A post pesticide prognosis for turf patients and carers

Dr Terry Mabbett continues his thesis on the future of pesticide

It’s April 1st (All Fools Day) 2015 and you wake up to find the EU has banned the last remaining chemical used as a pesticide on professional turf. Ferrous iron sulphate applied to turf for centuries to control moss can no longer be used for this purpose although you can still use ferrous sulphate as a fertiliser and buy the tablets from the chemist to boost your blood iron level.

Rooks and crows are watching in a re-run of the iconic ‘ Hitchcock Movie’ [The Birds], ready to tear up your turf and devour this year’s exceptionally heavy infestation of chafer grubs. Last year’s autumn mists crept up early during the first week of September and unleashed a flood of Fusarium and anthracnose into the turf still stressed from summer drought. The air [in September] was still full of dandelion parachutes from what had been the biggest country-wide infestation in living memory. Most survived the extra mild winter and are now healthy-looking dandelion rosettes spreading rapidly across the turf still threadbare from Fusarium and anthracnose infections. If this summer is a repeat of 2014, the hottest and driest on record, then it won’t be long before the fairways are patched with huge patches of drought resistant weeds taking over. Those chemicals most sorely missed are herbicides and green-keepers are now paying the price for others’ excesses. There’s always a much greater use of the same herbicides by farmers, while applicators manipulated by the industrial sector caused fast heavy run-off of herbicide into water courses. And greenkeepers need these herbicides now more than ever before, after a series of summers to stop drought resistant turf weeds including white clover, birds’ foot trefoil, yellow suckling clover, black medick, yarrow and now self-heal and cinquefoils taking over completely.

Your erstwhile ‘chemical’ rep, now something between a snake oil salesman and a witch doctor, has just pulled up behind the club house in a green van and wearing a green jacket. Joking apart what will you do if virtually all chemical-pesticides currently registered for use in managed turf disappear?

Looking back

Greenkeepers with turf ‘in the blood’ might recall what their grand-fathers but that’s not far enough back in time, because ‘modern’ turf pesticides like hormone weedkill-ers (herbicides) were first used in the 1940’s. The hormonal herbicide 2,4-D, a British discovery at Rothamsted Research Station in 1942 under the team leadership of Judah Hirsch Quastel, was first commercialised by a paint company in 1946. Not be outdone another paint company in North America commercialised MCPA soon after. There’s not too many greenkeepers still around who can tell you what happened much before 1940. Perhaps that’s because the very first turf pesticides developed just after the First World War, and used up until the Second World War, and sometimes beyond, sounded like something left over from the Battle of the Somme. There was gas lime, a by-product from the manufacture of coal gas which smouldered of moth balls (naphthalene) and rotten eggs (hydrogen sulphide) and used to control chafer grubs into at least the 1930’s.

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And if that wasn’t your particular poison then you could always consult Agatha Christie about ‘arsenic acid old lace’ or ‘sparking cyanide’ because both sodium cyanide and hydrocyanic acid were tried, tested and once used at the time. Reason why initial commercialisation of hor- monal weed-killers was carried out by paint companies was probably due their interest and expertise in aniline-containing paints.

Looking forward

There’s clearly no safe message or image in looking back chemi- cally so the only option is too look forward biologically and culturally by honing in on all the good turf and refined by generations of management practice developed forward biologically and culturally so the only option is too look forward biologically and culturally by honing in on all the good turf and discolouration, and when things do go wrong rapid remedial action is required. Whatever faults chemical pesticides may have they act and deliver quickly compared with biological pesticides. Biopesti- cides based on living organisms like friendly fungi, benign bacteria and non-naughty nematodes clearly require more exciting conditions (e.g. temperature, moisture and soil pH) and more time to work.

Turf is a perennial ecosystem and on face of things should respond to a balanced long term cultural care package without the use chemical pesticides, but will all the potentially destructive agents in turf, namely insect pests, fungal diseases and weeds, respond well enough. Answer is a qualified yes for fungal diseases and a definite no for insect pests and weeds. Potential turf grass pathogens are always present in the thatch in a benign saprophytic mode, only changing up through the gears into parasitism if conditions, including turf grass species and varieties, soil moisture and fertility, leaf surface wetness and atmospheric humidity, combine in the right way at the right time. All this can be monitored and manipulated by the greenkeeper to his/her advantage but insect pests and weeds arrive from the wider environment outside the golf course affording greenkeepers little if any control over the situation.

Turf diseases

Thatch which is the layer of dead, dying and decaying grass material at base of the sward is the source of most turf disease and its manipula- tion and management a key solu- tion for disease management in the absence of chemical fungicides. Most mainstream fungal pathogens like Microdochium nivale (Fusarium patch) and Colletotri- chum graminicola (anthracnose) are perpetually present in thatch as saprophytes feeding on dead grass material. They gear up into parasitic mode in response to changing environ- mental conditions and turf stress, which commonly come together as late summer moves into autumn.
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Thatch and root zone soil is also home for the wide range of antag-
nicastic microbes both fungal and bact-
terial which compete with, consume or
secrete natural chemicals to kill
growth of disease resistant grass species and
takes advantage of natural conditions conducive
to disease development, by for
instance removing surface moisture and
reducing shade in the case of
Fusarium Patch. Disease manage-
mant in professional turf without
the use of chemical fungicides becomes
feasible. That said Flemish
 free surfaces and ‘fast lawns’ will no longer be
an option.

Turf pests and weeds

UK turf gets off relatively lightly
from insect pests (compared with
North America). Chafer grubs (Phyl-
lophaga bortcilla) and leatherjack-
ets (Tipula paludosa) are the only
two of any real consequence. Direct
damage with severed roots causing
loose dried out turf is bad enough,
but collateral damage from corvids
(rooks and crows) and badgers and
foxes tearing up turf to get at the
grubs can prove almost terminal.
Chafer grubs historically present the worst problem not least because
in the period after withdrawal of
Gamma HCH (lindane) and before
approval of imidaclorpid there was a
gaping hole in the market and even
larger holes in turf.

Biocides based on entomo-
pathogenic nematodes are available
but being natural enemies they are
by definition density dependent
factor, dependent that is on the
density of the insect pest host. The
nematodes multiply gradually with
rising numbers of chafer grubs then
fall away as the insect pest popula-
tion is controlled. As such they are
not a short cutting solution. As biological
control agents they generally require
more exacting conditions than do
chemical insecticides. For instance,
trial results for application are when
the soil is already moist and soil temper-
are within the 12-20°C range.
They are clearly not the quickest and
most appropriate option for getting
greens already being damaged by
predators in late autumn and winter
with an important tournament just
weeks away.

It is difficult to imagine profes-
sional turf with an acceptable level
of weeds if the current arsenal of
approved herbicides is taken away.
Damage to turf from disease and
insect pests exacerbates weed prob-
lems by creating additional niches of
bare ground for germinating weed
species to exploit. Similarly, the disap-
pearance of chemical wormicides
would lead to greater worm caste
problems and create even more ideal
sites for weed seed germination.

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disease management is to maintain
a dynamic thatch kept at a depth
appropriate to turf type. A dynamic
thatch ensures continual and fast
recycling of nutrients for grass
growth and health while avoiding
high stress, especially during high
traffic and wear periods. In addition
it will lessen dependence on syn-
thetic fertilizers.

Thatch degradation is acceler-
ated and sustained using physical
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thatch degrading microbes can be
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Greenkeepers already face
several dedicated turf weeds with
little or no suitable chemical control
available. Only a small number of
selective herbicide active provide
use-off control of slender speedwell
(Veronica filiformis) and there is
essentially no selective herbicide for
control of field woodrush (Luzula
campestris).

Mycoherbicides which are biologi-
cal control products based on fungal
pathogens used to kill specific weed
species are used elsewhere against
woody weeds such bearberry (black-
berry) in Australia. However, these
highly specific mycoherbicides
would be of little use to greenkeepers
faced with anything up to a dozen
completely different turf weed spe-
cies at the same time.Visions into
the future are turf managers down
‘on all fours’ digging out weeds
just like their great grandfathers
did. But this won’t work for deep
rooted offenders like dandelion
and ragwort that produce new
plants from fragments of root left
in the ground. Some of the most
intractable problems will result
from invasive weeds like Japanese
knotweed and Himalayan balsam.

Doesn’t make sense

The more you look at EU attitudes
to chemical pesticides the less it
makes sense. The current conun-
drom surrounding the management
of surface casting earthworms
and control of the mole (the main preda-
or of earthworms) sums this up
in a nutshell.

Naphthalene was traditionally
used to deter moles. Turf managers
would place mothballs in mole holes
to deter digging and tunnelling.
Moth balls are freely available and
as far as I know you can still put them
in the wardrobe to kill clothes moths
without ending up in court.

But together with disinfectant
and diesel oil (also used to deter moles)
it is illegal to use moth balls because
under provision of the Control of
Pesticides Act 1986 there is no
approval to use naphthalene as a
deterrent against moles. But the
EU still allows you to catch and kill
moles using wicked looking traps
and dope them out using phos-
toxin, a highly toxic gas released
when aluminium phosphide tablets
are placed in mole holes with moisture
in the soil. It really doesn’t make sense
for EU to disallow half a century of
scientific research and develop-
ment that has given greenkeepers
highly effective and much cleaner
and safer pesticides to manage
turf diseases, kill turf weeds and
manage surface casting earth-
worms. And at the same time allow
such methods to kill moles which
are a protected species in some EU
countries like Germany. If you can
hope this conundrum and come up
with a clear and logical answer then
please let me know.

There will be no quick and easy solutions to this problem (chafer grubs and collateral
damage from corvids). But it is the responsibility of turf managers to seek for turf
diseases, kill turf weeds and
drought-stricken turf in July 2010 (southern England) with white clover and birds-foot
trefoil (Trifolium pratense). In north american
well for good biological control agent activity.