Protecting turfpesticides in the marketplace

A series of articles aimed at a varying readership.

Advanced Level

If you're a Course Manager or Head Greenkeeper, read on...

By Dr Terry Mabbett returns with part two of his high-level analysis of European Turf Threats

Turf pesticides are designed to protect fine grasses from insect pests, plant pathogens and weeds, but could now be in need of protection from themselves and the clutches of increasingly 'dynamic' EU directives issued by Brussels.

Given the short time frame in which apparently safe turf pesticides with long pedigrees of effective use are being withdrawn from the market, or having their wings severely clipped, the greenkeeper might well ask exactly what pesticides are 'safe' and secure in the marketplace.

The short straight answer is that no single chemical pesticide is absolutely secure with an assured future use in professional turf because those issuing the directives are the ones making (or making up) the rules.

As such they decide on the nature and height of the hurdles and position of the goal posts presented to pesticides running the gauntlet of their directives. With sufficiently high hurdles and widely spaced goal posts it is not difficult to find a chink in the armour of most active ingredients, so contemporary pesticides must present a drum-skin tight profile in every respect from environmental integrity to operator and public safety.

The answer to pesticide protection is in product 'stewardship', an ethic and concept embodying the responsible planning and management of pesticide resources in relation to the environment and public health.

Product stewardship operates at two levels, first with the manufacturer who develops and markets the pesticide product and secondly the greenkeeper who applies the pesticide product according to label recommendations and within a broader best practice turf management programme.

Bio-inspired pesticides

Manufacturers are designing and developing 'new-age' active ingredients based on naturally occurring bio-chemicals produced and deployed by soil based micro-organisms. There is an obvious environmental bonus when using a pesticide derived from a substance that is naturally occurring and operational in the soil and clearly presenting much less of a risk.

This is the logical place to look for the up and coming generations of bio-founded and bio-foundation pesticides.

For instance, the antagonistic fungus Trichoderma with an ability to suppress or kill pathogenic microbes, and used commercially as a bio-control agent, does so not by magic, but through an integrated process of competitive invasion, direct control by synthesis of fungicidal and fungi-static chemicals and the induction of anti-fungal responses in host plants.

A classic example of a contemporary turf fungicide with microbial origins is azoxystrobin discovered during research on Oudemansiella mucida and Strobilurus tenacellus.

These small white or brown coloured mushrooms commonly found in Czech forests first attracted scientists' attention due to their remarkable ability to defend themselves by releasing two substances – strobilurin A

ABOVE: New-age bio-inspired fungicides are being used to control Fusarium Patch (Photograph courtesy Syngenta)

TOP RIGHT and INSIDE RIGHT: Golf courses with water courses require extra care and attention when it comes to the pesticide application process. Protecting the many lakes and ponds from pesticide drift and run off is top priority

Wild plants at the water margin are another top priority for environmental protection

The Water Framework Directive is proving a pitfall for some herbicides

and oudemansin A – which kept competitor fungi at bay and even destroyed them when in range.

This pioneering work paved the way for the development of a whole range of new fungicides now called the strobilurins, several of which are at the forefront of turf management for control of Fusarium patch and other diseases of turf grasses.

A much more recent entry into the turf fungicide market from this avenue of research is fludioxonil, which Syngenta describes as bio-inspired.

Fludioxonil is a fungicide from the phenylpyrrole group of chemicals derived from the natural antifungal substance pyrrolnitrin produced by Pseudomonas pyrocinia soil bacteria.

Greenkeepers will recognise fludioxonil as the active ingredient of Syngenta's Medallion TL, a brand new contact turf fungicide providing targeted control of pathogens responsible for key diseases of turf such as Fuarium patch, anthracnose and leaf spot. Among its many novel and innovative features fludioxonil takes effect not only on the green leaf but also on the thatch and soil surface to pre-emptively hit the fungus Microdochium nivale (Fusarium patch) when in saprophytic mode and before it has a chance to infect living grass leaves and damage the turf with symptoms of Fusarium patch disease.

Opportunity for the discovery, design and development of new age pesticides along these avenues and pathways is limitless.

Pesticide profiles

Fast disappearing are the days when mind-sets were focussed on 'dosage' as the amount of active ingredient expressed on a per hectare basis and required to control the target pest, pathogen or weed. Manufacturer's now talk about 'loading' with the environment, now uppermost in mind and consideration. Of related focus and concern following the flood of restrictions and regulations in the 'Water Framework Directive' is the need for new active ingredients to stay where they are placed in the uppermost soil profile, to exert the desired control effect and degrade before any significant leaching of chemical down through the soil profile and into the groundwater can occur.

On-going research into pesticide application involves low drift hydraulic spray nozzles like the Syngenta Turf Nozzles shown in operation here (Photograph courtesy Syngenta)

INSIDE TOP: Wildlife and especially aquatic animals like these spawning common frogs now receive top priority when it comes to all aspects of pesticide safety

INSIDE SECOND TOP: Chlorpyriphos the only sprayable insecticide to control leatherjackets in turf (shown here) is in the spotlight over much heavier and widespread use in agriculture (Photograph courtesy Syngenta).

INSET ABOVE: Good turf management practice including aeration and mowing regimes may play a more tenuous though still important part in pesticide product stewardship. Shown here is white clover in flower on a fairway and proving attractive to bees.

INSET BELOW: What gets into water courses from spraying in agriculture may impact heavily on future pesticide use in turf

Bio-inspired, bio-based active ingredients are more likely to automatically fulfil these requirements compared with traditional chemical pesticides created in the crucible. The original natural biochemical having evolved in natural soil-dwelling microbes will, by its very nature, be highly potent and targeted and, therefore active at a comparatively low [?] loading against a narrow range of competitors.

Similarly it must be inherently resistant to leaching in order to carry out its defensive function in the uppermost soil profile including on the thatch. The eventual active ingredient is not the original natural biochemical, but having the same basic chemistry the foundations for these benefits are in place.

Stewardship on the golf course

Greenkeepers have their role to play by adhering to the instructions and recommendations on the product label and by following best practice around the entire pesticide application process and also in its wider context.

This will include avoidance of drift by not spraying in windy conditions and not placing spray closer than stipulated to water courses, lakes and ponds and by increasingly adopting low drift hydraulic spray nozzles and controlled droplet application (CDA) sprayers that use shielded rotary atomiser nozzles to virtually eliminate spray drift.

However, in these times of increasing official scrutiny, that might not be enough, meaning that the course manager should always be thinking laterally and one step ahead. Soil compaction is a fact of life on golf courses and its effect on grass growth and general turf condition is well known. However, there are additional dimensions with strong implications for pesticide use and environmental protection. For instance, compacted turf is prone to 'puddling' and run-off of surface water is thus created. Timely aeration may, therefore, become an important, albeit more tenuous, factor in pesticide product stewardship.

Thinking ahead means casting a watchful eye beyond the sports and amenity turf 'box' and into other dimensions of pesticide use such as agriculture and horticulture. A classic case in point is the current concern expressed by apiarists (beekeepers) and some environmentalists who claim that the use of neonicotinoid insecticides on arable crops, including oilseed rape, is harming bee populations.

At first glance such concerns are completely inapplicable to golf courses carpeted with wild flowers, but always in non-treated areas. However, closer examination shows that the greenkeeper needs to be on guard because successful broadleaf weeds of turf are, by their very nature, extremely prostrate plants with growing points at soil level that miss the mower blades.

Weeds such as white clover that flower on greens and tees are an extremely rare event, but fairways are a different matter. In midsummer as the turf starts to dry out and drought resistant white clover starts to get the edge on turf grasses it is not unusual to find large patches of white clover in full flower and acting as the proverbial honey pot for bees. White clover is one of the most important honey plants in the United Kingdom and mowing regime can clearly play a part in product stewardship.

What's in the spotlight?

Speculating on pesticides which could be at risk is generally not a good idea and probably a case of tempting fate. However, there are several important pesticides sufficiently in the spotlight and known to be at risk to a greater or lesser extent.

Asulam

Greenkeepers might not even be aware of this highly specialist herbicide unless they have a problem with bracken on their course. If they do they will undoubtedly be concerned because as the situation currently stands asulam could be on the way out forever as asulam can no longer be purchased and all stocks must be used by 31 December, 2012.

Asulam is highly selective against bracken and if this herbicide cannot be saved the only other herbicide for bracken control is glyphosate, a total systemically acting herbicide which cannot be used safely in the same way as asulam.

Greenkeepers with a bracken problem who are unable, or not

wanting to use glyphosate will be left with heavy horses and manual methods to flay, flail, roll, beat and bruise bracken into submission.

Asulam is available for use in 2012 under use-up provisions and moves are underway for re-registration to secure its future for the long term. This may take five years but there is now the possibility of obtaining a series of Emergency Authorisations for 2013, 2014, 2015 and probably 2016.

Carbendazim

Carbendazim is the last in a long line of chemicals used by greenkeepers to control surface casting earthworms and the mess they make on greens and tees.

The situation with carbendazim is becoming something of a saga and many are claiming that the pesticide will go sooner or later, although nobody seems to know when.

If it does go, and there is no certainty that it will, carbendazim will essentially have been 'hoisted by its own petard' as a highly effective, and essential lumbricide (wormicide). You couldn't make this one up if you tried because if carbendazim does fall it will be at the hurdle erected to trap pesticides which have negative effects on earthworms.

You can almost imagine the farcical situation some years down the line when the custodian of carbendazim is up in front of the 'beaks' in Brussels and the question is asked, "Does your candidate wormicide have any effect on earthworms?" The real irony is that if carbendazim goes and has nothing chemical to replace it, then any benefit seen by the 'burghers in Brussels' will almost certainly be lost in the fallout.

They will see withdrawal of carbendazim as further reduction in pesticide loading on the environment, but this will be more than made up for by herbicide applications to control the broadleaf weeds getting a quick and easy start and secure foothold on worm casts deposited all over greens and tees.

Furthermore, it can only add to mole activity and require greenkeepers to call in specialists to do more unspeakable things to these wild mammals which are protected in some other European countries.

Chlorpyriphos

Chlorpyriphos, the only sprayable insecticide for control of leatherjackets in turf, is the latest pesticide to stand in the spotlight, although current scrutiny is on its role in agriculture where the tonnage used is large and the application is much more broadly based than on turf.

Use and application as a spray on managed turf is vital but miniscule compared to what goes on with chlorpyriphos in agriculture where it is used on vast areas for leatherjackets and to control other important pests such as orange wheat blossom midge.

Agriculture is fighting back with a programme of enhanced product stewardship and a new set of guidelines under the banner 'Say NO to DRIFT'.

This includes adhering to an extended no-spray buffer zone of 20 metres adjacent to water courses and the use of LERAP three star rated low-drift nozzles for all chlorpyriphos applications. Any loss of chlorpyriphos for use on turf would almost certainly be collateral to its situation and status at the time in agriculture.

The Spraydome 5000 from Micron Sprayers designed with shielded rotary atomisers to virtually eliminate spray drift (Photograph courtesy Micron Sprayers)

If carbendazim 'the last lumbricide' is eventually lost any gain in reduced pesticide loading will be more than compensated for by the extra herbicide required to control a much larger and wider weed population on greens and tees.

Greenkeepers may not even be aware that the herbicide asulam appears to be on its way out unless they traditionally have a bracken control problem