

Greenkeepers in clover

Dr Terry Mabbett looks at how best to face up to the challenge of clover

To be 'in clover' implies a carefree life, the ancient saying coming from the fact that clover rich pastures were always good for fattening cattle.

Clovers were important component species of livestock pastures long before managed turf for sport and leisure, but I doubt whether greenkeepers faced with clovers and closely related leguminous plants as weeds would consider themselves carefree. And this, considering clovers and close relatives in the plant family Fabaceae (pea and bean family), are generally positive for soil fertility.

All things being equal clovers are useful leguminous plants living alongside Rhizobium bacteria in root nodules within a symbiotic relationship. The nitrogen fixing bacteria convert atmospheric nitrogen into nitrate which is utilised by the clover plant and to the benefit of soil fertility. Clover foliage is rich in protein, makes good grazing and palatable fodder for farm animals. The flowers are important sources of nectar for bees and the basis of sought after brands of 'clover honey'.

Turf managers faced with clovers as weeds in fine turf clearly fail to see these otherwise useful leguminous plants in such a positive light. To be 'in clover' presents real problems for greenkeepers. Clovers are among the most persistent and fast spreading weeds of managed turf and some of the most drought resistant. White clover in particular is widespread on fairways, where it is tolerated to an extent, but a definite no-no for greens and tees.

Clovers 'proper' comprise 300+ species worldwide all belonging to the genus Trifolium. Most commonly found in UK professional turf is Trifolium repens (white clover) and Trifolium dubium (yellow suckling clover or lesser trefoil). Trifolium pratense (red clover) normally a dedicated agricultural clover can become a problem in amenity grassland.

In addition, there are other closely related plants such as the trefoils and medicks with virtually the same form, structure and credentials as Trifolium species and therefore considered within a wider grouping of 'clover' weeds in managed turf. They include bird's foot trefoil (*Lotus corniculatus*) and

black medick (*Medicago lupina*)

All the 'clovers' share some common features and attributes which make them highly successful broadleaf weeds of turf:

- A prostrate and low growing habit permitting growing points to escape mower blades.
- Creeping stems which root at the nodes in the case of white clover
- Extended periods of flowering and seed formation lasting right through summer and into autumn
- Ubiquitous distribution frequent occurrence in non-turf areas to create a large area-wide seed loads and seed banks.

Clovers have two additional related attributes which provide significant growth and survival advantages over turf grasses and other broadleaf weeds. Inherent ability to access their own source and supply of nitrate from root nodules allows clovers to exploit poorly-managed and under-nourished swards and to grow rapidly at the expense of turf grasses.

Secondly, clovers are very drought resistant and will rapidly colonise water-stressed turf at the expense of virtually all other plants, grasses and broadleaf species alike



MAIN ABOVE: Close up on white clover
ABOVE: Close up on yellow suckling clover
BELOW: Bird's foot trefoil thrives in dried out turf





ABOVE: Big clumps of white clover in drought stressed turf in southern England July 2010
LEFT: Drought stricken turf in July 2010 (southern England) with white clover and bird's foot trefoil (yellow) as far as the eye can see
LEFT BELOW: Yellow suckling clover
RIGHT: Late summer on increasingly drought stressed turf is when clovers come into their own



For these reasons, turf should be irrigated throughout dry periods and receive well-balanced fertiliser regimes over the year as a whole. However, first spring dressing must be rich in nitrogen and relatively low in phosphate and potash (potassium). This will give the grass a 'flying' start over clovers at the beginning of this key high-growth period of the year. Starving turf grass of nitrogen will simply weight the scales even more in the favour of clovers.

Clovers and closely related species possess trifoliate (3-leaflet) leaves. 'Trifolium', the genus name for true clovers and the common name 'trefoil' are both derived from the Latin 'Tres' meaning three and 'Folium' meaning leaf.

Close-up on clovers

White clover (*Trifolium repens*)

A rampant mat-forming weed which colonises large areas of turf through its creeping stems, rooting at the nodes. Alternatively called 'Dutch' clover or more patriotically 'Kentish clover', it is a perennial plant with dark green trifoliate leaves borne on slender and erect

leaf stalks. Each leaflet has a white band or 'halo' near to the base. White clover prefers fertile but non-acid soils and has a long flowering period starting in May and extending right through until October. White flower heads sometimes tinged with pink are borne on long slender pedicels (flower stalks).

Bird's foot trefoil (*Lotus corniculatus*)

Also a perennial with creeping stems but which do not root even though they grow just beneath the soil surface. A strong and sturdy taproot anchors the plant and confers a high degree of drought resistance. Leaves, like those of white clover appear to be trifoliate although an additional pair of bract-like leaflets attached close to the stem makes five leaflets in all. Bird's foot trefoil is, like white clover, a fast-spreading and mat-forming weed especially on dry alkaline soils. This weed thrives in turf on well-drained soils especially those derived from sand or limestone.

Bird's foot trefoil flowers from May through to August producing attractive yellow and orange heads, streaked with red and comprising

5-8 pea-like flowers. The plant is sometimes called 'bacon and eggs' due this colour combination in the petals.

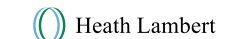
Bird's foot trefoil has a good biodiversity credentials, being the main food source of the common blue (*Polyommatus icarus*) and other British butterflies. *Lotus corniculatus* owes its common name to the inch long seed pods turned up at the ends to resemble a bird's claw or talon.

Yellow suckling clover (*Trifolium dubium*)

Yellow suckling clover (lesser trefoil) is a major nuisance weed especially in fine turf. Even though an annual weed it is more difficult to control than white clover. The creeping stems are slender and fast growing, but do not root like those of perennial white clover. Even so, yellow suckling clover will still colonise substantial patches of ground especially on dry non-acidic soils when turf is thin.

Each leaf comprises three leaflets but unlike white clover the middle leaflet is borne on a noticeably shorter stalk.

The long flowering period from



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TOP: Yellow suckling clover
 SECOND TOP: Close up on bird's foot trefoil
 ABOVE: White clover across the fairway
 LEFT: Red clover is more closely associated with agricultural grassland but does make a colourful addition to high cut amenity grassland.

May to October produces a succession of small and round flower heads yellow at first turning brown later.

Black medick (Medicago lupulina)

Black medick is not a major weed of turf but may show up in quantity on poor quality swards particularly if dry. It looks similar to yellow suckling clover with slender creeping stems, a prostrate habit and well-defined trifoliate leaves. Unlike yellow suckling clover each leaflet has a sharp point at the tip. In contrast to the smooth foliage of yellow suckling clover this plant is hairy and feels sticky to touch. However, defining difference is in the flower and seed heads. They start as small, yellow and rounded (slightly less so) like yellow suckling clover, but later develop into distinctive pods becoming black and coiled when ripe.

Clover control

The mat forming habit of clovers enabled by their creeping stems means scarification is a useful means of suppression. Since growth tends to be patchy manual application using a rake with upturned tines is a useful tool for smaller areas of turf.

The annual life cycles of black medick and yellow suckling clover makes hand weeding of small areas a practical proposition.

Always use a grass box when mowing, not only to collect the small but prolific seed heads from the annual yellow suckling clover and black medick plants, but also pieces of white clover stem with the capacity to root and produce new plants.

Low soil moisture and nitrate levels spell competitive doom for most plants. Low soil moisture levels aggravate the situation because nitrogen is absorbed by roots from the soil as soluble nitrate ions (NO₃⁻). Such conditions pose no problems for the clovers, because in addition to their intrinsic drought-resistance they have access to their own source and supply of nitrate in the root nodules.

High drought resistance and this 'home-made' 'in-house' supply of nitrate means clovers can weather such conditions and 'steal a march' on grasses. Indeed, timely applications of nitrogen fertiliser and summer watering are the next best thing to chemical control of clovers, and the first spring-applied fertiliser dressing should always be nitrogen based and never dedicated phosphate or potash fertiliser.

Keep turf well watered throughout the summer but remember patches of white clover are very slippery when wet.

Clovers were always among the most difficult to control weeds in managed turf but discovery of selective weed killers with a plant growth regulating (hormonal) mode of action helped 'save the day'. Until then clovers were a real nightmare in turf and any attempt to achieve clover free fine turf, especially under dry conditions, was virtually impossible. They are still not easy to control after seventy years of herbicide development and a whole new battery of active ingredients.

The industry still relies heavily on herbicides with a plant growth regulation mode of action and called synthetic auxins because they exert the same effect as indolylacetic acid (the main natural auxin plant hormone).

At high concentrations they are toxic to dicotyledons (broadleaf plants) but not as much to monocotyledons (grasses), and this is why they have been developed and deployed as selective herbicides in turf.

The group covers a whole range of widely known and used herbicides including the 1940's discoveries 2,4-D and MCPA, mecoprop-p and dicamba with their 1950's to 1960's vintage, and clopyralid and fluroxypur discovered and commercialised in the 1980's. Synthetic auxins are complemented with other newer herbicide actives such as diflufenican and florasulam with completely different chemistries and modes of action.

Contemporary commercial herbicides are invariably broad based products combining two or more of the above active ingredients in carefully crafted mixtures to obtain the most efficacious and broad spectrum weed control that includes the clovers.

White clover is the most widely spread and frequent of clovers in turf but also the most easy to control.

It is not unusual for the manufacturer's herbicide label to stipulate higher dosage rates and a tighter weed growth stage restriction for commercial control of bird's foot trefoil, yellow suckling clover and black medick.

That said these herbicides used at recommended rates have one thing in common.

That is selective action against broad-leaf dicotyledonous weeds like clovers without adverse effect on the monocotyledonous grasses in fine turf.