch if allowed to dry out is known to be highly water-repellent and is capable of forming a barrier to water penetration. It is possible therefore, that thatch may enhance the severity of the symptoms but it is not a primary causal factor in dry patch development. Root breaks can appear on any green, irrespective of its construction type or its age and occur as a result of a change in the physical state of the soil. Most commonly, this is a result of a change in top dressing material, which eventually leads to shallow rooting, poor turf composition and frequently an increase in its tendency to dry out.

From the results of the survey, we have found no evidence that dry patch is caused by compacted soils – another common misconception. Over 60% of the affected courses surveyed indicated no association between areas of dry patch and the normal traffic routes/pin position. Compaction may itself cause reduced water infiltration and subsequent deterioration of the sward, but it is not directly associated ➠ 12

Core holes taken from adjacent unaffected (left) and dry patch (right) areas

DO OR DRY

11 ➡ with dry patch development.

Finally, as expected, non-ionic wetting agents are used on 93% of courses affected by dry patch, in an attempt to control the symptoms. Currently, a wide range of wetting agents are in frequent use as a tool to combat the problem. However, it appears that although wetting agents solve the short-term problem of getting water into the soil profile and sustaining plant growth, the symptoms of dry patch recur shortly after treatment stops. Various methods of aerating the soil such as spiking are frequently used, particularly on severely affected areas prior to wetting agent application. If certain areas on particular greens are known to have a severe problem with dry patch, it is perhaps advisable to complete the first application of the wetting agent in the early spring before the symptoms begin to show.

It is well known that whilst wetting agents have a role to play in turf management, they will never be able to solve the problem of dry patch completely, but currently they are an effective means available to greenkeepers to reduce the symptoms.

Laboratory analysis of soil has identified a significant reduction in the moisture content of soil from areas affected by dry patch when compared with adjacent, unaffected areas. However, soil analysis has also shown that there are no significant differences between soil from dry patch and unaffected areas with regard to levels of pH, phosphate, potassium or nitrogen, nor are there any significant differences with depth with regard to soil particle distribution or soil organic matter content. These results tend to imply that dry patch is more likely to be a biological problem rather than a purely chemical or physical one.

In conclusion, we are now aware of the distribution and severity of dry patch on UK golf courses, its associated maintenance factors and how the problem is currently being alleviated with wetting agents. In addition, the physical and chemical characteristics of soils from areas affected by dry patch have now been well defined. This information is crucial for the development of techniques to remove the deleterious effects of dry patch on UK golf greens.

■ **In April's Greenkeeper International, the results of research at the STRI on the influence of turf irrigation practices on dry patch formation and the possible biological causes.**

THE KUBOTA L2550GST AND L3250. YOU'LL NEVER FEEL MORE COMFORTABLE WITH A TRACTOR

With the L2550GST, you can comfortably change through the gears without the clutch with the innovative, exclusive Glide Shift Transmission.

With the L3250, you've got additional comfort of steering column mounted levers for both main shift and shuttle shift – providing more leg room and quicker, easier shifts.

On both, you've got the latest low-noise cabs – to reduce operator fatique and enhance comfort.

The new DL Cab from Kubota, designed by Duncan Cabs for Kubota, complements the all-weather Q cab, and fulfills the most testing criteria – well below the sub 90 dBa requirement of the regulations.

Just complete and return the coupon. You'll never feel more comfortable with a tractor!

Kubota

THE *POWER* THAT LEADS

Flexible. Budgetable. Available. *Like all Kubota machines, the L2550GST and L3250 tractors are available through Kubota Flexiplan, which offers low cost rentals from two to five years and which can include comprehensive maintenance plans, breakdown cover and replacement machines.*

GI.3.93

Name _____

Address _____

_____

Post Code _____ Tel: _____

AD REF 86

KUBOTA (UK) LIMITED
DORMER ROAD, THAME
OXFORDSHIRE OX9 3UN
Tel: 084421-4500 Fax: 084421-6685
Telex: 837551

Demand for golf in Germany to 'explode'

Under the Communist regime in East Germany, golf was rarely played, as the sport was viewed as typically capitalist, and its introduction was discouraged.

For a long time even in the former West Germany there was a suspicion that only the wealthy could afford to play. For this reason the number of players has been, and continues to be, small. Of a total population of about 80 million, there are only 170,000 golfers, belonging to about 370 clubs.

In comparison to the United States or Great Britain, Germany is, in golfing terms, an under-developed nation. Still, there is an unmistakable upwards trend: the number of players has doubled every ten years. Recent surveys indicate that more people would play golf if more courses were available. Many existing clubs will accept no new members and public courses are almost non-existent. The only public course in the whole of Germany is in Düsseldorf, at Lausward.

Many golf course projects in the western part of Germany do not proceed because of the concerns of the politically appointed committees that are responsible for issuing permits, or because they cannot overcome conflicts with environmental protection measures. In addition to their significant successes in national politics in recent years, members of the Green political movement have gained considerable influence in elected bodies at the city and town level. They regularly oppose the construction of new golf courses. Considerations of preservation of the countryside and protection of the environment lead many of them to try to put a stop to a sport they have chosen to mistrust. For these and other reasons the construction of golf courses in the densely populated parts of western Germany has become almost impossible.

So it is not surprising that shortly after the reunification of Germany in 1990 planning commenced for new golf courses in the eastern part of Germany. The eastern part offers many good conditions. It is not as densely populated as the western part, so there is more space available and environmental concerns can be more easily accommodated. Most importantly, there is a more open-minded view of golf in many cities and towns. Golf is associated with expansion, prosperity, and the growth of industry. There is keen interest in any form of investment, which (for example) is a factor weighing heavily in favour of a proposed development when the effect on the countryside is being assessed.

The real boom will only come when the federal Government Ministries have been completely transferred from Bonn and Berlin is fully established as the capital of Germany. The demand for golf courses and golf clubs is then expected to explode. The golf courses that profit most from this boom will be those that were planned properly at the outset. Good sites for popular golf courses won't be available for ever.

■ Reproduced courtesy of Denton International, from their January 1993 Leisure Newsletter.

On your

The difference in golf course greenkeeping between Germany and Scotland is quite striking. To a large extent this may be attributed to Germans slavishly following the American example, rather than attempting to develop the traditions of 'real' golf, such as may be found in Scotland and elsewhere in the British Isles. The point must be made: Britain is a much closer neighbour than Florida and one might sensibly assume therefore that it offers a more appropriate example to follow.

Wall to wall manicuring and course 'prettifying' has become the essential criteria, not only in Germany but in many other European countries, and the true turf quality we greenkeepers know to be critical to the game has in general been sacrificed, or at least not fully recognised as being of high priority, in the European quest for a 'beautifully green' golf course.

As with most developing industries, initial influences can have a lasting and sometimes irreversible effect. This may be seen to the extent that fescue greens are unheard of in Germany. To some extent this is understandable, for in very many instances greens have been improperly constructed using poor materials and employing doubtful specifications. They are then built only to about 350 – 500m² in size, with crazy contours which severely restrict pin positions.

In my experience, tees also are generally too small in area, offering little scope for movement following natural wear, whilst often being set at incorrect angles and in many cases being uneven to boot. Bunker design and positioning also leaves a lot to be desired on many courses. Yes, many clubs in Germany have suffered through bad construction, despite having paid a great deal of money,

Deutschmarks

ARNE VAN AMERONGEN discovers how the developing German greenkeeping industry is taking its lead from the United States, in preference to following the traditions of 'real' golf

though this money thing is something which I am led to believe is not uncommon in Scotland as well!

Regular spring and summer applications of NPK fertilisers, allied to overwatering (to stop the ball on greens, never mind the putting quality), autumn fertilisers often high in phosphates, lack of regular and appropriate aeration and the use of poor quality compost top-dressings are not uncommon practices on German golf courses, regardless of soil types and with inevitable results (not to mention costs!).

Poa annua is by far the most dominant grass species, particularly on greens, even on very young greens originally sown out to *Agrostis Palustris*. Here again the American influence is strongly evident in both northern and southern parts of the country, although some courses have started out with *festuca rubra/agrostis tenuis* seed mixtures on greens only to succumb to *Poa annua* infestation. Ryegrass fairways are commonplace and various unsuitable seed mixtures have been used on teeing grounds.

Greenkeeper education in Germany is in its infancy and is consequently well behind the training available at colleges in Scotland. With no established golfing heritage and with little recognition of the original concepts of the game, many ill-conceived developments have resulted.

I have seen it happen – the president or owner of a golf club will suddenly decide that the course needs some water hazards (which he saw whilst on holiday in the USA), perhaps a windmill or two, or flower beds around the tees! This public park concept has little in common with golf in the real sense. In light of this and other circumstances I consider golfer education in Germany to be even more critical than greenkeeper education if real progress is to be made in the future development of quality golf courses.

The golf courses of Scotland exhibit much greater character. Rough areas are not mown, bunkers are deeper, better designed and of greater variety, whilst fairways are generally somewhat narrower. The resulting effect presents a natural appearance, emphasising the architecture of the course: skill is rewarded and wayward shots are punished. There is much greater emphasis on developing the fine, perennial grass species for golf and their needs in all areas of the golf course. Cultural practices are designed to work hand in hand with nature – not against it, as is so often the case in Germany.

Particular attention is paid to physical, rather than chemical, requirements, with aeration in its various forms a top priority in maintaining and improving soil structure. Compost top-dressing materials are of a high quality and contain 70-80% sand. Root-zone mixtures for construction purposes, for instance at Carnoustie, are processed from silt and clay free fensoil and local beach sand in a ratio of 25%-75%.

Scottish greenkeepers show a 'greater awareness of soil life and daily turf conditions with a view to assessed needs. For example, I have witnessed much greater concern regarding efficient plant water usage, rather than just straightforward 'turn on the taps' application. All playing surfaces are maintained as dry as possible anyway and firmness allied to correct resilience in greens is always a paramount aim. Fertiliser inputs are low and of nitrogen only and herbicide use is limited. Control of the weed grass *Poa annua* is a high priority and every aspect of maintenance is geared toward giving the competitive edge to more desirable species. Turf resilience is sought by way of cultivating fine grasses, not ball receptiveness, and colour is irrelevant.

In Scotland then, the art of greenkeeping is very much to the fore, based on good old-fashioned common sense and long standing traditions, both of which have been adapted and intensified to meet modern demands. This natural approach to course maintenance is in direct contrast to the artificial German approach. I think it is the only way to produce fine fescue dominated turf, the ultimate in quality for the game of golf.

I would thoroughly recommend a stay in Scotland to all aspiring young European greenkeepers, working under an experienced course manager such as Carnoustie's John Philp. The experience to be gained regarding the practical aspects of fine turf maintenance and production in the vast turf nursery areas, not to mention the reconstruction work on greens, tees and bunkers, is invaluable. Be prepared to learn and work hard because, like most things in life, you only get out what you put in.

■ The author, Dutchman Arne Van Amerongen, spent several years working as a course manager in Europe, specifically in Germany. He trained at a BIGGA approved college in Great Britain and was nominated for the Toro/PGA European Tour Young Greenkeeper of the Year in 1990. He is currently employed at Carnoustie Golf Links whilst studying for an HNC in Golf Course Management.

Worm casts can be a real handicap

NEW

Twister Flow works fast to control worm problems in turf

Apart from being unsightly, worm casts spoil turf surfaces by causing mud deposits. These form ideal sites for weed establishment – and interfere with the true roll of balls on playing surfaces.

Twister Flow contains 24% of the carbamate insecticide Carbaryl and controls casting worms in turf grass. Available in a 5 litre pack, it is a flowable formulation giving fast, contact action on all turf surfaces, including fine or semi-fine turf, and remains active in the soil for up to two months.

Worm casts also encourage the spread of turf disease and the presence of high worm populations in fine turf is likely to attract moles – with even more devastating effect!

So if you have problems with worm casts in turf, choose Twister Flow. It could be a master stroke!

RHÔNE-POULENC

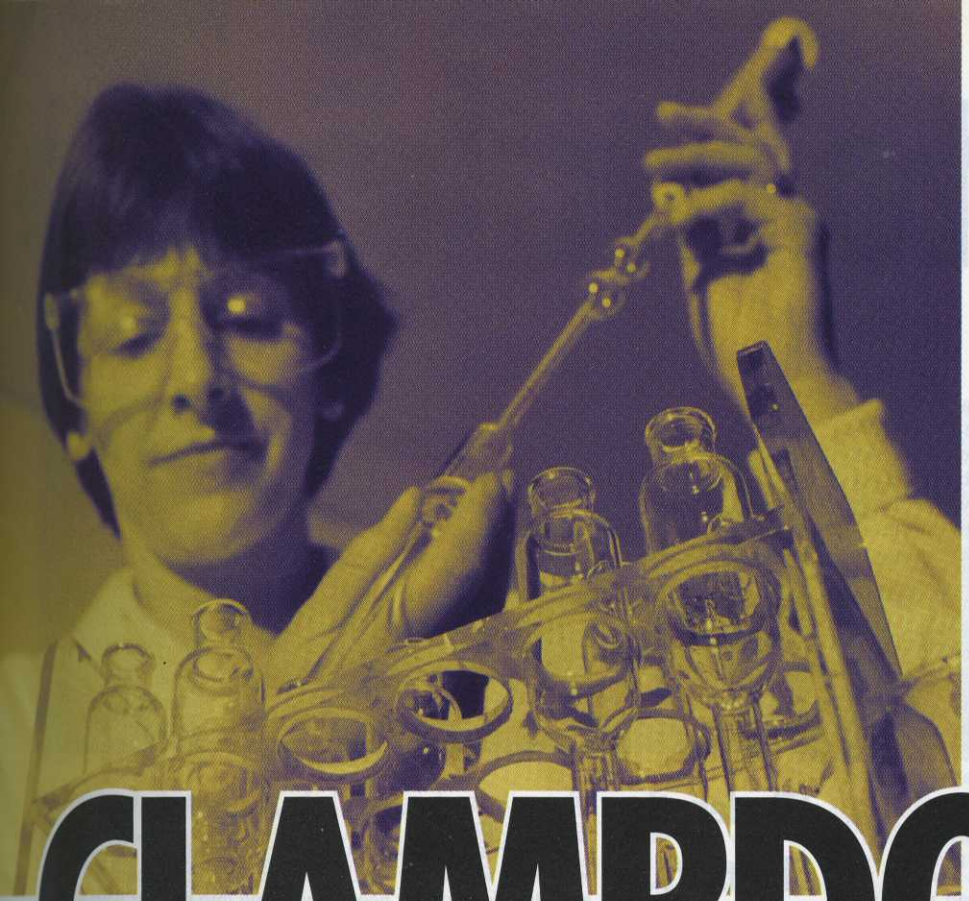
For further information call our HELPLINE (0277) 301114.

Rhône-Poulenc Environmental Products, Fyfield Road, Ongar, Essex CM5 0HW. Tel: 0277 301301 Fax: 0277 301119

TWISTER FLOW CONTAINS CARBARYL
READ THE LABEL BEFORE YOU BUY : USE PESTICIDES SAFELY

MAFF No. 05712

AD REF 59



CHEMICALS and the GREENKEEPER

Certain chemicals are now OFF the shopping list, leaving greenkeepers weighing up the alternatives. Greenkeeper International asked experts Graham Paul, Geoffrey Ellis and David Stansfield to take a look at the options, the fungicides and the pesticides which keep YOU in control

CLAMPDOWN

The passing of 1992 saw the withdrawal of approval for the use of the wormkiller chlordane. Later this year a similar fate will befall some of the triazine herbicides – namely atrazine and simazine. Is this 'weeding out' of chemicals going to become a trend for the years to come? GRAHAM PAUL looks at the future for the chemicals we have come to take for granted and suggests measures we might take to preserve their usefulness.

by GRAHAM PAUL

The loss of atrazine and simazine will mean that almost one hundred products will no longer be available to the greenkeeper. This will be quite a devastating blow for users and suppliers alike, for the triazine herbicides provide useful long-term control of weeds and grasses in non-crop areas. They persist in the soil, preventing seeds from germinating, and it is this persistent behaviour which has resulted in the detection of minute amounts of triazines in ground water. One could argue that the popularity of this large group of products has contributed to their demise. Alternative methods of controlling weeds in non-cropped areas are not easy to find. There are chemical alternatives – such as diuron and imazap – which are available, but the process of developing and registering new products based on them is very costly and can involve long delays: three or four years to develop a formulation and carry out laboratory studies and field trials, plus up to two years waiting for the necessary approval from the Ministry of Agriculture.

The wormkiller chlordane has been off the shopping list for some time now, although the approval for its use remained until December 31, 1992 to enable stocks to be used up. In a similar way to the triazine herbicides, the persistence of chlordane in the soil made it an excellent product for achieving long term control. Now that we have to use less persistent products we might need as many as ten applications to do the same job – a fact that will be welcomed by the manufacturers and, I imagine, by the worms!

When mercury based fungicides were withdrawn in 1981 their place was filled by alternative, less persistent fungicides such as iprodione, chlorothalonil, quintozene and the systemic fungicides; thiophanate methyl, carbendazim and thiabendazole. These chemicals were available as substitutes because they had been developed for uses in the much larger agricultural market. However, that happened in the 1980s. Registering new products was easier then and there were more new active ingredients being discovered and developed for uses in agriculture.

Today there is no endless supply of alternatives to replace those being withdrawn and we have to take great care in the use of the remaining armoury of pesticides, or they too maybe withdrawn. it is not just the recession that has reduced the rate of registration of new products, but more durable causes such as the effect on the farmer's purse of policies to reduce surplus food production. Farmers have been forced to spend less on chemical sprays and so the manufacturers are looking harder at what money they can invest in the search for new active ingredients. Currently it costs about £30 million to bring a totally new active ingredient to the market-place. A large proportion of this is the cost of providing data on the toxicology and environmental impact to support the approval of products containing it.

Clearly, if we wish to continue to benefit from using chemicals to control weeds, pests and diseases, then we must learn to safeguard those we already have. This might be achieved by ensuring that all pesticides are only used when necessary, with the utmost of forethought and care to prevent contamination of ground water supplies. We should take particular care in using the few residual herbicides new to this market, such as those based on diuron, lest these too find their way into ground water and are banned – like the simazine and atrazine products.

Users should avoid under-dosing as well as over-dosing because the former can result in the need to re-apply a product which fails to perform, thereby using in total nearly twice the correct dose. Consideration must also be given to the possibility of pesticides losing effectiveness through resistance developed by the target species. Although this has not been common in the past, cases have occurred in most areas of pesticide use; such as warfarin resistance developed by rodents and fungicide resistance in grey mould and powdery mildew.

In many cases such resistance can be attributed to popularity and sheer over-use of the product. Where there are several alternative products to choose from, as with turf pesticides, sensible rotation will go a long way to help preserve our armoury.

We are all in favour of cleaning up our environment to improve the quality of life on earth, but pesticides can provide a useful benefit to our society without posing a threat to its future. The continued availability of these valuable tools will only be assured by sensible and responsible use.

■ The author, Graham Paul, has over 20 years experience in the chemical industry, having been closely involved in the development of the Rhône-Poulenc range of environmental products for much of that time. Graham is now territory sales manager for Sta-Brite Supplies Limited.

How to make the

Earthworms have both beneficial and harmful effects on fine sports turf. If you like, this makes them both baddies and goodies. The good news is that by going about their daily business, worms tunnel through the soil and give much needed aeration. The bad news is that some species, actually only two or three of the twenty or so found in Britain, come to the surface to cast. This causes the unsightly heaps of which we are all aware.

So how can we prevent the harmful effects of the baddie earthworms, while encouraging the benefits provided by the ones in the white hats? Well, a knowledge of their life cycles, plus knowing when and why they cast can help with a sensible approach to their control. The first point to note is that in any healthy soil, whatever may be growing, earthworms are present in abundance. This is particularly true in undisturbed turf, which unlike annually cropped land is not regularly disturbed by ploughing or cultivating. Up to one million worms per hectare were recorded in trials conducted at the Sports Turf Research Institute.

All these earthworms naturally are very hungry. They eat virtually anything organic, including living and dead plant and animal material. Thatch formed under fine turf is one of their favourite feeding places. So if you control earthworms too thoroughly by chemical means you could finish up with a worse build-up of thatch. If you add the benefits they give from improving soil aeration and structure, their general activity is beneficial. But the difficult trick is to balance this with the suppression of surface casts.

The three worms which cast are the two Allolobophoras species longa and nocturna and the common Lumbricus terristris. Like most earthworms, their activity is worst in heavy soils containing a large reserve of organic matter, and least on lighter, well-drained turf like the greens of links golf courses. Moisture also plays a part and casting is always more prevalent in moist springs and autumns than in a dry summer, when worms go deep down in the soil to avoid the effects of drought. At this time they go into a form of suspended animation, waiting for moisture to return. Obviously, this is less likely under heavy irrigation.

The damage caused by casts is obvious, but not always fully appreciated. They are unsightly, ruin the true running of a green, suppress grass growth, spoil surface drainage and encourage fungus disease, whilst the excreted fine soil particles make ideal weed seed-beds. After a wet autumn, unless they are swept up, the casts can lead to muddy playing conditions all winter.

Finally, all earthworms, but especially those that live near the surface, also encourage moles – I speak with a lawn currently looking a bit like a miniature version of the western front. So, as most greenkeepers would agree, casting worms must be controlled. Adopting the right cultural measures will help; quite a lot can be achieved, for example, by regularly discouraging the production of the thatch, which gives the casting species a near-surface source of bed and board. A regular programme of slitting and coring where it is needed is therefore important, coupled with the removal of grass clippings and restriction in the use of organic surface dressings.

Earthworms also dislike acid conditions, so be careful of overliming and in naturally chalky conditions use acidifying fertilisers like sulphate of ammonia and sulphate of iron. In a wet, heavy soil further improvements to the drainage system are also worth considering.

In past years, a number of different chemical pesticides were used to kill earthworms. These were usually aimed at the whole population, casters or not – I don't think in those days we knew the difference. These included mercuric chloride, lead arsenate, copper sulphate, sodium hypochlorite and potassium permanganate. Some of these are very nasty materials indeed and at least two of them may by law no longer be sold for any horticultural use. Apart from the now totally banned lead arsenate, which gave control for up to two years but also killed off most other soil organisms, most had a short-term effect and needed repeat treatment.

'The length of activity of the modern wormicides is usually less than older materials like lead arsenate, which also helps make them more environmentally friendly'

Mowrah meal was a much safer alternative to all these and was used widely for earthworm control until about 25 years ago. Broadcast dry, it needed watering into the turf with a copious amount of water by hose pipe. After a fairly short period the worms came wriggling up to the surface, quickly died and could then be brushed up and removed.

This treatment undoubtedly helped to control a lot of worms, most of them sub-surface and probably casting species. The effect could be seen for up to two seasons. But it used a lot of mowrah meal, up to eight ounces per square yard was the recommendation, and thorough watering-in was needed to gain full effect. Removing the bodies, which otherwise could make an even worse playing hazard than casts, was another tedious operation. Therefore, as older greenkeepers will remember, all in all, applying mowrah meal was a very time consuming process. The organic matter left from this bulky material might itself also have helped encourage another generation of sub-surface feeding species.

In more recent years chlordane has been a successful successor to mowrah meal. The two forms available were the liquid Sydane 25 and Sydane Granular. It was relatively safe to apply, controlled worms for a fairly long period, but has been decreed to be excessively harmful environmentally. So, as most greenkeepers will now be aware, official approval for sale and supply ceased on 31 December 1990, and storage and use for earthworm control ceased to be permitted after 31 December 1992. After this date, unused stocks of chlordane should have be destroyed.

Fortunately, we have approved alternatives. One of the most useful is a mixture of gamma-HCH with thiophanate-methyl, which controls both earthworms and leatherjackets – a considerable bonus where they are troublesome. It is sold as Castaway Plus and is available in normal flowable and CDA formulations. The makers also claim that it gives selective control of casting worm species.

Another modern approved replacement is the carbamate insecticide carbaryl, sold in flowable formulation as Twister Flow by Rhône-Poulenc. Carbaryl is a pesticide with a wide range of uses as an insecticide, even for use against head lice!

The length of activity of the modern wormicides, or lumbricides to use the official term, is usually less than older materials like lead arsenate, which also helps make them more environmentally friendly. The proper time of application for all of them is when the earthworms are casting most actively, usually in wet periods in spring and autumn. In areas where levels of casting worms are high, repeat applications will almost certainly be needed to achieve complete control. Carbaryl is said to remain active in the soil for up to two months.

When and how much you use a chemical control will depend on the situation and the problem the worms are causing. Usually the problem is worse at the back end rather than spring, and it was particularly bad last year following a wet September and October. On light soils and where the playing surface is not used

worms turn

CHEMICALS and the GREENKEEPER

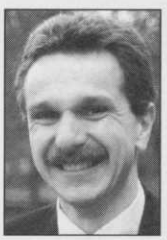
over winter you might decide not to bother. In that case you must be prepared to deal with any weed seedlings growing the following year in the convenient seed-bed the casts have left for them.

But I suspect that many greenkeepers on heavier, wetter soils, especially if they are chalky, will find it pays them to apply wormicides as a fairly regular treatment. It will also pay to remember the benefits from the goodie, non-casting worms and try to limit the control of the baddies to only what is strictly necessary. One day we might have a chemical that is guaranteed to distinguish between the two. Until then, care and caution appear to be the watchwords.

■ The author, Geoffrey Ellis, is an independent consultant and writer with some 30 years experience in the agro-chemical industry. He runs a small nursery specialising in the production of wild flowers.

◆ The way it used to be... pictures from 'Lawns for Sports' published in 1924, show how 'Carters Wormkiller' handled the problem. And you're right – the end picture *isn't* spaghetti!

FIGHTING THE FUNGUS



by DAVID STANSFIELD

In an ideal world we would never have any problems with fungus attacks on the golf course if healthy and vigorous turf, with good disease resistance, could be maintained by careful cultural management to shrug off disease. Then there would be no need to use chemicals to keep down pathogenic organisms. However, very few are blessed with the ideal golf course turf, especially on greens, where fungal attacks are most likely to occur and cause damage and where sustaining uniformity and density is vital year-round.

This is not to say that courses which do not have disease-resistant turf on greens (ideally fescues and bent grasses, carefully managed for growth, sited on healthy, well-structured, free-draining soil, out in the open air to produce a stable system) should not practise good cultural control of disease. Indeed, this is essential if reliance on chemical control is to be kept to the minimum. Whilst there is a range of fungicides available for treatment of turfgrass diseases, the range is not limitless: chemical applications are expensive and any input of chemicals into the environment should be avoided if possible. It is always best not to have to deal with disease in the first place and the use of fungicides should be a line of last resort.

The principle of good cultural practise is to create an environment in which disease is less likely to occur. Again, management to encourage disease resistant species within the turf has to be a primary consideration, looking for good aeration and free drainage, together with careful control of fertilizer input, application of irrigation and timing of top dressings. This latter item is a frequent means of encouraging autumn diseases, when year-end dressings are applied late and cause some smothering of the swards at a time when top growth is slow and the grasses are damp.

In the same vein, operations to promote drying of the grass cover are always valuable. The switching of surface moisture is an obvious one in this respect, but of equal if not greater value is ensuring that greens are recipients of a draught whenever possible. A good breeze across a putting surface, encouraged by the thinning of trees and under-scrub, is one of the best 'fungicides' around.

Applying Sulphate of Iron as a routine dressing is often cited as a means of limiting incidence of fusarium patch. This is true up to a point, and there are other beneficial spin-offs from applying sprays of Iron. On the other side of the coin though, acidification of the soil profile can come about by excessive use, and it must always be remembered that Iron is not a fungicide. It may make an outbreak of fusarium less likely, but it will not stop one which has already started.

Working on the above principles, there are clubs that rarely, if ever, use fungicides to deal with disease problems. Nevertheless, there are many more reliant on chemical applications to keep putting surface turf in as good a condition as possible year-round, and these have to apply fungicides fairly regularly.

The main problem to be dealt with in relation to fungicide is (by far and away) fusarium patch disease. On average, the majority of clubs will treat for fusarium on greens three times in any one autumn/winter period, costing in the order of £1000-£1500 for an 18-hole golf course. This average treatment frequency may fall within a range of 1-5 treatments per annum depending upon the weather.

So, for most clubs, use of fungicide is a significant item within the budget for the green, merely allowing for applications on putting surfaces. Treatment of other sections of the course beyond immediate greens surround is very rare. Here, the cost-benefit of fungicide application is much less, as the effect of disease is much less damaging in the medium term.

Returning to greens, while application of fungicide is not cheap, nine times out of ten procrastination in its use is expensive too. A few spots of fusarium can run riot in quite a short spell, causing lingering damage. Never forget either that fungicides work best at the outbreak of disease, and the earlier that spraying is carried out (wind and rain permitting) the more likely the chance of complete success first time. Constant monitoring of disease outbreaks is essential if timing of spraying is to be to the best advantage.

When it comes to choice of fungicide for treatment of fusarium, in principle, systemic types are best for the bulk of the year, confining use of contact type materials to the very ➡ 21

Now, the Fusarium Control you've been waiting for!

New Rimidin is the latest addition to the Mascot Range of products from Rigby Taylor.

Rimidin is today's revolutionary answer to long term control of Fusarium, Dollar Spot and Red Thread. Technologically advanced Rimidin provides unrivalled performance.

Rimidin's performance has been confirmed in STRI Trials and offers unrivalled efficacy. Because of its systemic action Rimidin keeps on working after rainfall or mowing giving superb value for money.

Don't wait any longer for the Fusarium control you need. Talk to Rigby Taylor now for full information.

Rigby Taylor

A **GROWING** FORCE IN LEISURE

FREE 0800 424 919

AD REF 127

Read the Label before you buy. Use Pesticides Safely
RIMIDIN CONTAINS FENARIMOL

Rigby Taylor Limited
Rigby Taylor House, Garside Street, Bolton, Lancs BL1 4AE. Tel: 0204 394888. Fax: 0204 385276.