

# The revolving door on turf pesticide products

A series of articles aimed at a varying readership.

## Advanced Level

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

**A cohesively managed turf pesticide market started to evolve somewhat later than in agriculture where agrochemicals, albeit few in number, were already in full flourish as foliar sprays and seed treatments by the 1930's.**

The turf chemical pesticide market has always been dynamic growing in product range and tonnage but more recently consolidating as increasingly tight environmental and safety legislation takes its toll across the board on fungicides, insecticides and herbicides.

Many 'household names' in turf's pesticide portfolio have already gone and the days of many more look numbered, but greenkeepers and groundsmen can relax for the moment at least. Evidence suggests pesticide manufacturers are designing and developing new actives specifically for the turf market and much better targeted to provide superior control in smaller amounts.

The revolving door opening and closing on contemporary turf pesticides is not altogether logical. It certainly isn't always the case of oldest pesticides in being the first ones

out because hormonal herbicides like 2,4-D and MCPA, with pesticide pedigrees now approaching 75 years, are still widely used. The products may have changed with 2,4-D and MCPA now commonly used in two-way and three-way pre-formulated mixtures with other actives. However, at the end of the day these two 'household' herbicides have achieved their three score years and ten by continuing to provide good selective control of broad leaved weeds in turf, the job they were designed and developed to do in the 1940's.

There are many more products with a considerably shorter pedigree and commercial life span but already consigned to the history books. How many people remember the fungicide thiophanate methyl (a precursor of carbendazim) with systemic activity and heralded as a new beginning for disease control when it came onto the market in the 1970's. Thiophanate methyl was also a highly effective wormicide and gave short shrift to surface casting earthworms. However, all that was inconsequential when medical researchers found thiophanate methyl wanting on human toxicological grounds causing its

withdrawal from the marketplace more than five years ago after only 25 years use on turf.

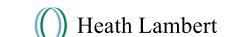
### Different factors at work

The credentials of contemporary pesticides including those used on managed turf are under fire from four EU directives coming at the market from different directions and using different criteria. They are:

- Revision 91/414 Directive
- Water Framework Directive
- Sustainable Use Directive
- Machinery Directive

Revision 91/414 requires re-registration on a 10 yearly basis and forces manufacturers to face up to contemporary conditions and concerns around pesticide usage ten years on. And a lot can happen in one decade in today's fast moving arena of scientific research and public concern around the use of chemical pesticides. Toxicological research may have uncovered indications of endocrine disruption or carcinogenesis while environmental investigations may have un-earthed possible effects on useful soil organisms such as decomposers and natural enemies

Dr Terry Mabbett reports, with a high level analysis of pesticide products...



This article comes to you courtesy of the BIGGA Learning and Development Fund.

Thank you to all our key sponsors





ABOVE: 2,4-D and MCPA with their 70 year pedigrees are still used with other herbicides in pre-formulated mixtures for the selective control broad-leaved weeds in turf. Parsley piert (*Aphanes arvensis*) is the main weed shown here.

BELOW: Preserving and expanding biodiversity such as water margin plants is a top priority. Marsh marigold also called 'king cup' (*Caltha palustris*) is shown here.



or perhaps pollinating insects.

Chemical pesticides up for re-registration are invariably faced with more and higher hurdles to negotiate. Some are unable to meet requirements. Others can but the manufacturer faced with mounting costs of carrying out new trials and providing more data to the registration authorities may look at the cost benefit ratio and decide to let an active go. And turf being a relatively small niche market doesn't help, especially if there is no wider application in the much larger agricultural market. Perfectly good pesticides with many more years of safe and effective use in managed turf have already been lost in this way.

The Water Framework Directive is the watery grave for pesticides caught 'red-handed' at an excessively high concentration in ground water. High water solubility and soil leaching is clearly a disadvantage although other factors including widespread intensive use and run-off from hard surfaces are clearly critical. Use on managed turf is a 'red herring' because big use in broad-acre arable crops and weed control on hard surfaces are the two key factors that tend to trap pesticides in this watery grave.

Water flows where it wants to. Streams meandering across golf courses may have already passed through miles arable farmland where cereals and oilseed rape are intensively sprayed with selective herbicide and then afterwards hit industrial sites where total herbicide is sprayed on hard surfaces. When water is tested all that matters is the concentration in ppm (parts per million) of a particular herbicide (or insecticide/fungicide), with little consideration to exactly how it got there. This is clearly of no consequence to managed turf when a pesticide is purely agricultural in use such as the herbicide IPU which 'fell foul' of this directive, but a different matter if there is parallel use on managed turf.

As far as 'Sustainable Use' is concerned greenkeepers and groundsmen could reasonably be forgiven for believing this directive is custom-designed and targeted to specifically clobber the sports turf and amenity sectors. The Sustainable Use Directive targets pesticide use in public places (and those places used by the public) which is essentially what sports, amenity and leisure turf is all about.

The Machinery Directive immediately brings to mind the old adage 'there are more ways of killing a chicken than choking it'. This

directive deals specifically with the machinery and equipment used to apply pesticides and now requires every new turf and amenity sprayer to achieve certification to a required level of environmental protection before being released onto the market. Clearly there is no attempt to directly target pesticides but end result is the same. Without an approved application method there is no way of delivering a pesticide product.

Turf and amenity sprayers can be found wanting due to intrinsic design factors such as inappropriate droplet size and droplet size distribution causing spray droplet drift and high volumes of spray mixture leading to excessive run-off. Or manufacture and maintenance faults leading to leakage and nozzle drip.

Inherent design problems in hydraulic sprayers are being overcome by the design and development of a new breed of sprayers based on controlled droplet application from rotary atomization nozzles applying ultra-low volumes of spray mixture to eliminate run-off, and shielded or shrouded to completely eliminate the inherently minimal amount of droplet drift. Pesticide manufacturers are playing an important part too through on-going design and refinement of their own 'low drift' hydraulic nozzles.

### Forward and lateral thinking

Some of the first turf pesticides to disappear many years ago did so for good reasons. A succession of insecticides applied to turf to control chafer grubs including organo-chlorine insecticides like chlordane and gamma HCH (lindane) and carbaryl (a carbamate insecticide) were unmitigated environmental disasters. To be fair they were doing a 'good' job (on chafer grubs) which became immediately apparent when the last of these was withdrawn but before imidacloprid (Merit Turf) was released onto the market.

For some years there was a gaping hole in the market and even bigger holes in turf up and down the country as chafer grubs severed grass roots. Rooks, crows, badgers and foxes finished the job by ripping up already loosened turf foraging for the grubs.

But the pendulum has swung the other way and pesticides that no-one thought in a million years would disappear or suffer from restricted use have fallen foul of EU legislation or suffered collateral





**ABOVE:** Even a small patch of Fusarium is enough to throw that vital putt off line (Photograph courtesy Syngenta)



**LEFT:** Worm casts will not be a problem as long as carbendazim is around

**BELOW:** Any potential effects on wildlife (wild mallard duck shown here) is a key consideration for the use of any pesticide

damage from high costs associated with re-registration.

Multi-national pesticide manufacturers are thinking ahead and laterally. Classic case is Syngenta which saw chlorothalonil, universally used over a long period of time as a contact fungicide, coming under scrutiny. By dispensing with chlorothalonil as a single-active product (Daconil) on managed turf, in favour of registration in a three-way product with fludioxonil and propiconazole (Instrata), Syngenta is helping to keep this valuable 'workhorse' fungicide alive for future use on turf, as well as in agriculture and horticulture. Any anticipated downside for turf disease control was more than compensated for by Syngenta's introduction of fludioxonil, as a brand new single active contact fungicide (Medallion TL) with a much superior overall profile.

Chlorothalonil is not the only pesticide to have lost some aspects of its traditional application and use and remained alive to fight another day. Carbendazim the last remaining wormicide approved for control of surface casting earthworms, and the mess they create on professional sports turf

including golf greens, was originally released as a turf fungicide for the control Fusarium patch and other turf diseases and a highly effective one at that.

Essential difference is there being nothing to replace carbendazim as a wormicide should it eventually fall by the wayside. It is inconceivable to imagine the registration of any other chemical to kill surface casting earthworms will ever be considered in future, either by legislators or commercial companies, irrespective of what will always be a clear need on professional turf. Earthworms are key soil fauna included in the increasingly broader and higher environmental hurdles erected for all types of turf pesticide.

### **New environmental mind-set and language**

The example set by fludioxonil shows quite clearly the new era of thinking and language when it comes to chemical pesticides in the twenty-first century. Dosage was the traditional language used to describe the label recommended amount of pesticide required to control the pathogen, pest or weed,





with these targets clearly at the fore-front of thinking. Not so now with contemporary terminology changed to 'loading' and the environment now uppermost in mind and consideration.

Big plus point claimed for fludioxonil is an efficacy as good if not better than chlorothalonil but with a loading which is ten times less. On a weight for weight basis fludioxonil weighs in with loading of just 375g a.i. (active ingredient)/hectare (ha) compared with around 5000g a.i./ha for long established contact fungicides like chlorothalonil and iprodione with their 30-40 year pedigrees on turf.

The manufacturer as much anyone else now regards chemical pesticides as intervention agents rather than foundation products for turf pest, disease and weed control. The latter is increasingly seen as the function and responsibility of the myriad of living organisms and their biological systems in the root zone and thatch.

Around this new thinking is growing a whole new field and industry encompassing biological control and natural soil systems designed to set the nutrition and health agenda on and under turf. Integrated pest and disease management is the name of the game but the essential meaning of 'inte-

grated', which was coined and used in agriculture and horticulture long before it became established in turf, is inclined to get lost.

In this context 'integrated' means using everything at your disposal including where necessary chemical pesticides but only in highly interventionist and targeted ways for minimal impact on natural biological systems in the root zone and thatch. Be that as it may, there is increasing pressure within the industry to dispense with the use of all chemical pesticides.

Proponents of pesticide free turf wax lyrical about what is happening on and under the turf as though they are actually there observing these complex and often microscopic systems at work. Danger for greenkeepers, who clearly want to do right by the environment, is to 'sign the pledge' on pesticides and embark on a course of chemical pesticide-free golf course management. And then find it is practically impossible to achieve depending on the situation – e.g. location, local topography, level of wear and tear on turf and the expectations of club management and members.

Being wedded to organic (no chemical pesticide or synthetic fertilizer) turf management is not much fun and consolation when birds and badgers are tearing up

your turf because there is an infestation of chafer grubs underneath the grass that requires prompt intervention by chemical control. A biological control product based on entomopathogenic nematodes may suffice if both time and temperature are on your side otherwise chemical control is the only option.

Even a tiny patch of *Fusarium* or a wobbly grass tiller with its roots cut by chafer grubs is enough to throw that vital putt off line. Some greenkeepers have already paid the ultimate price for doing the 'right green thing' on their golf course but not according to their management and members.

An entire golf course covers a huge area in relation to the 18 greens where the 'make or break' of the game of golf tends to occur. Surely there is a sufficient area out there for the biodiversity-driven pesticide-free course management we all want to see, while allowing the greenkeeper a large measure of leeway on his greens.

To criticise greenkeepers as environmentally unfriendly for spraying greens with fungicide to fend off *Fusarium*, spreading insecticide granules to kill chafer grubs and applying wormicide to prevent worm casts is highly hypocritical given the amount of synthetic turf elsewhere in the sports sector.

The Water Framework Directive is already becoming a watery grave for significant numbers of herbicides

