Our mission: "Bayer: Science For A Better Life"

Bayer is an inventor company with a long tradition of research. By applying science to the major global challenges, we deliver innovations that address unmet customer and market needs.

Bayer Turf & Amenity Solutions







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Product selection table

Category	Product name	Active ingredient	Main usage period											
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	Chipco Green	Iprodione	•	•	•	٠							•	•
Fungicide	Dedicate	Tebuconazole & trifloxystrobin					•	•	•	•	•	•		
	Interface	lprodione & trifloxystrobin	•	•	•	•	•	•	•	•	•	•	•	•
	Scorpio	Trifloxystrobin					•	•	•	•	•	•		
Insecticide	Merit Turf	Imidacloprid				•	•	•	•	•	•	•		
	CDA Vanquish	Glyphosate			•	•	•	•	•	•	•	•		
Total herbicide	Finale 150	Glufosinate-ammonium			•	•	•	•	•	•	•			
	Pistol	Diflufenican & glyphosate			•	•	•	•	•	•	•			
Selective herbicide	Longbow	2,4-D, MCPA, mecoprop-P & dicamba				•	•	•	•	•	•			
Line marking	Finale 150	Glufosinate-ammonium			•	•	•	•	•	•	•			

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Bayer as a global company

Bayer is an inventor company with over 150 years of expertise and social commitment. By applying science to the major global challenges, Bayer can deliver innovations that address unmet customer and market needs.

As a global enterprise, Bayer has key skills in the fields of health care and agriculture with the mission:

Bayer: Science For A Better Life



Bayer Leverkusen The BayArena stadium and training ground is home to the company's football team, which was founded in 1904.



Aspirin™ Discovered by Bayer in 1899.

Bayer UK & Ireland

Bayer is a global leader in providing innovative solutions to pest, weed and plant disease problems in the professional non-crop markets. This encompasses the turf and amenity sector, as well as industrial vegetation management and horticulture.



Bayer campus in Monheim, Germany.

Bayer UK offers;

Extensive product portfolio

The UK and Irish product portfolio consists of turf fungicides, insecticides and herbicides which Bayer distribute through a number of distributors throughout the UK and Ireland. Turn to page 95 to find a list of these distributors.

Direct contact with turf managers and ground maintenance professionals

Baver have formed Customer Advisorv Councils which offer a forum for feedback. By working closely with turf and amenity professionals, Bayer can gain an understanding of the problems encountered and experienced on a day to day basis in the field.

Research and development to bring new products to market Bayer invest up to 10 years and €300







Bayer campus in Clayton, US.

million to bring each new active to market. Turn to page 88 to find out more about these innovative solutions. Bayer has turf research centres in Monheim, Germany and Clayton, US. Clayton has a golf course on site meaning that the solutions that Bayer offer can be targeted and developed to turf conditions, instead of the traditional route of adapting from agricultural uses. Once approved, Bayer continues to trial the product with professionals and organisations to look for further developments and to continue understanding the needs of the industry.

Team of experts

The Bayer Turf Solutions team are BASIS qualified and are available to answer technical questions and to give educational seminars in the use of plant protection products in the turf and amenity sector. Turn to page 6 to find out more about the team.







Use Medicines Responsibly (www.noah.co.uk/responsible) Drontal Dog contains praziguantel, pyrantel embonate and febantel [NFA-VPS]. Drontal Cat contains praziquantel and pyrantel embonate [NFA-VPS]. Advantage contains imidacloprid [NFA-VPS]. Please refer to appropriate data sheet at www.noahcompendium.co.uk. Further information available from SPC or on request. Registered Trade Mark of Bayer plc, Animal Health Division, Bayer House, Strawberry Hill, Newbury RG14 1JA Tel: 01635 563000.











Turf Solutions team

The Bayer UK and Irish team consists of former greenkeepers and groundsmen which combine the expert scientific knowledge of Bayer with a practical understanding of how the Bayer products can be incorporated into an integrated turf management programme.

Dr. Colin Mumford

With wide-ranging experience and qualifications in the amenity and sports turf sector, Colin has a role that's largely focussed on advising industry professionals with general management, best practice advice and he's the first port of call if there's an issue, disease, or insect problem.

Neil Pettican

With 20 years' experience in the turf and amenity sector, and a masters degree in sports turf technology, Neil has hands on experience in greenkeeping, groundsmanship and new constructions; giving a diverse mix of sports turf expertise in the UK and abroad. He's worked on a number of international class events at Wembley Stadium and has also been involved with four European Tour golf tournaments.

Dave Orchard

Dave's been immersed in a world supporting amenity professionals for over 20 years. His career started with Rigby Taylor and from there he worked for eight years as a technical representative for Gem Professional. Dave has been with Bayer since 2006.

Greg Collins

Greg is based in Ireland and has been in the industry for 23 years. A key part of his role is communicating up-to-date information to keep customers completely informed about products, best practice, and legislation changes, as there are often vast differences to the rest of the UK.

Section 2 Plant Health



Contact the Turf Solutions team with your questions at turfsolutions@bayer.com or on 00800 1214 9451.





Grass identification

A simple identification guide for the main turfgrass species

Grass species	Youngest leaf	Upper leaf surface	Lower leaf surface
Annual meadow grass Poa annua	Folded	Tram lines	Dull
Bent Agrostis spp.	Rolled	Ribbed	Dull
Cocksfoot Dactylis glomerata	Folded	Smooth	Vein/rib on the back of the leaf
Fescue Festuca spp.	Rolled	Needle	Needle
Perrenial ryegrass Lolium perenne	Folded	Strong ribbed	Shiny
Smooth stalked meadow grass Poa pratensis	Folded	Tram lines	Dull
Yorkshire fog Holcus lanatus	Rolled	Soft, hairy, slightly ribbed	Dull





1. Leaf blade

3. Awn A bristle arising from the outer covering, or glumes, of the seed of a grass.





Ligule	Auricle	Other	
Yes	No	Crinkled leaf, seed heads	
Depends on species	No	Can be bluish green/grey colou to a point	r, leaf tapers
Yes (big)	No	Flat stem	
Not visible	Not visible		
Yes	Yes	Red base to stem	
Not visible	No	Darker green	
Yes	No	Purple / red striations on stem	base
Leaf blade Ligule Auricle Leaf sheath	 6. Auricles Small claw or ear-like outgrowths at the junction of leaf sheath and blade. Ligule Membranous extension at the junction of the lead sheath and blade. 	f	9. Ribbed leaf 10. Non-ribbed leaf
7	 7. Boat-shaped tip Characteristic of <i>Poa spp</i> 8. Tramlines Two parallel lines, and 		11. Rolled in bud: Characteristic of italian rye-grass.
8	either side of the mid-rik Easily seen if held up to the light. Characteristic of <i>Poa spp.</i>		12. Folded in bud: Characteristic of perennial rye-grass.

Plant Health)





What is turf stress?

The day-to-day management practices on managed turf can subject turfgrass to year round stress. This turf stress results in poor growth and reduces the grass sward's ability to recover, making it more susceptible to disease threats. Reducing plant stress, especially when approaching a period of dormancy or minimal growth in the late autumn and winter, will help improve the grass plant's ability to withstand disease. Identifying the causes of stress enables turf managers to minimise, cure or avoid these stress factors.



Mowing: blunt blades tear the grass leaf tips creating a wound with a large surface area. This increases the potential for disease to penetrate the grass plant.

Dew control: most diseases thrive in moist conditions; keeping surfaces as dry as possible through regular switching or brushing to knock dew off the leaf will help keep the leaf as dry as possible.

Drainage: check drainage inspection chambers and outlets to ensure adequate drainage is achieved. Improve surface water infiltration by spiking the surface with a light 'sarel' roller or by undertaking aeration if the weather conditions are suitable.



Light and airflow: shade and poor airflow will help emphasise the moist conditions that need to be avoided. Dense tree and shrub canopies can reduce light levels, even in the winter when the leaves have fallen off deciduous trees. Conditions can be improved by thinning dense tree canopies, but always seek advice from a qualified arborist or tree surgeon before undertaking any thinning work.



Pests: Chafer grubs and Leatherjackets feed on the grass plants roots, causing it to die back and exhibit straw coloured leaves.

Maintenance: Maintenance operations can cause significant turf stress. Soil compaction from maintenance machinery will impede root development as well as drainage. Sand dominant dressings can be abrasive and graze or scrape the grass plants leaves, affecting their ability to function properly. This, alonside inappropriate fertiliser applications, particularly toward the end of the growing season, can create soft growth that is more prone to disease infection.



Stress management

Interface is the first UK and Irish fungicide developed using StressGard Formulation Technology, this formulation has been fine-tuned to upgrade the performance of the product, to provide superior disease control and visibly healthier turf.

As well as delivering disease control against 6 key turf diseases, Interface with StressGard Formulation Technology also provides the following turf benefits:

- Broad-spectrum dual-action fungicide.
- Enhanced turf colour.
- Better UV stress management.
- Increased drought tolerance.
- Improved turf quality and plant health.

Some of these benefits may be available separately in fungicides and plant health products from other manufacturers; but Interface with StressGard Formulation Technology has these proven technologies already built in. The benefits add up to improved disease control, enhanced turf colour and density, and overall improvements in turf quality and plant health.

StressGard Formulation Technology enhances the ability of Interface to deliver turf health benefits by augmenting plant physiology so turf can fight stress and perform better.









Broad-spectrum fungicide

Interface with StressGard Formulation Technology contains iprodione and trifloxystrobin, which can be used at any stage of the disease and at any time of the year; delivering preventative, curative and eradicant disease control and long-lasting protection against the 6 key turf diseases.

Enhanced turf colour

Interface with StressGard Formulation Technology enhances the chlorophyll related green turf colour, adding to the natural aesthetic characteristics of turfgrass. The improved natural appearance lasts up to 6 weeks.

Better UV stress management

Interface with StressGard Formulation Technology reduces the impact of harmful ultraviolet radiation and selectively allows for the transmission of red and blue light wavelengths used by turf plants for photosynthesis. Products that block all radiation, including the red and blue wavelengths, may actually injure plants by reducing the light available for photosynthesis (McCarty, B., Gore, A. and Gann, J. 2014). The degree of selective radiation and light filtration has not been scientifically documented for non-StressGard Formulation Technology products.

For more information on Interface please turn to page 28.

Increased drought tolerance

Interface with StressGard Formulation Technology contains trifloxystrobin and can be used to assist in stress reduction on turfgrass. Trifloxystrobin reduces oxidative stress in plants, resulting in increased tolerance to drought and other abiotic factors (Han et al. 2012). It has been proven to improve turf quality under drought stress conditions (based on Bayer EU 2014 data).

Turf quality

Interface with StressGard Formulation Technology is proven to improve turf quality, resulting in improved playability. This includes improvements in turf density, visual appearance and homogenity of turf. Data has been accumulated from a large number of independent UK trials to verify these turf quality attributes. Therefore the turf is better able to handle physical stresses such as traffic and cutting stress. These all result in visibly healthier turf.



Section 3 Disease Control

McCarty, B., Gore, A. and Gann, J. 2014. Is the grass really greener? Golf Course Management 82(8):86-9.1. Han, S. H., Kang, B. R., Lee, J. H., Lee, S. H., Km, I. S., and Kim, C. H. 2012. A Trifloxystrobin Fungicide Induces System Tolerance to Abiotic Stresses. The Plant Pathology Journal 28:101-106. StressSard™ Formulation Technology is a trademark of Bayer CropScience Ltd.



Introduction to turf diseases

Turf diseases

Intensively managed turf is usually under considerable stress which can affect the grass plants health, making it more susceptible to disease infection. The adverse effects of diseases upon turf can result in a reduction in the playability and wear tolerance of the playing surface as well as the aesthetic value of the turf.

Parasitic fungi invading plant tissues and sapping the plant of vital nutrients are the most common cause of turf diseases. Turf can, however, be indirectly affected by the fungi in the rootzone which create hydrophobic conditions that reduce the availability of water and nutrients to the grass plant, causing a disorder, such as Localised Dry Spot (LDS). Employing management regimes to improve conditions suitable for turf growth can considerably reduce disease incidence.

An integrated approach to disease prevention and control, often referred to as Integrated Disease Management (IDM), uses a combination of cultural, biological and chemical processes. An IDM approach to turf management will help achieve a high quality turf surface with optimum playability. The following sections highlight typical IDM practices and how they can improve the health of the grass plant and reduce the potential for turf to be affected by disease infection.

Integrated disease management practices

Cultural

Correct feeding

Nitrogen, potassium and phosphate are the main nutrients required by grasses although other elements, such as trace elements, are also required. The optimum requirements of these will vary depending on the time of year, weather conditions, grass species, soil type and other management regimes. Some diseases are more likely to occur where soil fertility is low, for example Red thread and Dollar spot. Conversely the occurrence of Microdochium patch (commonly referred to as Fusarium patch) is encouraged where fertility is high.

Organic matter control

Excessive organic matter (thatch) is the food substrate many fungi use. Thatch also holds water during wet periods and this may encourage growth of the pathogens. Practices, such as scarifying, hollow tine coring and the application of suitable top dressing material will physically remove or dilute thatch and improve air movement into the root zone. This allows the soil microbes to proliferate and, as they feed on the thatch, helps to reduce it further.

Water management

Most turf diseases infect more easily in conditions of high humidity or surface wetness. Increasing airflow within the turf canopy can reduce humidity and reduce the water needed for spore germination and infection by many pathogens. Irrigation should be carried out just before dawn, followed by the removal of dew by switching or brushing.

Shade

Shade increases the length of time the grass surface remains wet. Morning sunlight is important to encourage surface drying, therefore reduce shade on turf where possible.

Cutting height

Intensive mowing regimes place grass under greater stress, making it less able to survive the symptoms of disease. Increasing mowing heights slightly, particularly in periods of stress conditions such as drought, can improve turf vigour, reducing susceptibility to disease.

Soil pH

The optimum pH for grass growth is between 5.5 and 6.5, although grass can survive in a much wider range, some species more so than others. An excessively high pH, above 7.0 (alkaline), is linked to the occurrence of diseases such as Take-all patch. Consider testing the pH of the root zone and irrigation water.

Biological

Maintaining good soil biology to encourage the natural processes that help break down organic matter and release nutrients will contribute to good plant health. Carrying out good regular cultural practices, as identified in the previous section, will help achieve an environment conducive to microbial communities. Microbial inoculants can be used to further boost the microbial populations.

Cultivar selection

Cultivars can have different susceptibility to particular diseases. Using a less susceptible seed for over sowing or renovating a disease prone area can improve the overall sward's disease tolerance.

Fungicides

Fungicides consist of a range of active ingredients, which may be used preventatively, curatively or as an eradicant to protect turf from infection, prevent further spread of disease and/or to reduce existing disease symptoms.

Which products to use

Choosing the correct fungicide is dependant on identifying which diseases are most likely to cause symptoms and the high risk factors for these diseases. The developmental stage of the pathogen is also important as successful control may depend on the pathogen activity at application. Turn to page 2 for the Bayer Product Selection Table.

Application timing

Contact fungicides are favoured by turf managers because they will continue to control disease even when the grass is not growing which is often during the height of the Microdochium patch season. Systemic fungicides are absorbed by the grass plant and moved around the plants so they are best applied when the turf is actively growing. The different types of systemic modes available include acropetal penetrant and mesostemic. An acropetal penetrant moves upwards in the xylem (which moves water from the roots to the leaf) from the point of application. Mesostemic creates a weather resistant reservoir on the plant's surface which retains the fungicide and enables continual penetration.

Please remember when using fungicides to adhere to label recommendations and ensure all COSHH regulations are applied.

Rotation of actives is necessary as part of an Integrated Disease Management (IDM) approach as switching between the different chemical families reduces the risk of resistance build-up.







Disease life cycle

The diagram below shows the disease life cycle of Microdochium patch (commonly referred to as Fusarium patch). Bayer fungicides are very effective at providing both curative and eradicant activity, as well as preventative, which gives them added flexibility compared to other fungicides which are largely protective in nature.

Preventative







Stage 1 Spore Germination

Spores are present but they are not visible to the naked eye.

Stage 2 Very first signs of Microdochium patch development Visible to the naked eye.

Stage 3 Early Microdochium patch spreading

Early control is the key for disease control; be vigilant and monitor the turf surface regularly for signs of disease or plant stress. The sooner you treat disease incidence, the less likely it is that the playing surface will be affected. Delaying using a fungicide can be a risky policy, if there is a sudden change in the weather and you cannot apply a spray application because of the conditions, you can easily get caught out with the disease taking hold and spreading across your playing surface. Turf managers should be looking for early signs of disease, with preventative, rather than curative treatments vital to ensure the best playing surfaces throughout the year.

Eradicant



Stage 4 Microdochium patch spreading with mycelial growth



Stage 5 Fully developed Microdochium patch

Product Name	Application Timing Stage of disease life cycle						
	1	2	3	4	5		
Chipco Green	•	•	•	•			
Dedicate	•	•					
Interface	•	•	•	•	•		
Scorpio	•	•					

Photographs courtesy of STRI.

If a fungicide is required, ideally do not mow for at least 24 hours prior to applying the fungicide so that you have the maximum leaf area possible to apply to. If possible, do not mow again for at least 24-48 hours after the application, and always read the label to make sure the product can be used at that time of year.

Turf managers must also plan their treatment programme based on a combination of weather information, visual assessments and knowledge of the turf reaction to certain environmental conditions. If it's left until the disease takes hold of the turf, an eradicative treatment will be necessary. This is more likely to lead to scarring which, during the winter month, will take longer to recover.







How to identify turf disease

The identification of turf disease is not easy, because the symptoms vary considerably with grass species and the environmental conditions.

This key will help you make a start. At each **numbered choice**, decide which description fits best and then go to the **)** • **number given.**

1 2 3	Disease most typically associated with cool, humid/wet weather conditions. Disease most typically associated with warm weather conditions. Disease most typically associated with mild weather conditions.) ()) ()		0	EITHER symptoms start as small pale coloured circular spots. Hourglass lesions may be present on individual leaves and 'spiders web' mycelium may be present on a dewy morning. OR symptoms show as regular shaped) Dollar spot	p25
4	EITHER damage revealed by melting snow OR not associated with melting snow.) 5) 6			affected patches. OR sympoms show as irregular affected areas.) (D	
6	EITHER patches with pink/white coloured mycelium. OR patches with grey/white mycelium with small (<4 mm) brown, oval or round sclerotia in the dead grass leaves.	 > Pink snow mould > Grey snow mould 	p26	8	EITHER patches up to 1m across, of brown/ bronze coloured bentgrass with blackened roots and other grasses/broadleaved weeds colonising the central part of the patch. OR patches brown/grey or yellow rings 10-60 cm in diameter.) Take-all patch	p28
6	EITHER patches of dead grass, usually with paler centres and dark borders. Pink/white mycelium and salmon coloured sporodochia* may also be present.	» Microdochium patch	p26	0	EITHER grey/brown patches (mostly on bentgrass) often showing greyish 'smoke rings' of mycelium in morning dew; temperatures more than 20°C.) Rhizoctonia brown patch	p24
	OR small spots or individual plants of annual meadow-grass with yellow leaves. The youngest leaf may be brick red and the base black.	> Anthracnose basal rot	p24		OR yellow rings mostly on bentgrass; temperatures 10-20°C.	> Rhizoctonia yellow patch	





How to identify turf disease continued

0	EITHER irregular areas of turfgrass exhibiting drought like appearance, most common when annual meadow grass is dominant and nutritional input low. Inspection with a hand lens will reveal acervuli* and hair like setae*.) Anthracnose foliar blight	œ	EITHER rings of dead grass with stimulated growth on the inner and outer side of the ring. Fruiting bodies may be present. OR rings of darker green stimulated growth with no central dead zone. Fruiting bodies may	 > Type 1 fairy ring > Type 2 fairy ring 	
	OR irregular areas of smooth stalked meadow grass or fescue with white powdery mycelia covering the grass leaves. OR irregular areas of slow growing smooth stalked meadow grass showing orange or yellow powdery spores in raised pustules.	smooth stalked meadow vhite powdery mycelia ves. slow growing smooth as showing orange or es in raised pustules. Powdery mildew Powdery mildew Powdery mildew		be present. OR rings/arcs/ribbons or solitary mushrooms present with no other symptoms. OR patches of white/grey/yellow mycelium with no fruiting bodies. Characteristic mushroom	p25) Type 3 fairy ring) Thatch fungi	
0	EITHER symptoms appear as individual plants with pale green/yellow tufted growth and very poorly developed roots. OR sympoms appear as small spots of) Yellow turf	ß	smell from rootzone. EITHER irregular areas of thin, weak grass exhibiting leaf lesion on close inspection. OR irregular patches of bleached turf with overall) ()	
	water soaked grass, which may develop into patches of dead grass, usually with paler centres and dark borders. Pink/white mycelium and salmon coloured sporodochia* may also be present.) Microdochium patch		OR irregular areas with purple/yellow/grey or white gelatinous masses of egg-like structures covering leaves.) Red thread p2	27
	OR symptoms appear as rings/ribbons/arcs or patches often with white mycelium in the soil. OR symptoms appear as irregular areas.) 12) 13	Ð	EITHER perennial ryegrass with oval or circular lesions, pale in the centre with chocolate brown borders.) Leaf spot (<i>Dreschlera siccans</i>) p2	27
	*Sporodochia: small, compact circles usually formed on h *Acervuli: one of the groups of conidiomata produced by below the cuticle of host tissue, it is a small cushion like produced spores	nost plants parasitised by mitosporic fungi. the parasitic fungi coelomycete. Formed just structure which contains a mass of asexually		OR other grass species with lesions. Lesions may) Red leaf spot	
	*Setae: bristle or hair like structure on a living organism. It Key courtesy of STRI.	derives from the Latin word for "bristle".	Dis	often have pale centres.	> Leaf spot	21

Turf diseases



Basal rot anthracnose

Colletotrichum spp. Latin name:

Habitat & timing: Fairly common on poorly managed turf in late summer and autumn. Predominantly Annual meadow grass.

> Leaves of affected plants turn yellow and the youngest leaves often turn red. The plants rot at the base and can be pulled out with great ease. A black staining at the base of the plant can be seen when the disease is at the advanced stage.

Control:

Latin name:

Symptoms:

Symptoms:



Foliar anthracnose

Collectotrichum graminicola.

Turn to pages 28, 30 & 34.

Turn to pages 28, 30 & 34.

Habitat & timing: Most common on Annual meadow grass but can affect all grasses during warm weather.

> Irregular areas of turfgrass exhibiting drought like appearance due to the presence on the leaf surface of countless numbers of dark brown fungal fruiting structures called acervuli.

Control:



Fairy rings

Brown patch

Lat Des

Latin name:	Rhizoctonia solani.
Habitat & timing:	Affects many grass species, in humid and warm temperatures above 20°C, heavy dew, excessive fertility and poor drainage.
Description:	Brown patch survives and spreads by mycelium in debris and soil and it infects through wounds or direct penetration.
Symptoms:	On closely mown turf, grey/brown circular patches appear 1-50 cm in diameter. The tissue becomes dark and water soaked and the infected spots turn brown and die. Under warm, humid conditions, the affected patches will have what is called a 'smoke ring' around the edge of the affected turf. On taller grasses light brown patches form and often a close inspection reveals leaf lesions.

Basidiomycetes fungi.
Toadstool producing fungi inhabit the soil 3-18 inches below the grass. Various species divided into groups according to their effect on the turf: Type 1: Ring of dead grass bordered by darker green grass (illustrated). Type 2: Ring of darker green grass. Type 3: Just a ring of toadstools.
Patches of white/grey/yellow mycelium with no fruiting bodies caused by a number of non-sporing basidiomycetes.



Turf diseases continued



Vicrodochium patch Commonly referred to as Fusarium patch)				
_atin name:	Microdochium nivale.			
Habitat & timing:	All times of year, most types of soil; Annual			

meadow grass particularly susceptible. Symptoms: Orange-brown patches, 1-2 inches acr

Turn to pages 28, 30, 32 & 34.

Orange-brown patches, 1-2 inches across, increase in size under suitable conditions and join up to form large areas. Often active after snow cover when it appears as a brown ring around a straw-coloured or pinkish centre.

Control:



Grey snow mould

Latin name: Habitat & timing: Symptoms:

e: Typhula incarnate and Typhula ishikariensis.

All grass species can be affected and prolonged snow cover is a high risk situation.

Yellow/brown patches are visible before snow which spreads under snow to patches of grey/white mycelium with small (less than 4 mm) brown, oval or round

sclerotia in the dead grass.



Leaf spot/melting out

Latin name:	Drechslera spp. and Bipolaris spp.
Habitat & timing:	May be found in turf containing susceptible grasses at any time of year if conditions are ideal.
Description:	A disease which attacks Smooth stalked meadow grass (<i>Poa pratensis</i>).
Symptoms:	General browning and gradual disappearance of susceptible grasses. Individual grasses have brown or purple spots with straw-coloured centres.
Control:	Turn to pages 28, 30 & 34.

Red thread/pink patch

Latin name:	Laetisaria fuciformis and Limonomyces roseipellis.
Habitat & timing:	Common on swards of low fertility, specially late summer and autumn; Fescues and Ryegrass particularly susceptible.
Description:	Now thought to be a 'complex' involving two species; <i>Laetisaria fuciformis</i> produces red needles attached to leaf; <i>Limonomyces</i> <i>roseipellis</i> produces pink mycelium in morning dew.
Symptoms:	Poorly defined patches of bleached grass.
Control:	Turn to pages 28, 30, 32 & 34.



Dollar spot

Latin name: Rutstroemia floccosum (formerly Sclerotinia homoeocarpa) Habitat & timing: Affects many grass species.

Symptoms:

Small brown spots about 1-2 inches in diameter, which may occur in clusters affecting larger areas. The patches turn from brownish-yellow to brownish-grey.

Control:

Turn to pages 28, 30 & 34.



Turf diseases continued



Gaeumannomyces graminis.

Habitat & timing: The disease can occur on all types of turf, but is mostly found on Bentgrass and Annual meadow grass. It is often induced by the practice of applying lime to neutralise an acid soil and high risk conditions include; alkaline root zone, alkaline irrigation water, poor drainage, excessive thatch and lack of manganese.

Description:

Symptoms:

infected plants and spreads by ascopsores (wind, water, soil and debris). It infects by runner hyphae into the root and through direct penetration.

Take-all patch survives in previously

Initial signs start as small patches that could increase to 1m across. Plants take on a brown/bronze colour but as the disease progresses and the root system is gradually reduced the plants die, being easily removed from turf. At the base of the stem and around the crown dark brown spores (1 mm) can be found. The disease can actively reduce the amount of manganese available to the plant.



Rust

Latin name:	Puccina spp.
Habitat & timing:	Many species of Rust occur on turf grasses and symptoms are normally seen in the summer and autumn; the most commonly affected grasses are Perennial ryegrass, Cocksfoot and Annual, Smooth stalked and Rough stalked meadow grass.
Description:	Rusts are fungi of the order Uredinales, many of these species are plant parasites. These rusts have two or more hosts and up to five spore stages. Their spores are airbourne and can travel great distances. They mostly cause foliar infections.
Symptoms:	Rusts appear as small chlorotic flecks followed by orange or brown spore pustules on the leaves, either scattered randomly or in lines.
Control:	Turn to pages 28, 30 & 34.

Turf diseases such as Anthracnose and Red thread are a classic result of nitrogen deficiency, maintaining adequate plant nutrition will help prevent their occurance. When present, while applying a fertiliser may seem like the next course of action, it is important to note that applications of a nitrogen based fertiliser can make the grass plant more susceptible to disease if over applied at the end of the summer.

No two playing surfaces are the same, therefore there's no 'one size fits all' approach that can be advised. It's important that turf managers know what disease threatens their turf, and what pressures they are likely to encounter in certain weather conditions.





Interface

- Unique StressGard Formulation Technology.
- Contact and mesostemic turf fungicide.
- Offers control against 6 key turf diseases.
- Can be used all year round.

Diseases controlled

Interface delivers disease control against 6 key turf diseases. Interface is the first turf fungicide with StressGard Formulation Technology. This Bayer formulation has been fine tuned to upgrade the performance of the product, providing superior disease control leading to visibly healthier turf.

Interface controls Microdochium patch, Red thread, Dollar spot, Leaf spot and Rust and gives moderate control of Anthracnose, where present at the time of application against other listed diseases.

Areas of use include:

- Golf courses.
- Professional sports grounds/stadiums.
- Bowls areens.
- Cricket pitches.
- Lawn tennis courts.
- Lawns.

Rainfastness

The special liquid formulation of Interface is rainfast within 1 hour. Once the spray application has dried on the leaf surface, rainfall will not interfere with its ability to control disease



Timing of application

Interface can be applied during the spring/ summer/autumn when turf is actively growing; during the winter when turf is slow growing or near dormant: or at times of increased disease stress.

Application rates

Add the required quantity of Interface to a half-filled spray tank with the agitation system in operation and then fill to the required level. Continue agitation at all times during spraying until the tank is completely empty, this aids the effective mixing for all fungicides. Spray immediately after mixing.

After use

Wash equipment thoroughly after use.

Disease management

Interface can be applied as part of an IDM approach and can be integrated into your exisiting turf fungicides programme to ensure rotation of fungicide groups. It is a perfect partner for Dedicate or Chipco Green.









Application equipment Vehicle-mounted hydraulic sprayer Knapsack sprayer Rate per hectare Water per hectare Rate per 100 m² Water per 100 m² 100 ml 4-6 litres 400-600 litres Rate per 500 m² Water per 500 m² 10 litres 500 ml 20-30 litres

Turn to page 68 for further information on spray targeting and nozzle selection.



Contact

- Fungicide remains on the leaf surface, acting as a shield.
- Provides a barrier to protect against infection.



Mesostemic

- Creates weather resistent reservoir on plant's surface.
- Reservoir retains fungicide.
- Enables continual penetration and replacement of active ingredients.

Interface® contains 256 g/L iprodione and 16 g/L trifloxystrobin. USE PLANT PROTECTION PRODUCTS SAFELY. ALWAYS READ THE LABEL AND PRODUCT INFORMATION BEFORE USE. PAY ATTENTION TO THE RISK INDICATIONS AND FOLLOW THE SAFETY PRECAUTIONS ON THE LABEL. (MAPP 16060, PCS 04882) Chipco®, Dedicate® and Interface® are registered trademarks of Bayer CropScience Limited. Packshot for illustration purposes only, pack may vary.



Disease Control)



Dedicate

- Contact and systemic turf fungicide.
- Rapid acting and long lasting.
- Controls 6 key turf diseases.



Diseases controlled

Dedicate is a contact and systemic turf fungicide for the control of Microdochium patch, Red thread, Dollar spot, Anthracnose, Leaf spot and Rust in managed amenity turf, at any time of year.

Areas of use include:

- Golf courses.
- Commercial and residential lawns.
- Sports fields.
- Parks.
- Bowls and cricket pitches.
- Municipal grounds and cemeteries.

Timing of application

Dedicate should be used preventatively or as early as possible in the disease cycle, applying at the first sign of disease. It can be used when grass is either dormant or actively growing and displays both protective and some curative activity.



Application rates

Add the required quantity of Dedicate to the half-filled spray tank with the agitation system in operation and then fill to the required level. Continue agitation at all times during spraying until the tank is completely empty, this aids the effective mixing for all fungicides. Spray immediately after mixing.

After use

Wash equipment thoroughly after use.

Disease management

Dedicate can be applied as part of a disease management programme. It is a perfect partner for Interface or Chipco Green.



Visit www.environmentalscience.bayer.co.uk





Application equipment							
Vehicle-mounted	hydraulic sprayer	Knapsack sprayer					
Rate per hectare	Water per hectare	Rate per 100 m ²	Water per 100 m ²				
		10 ml	4-5 litres				
1 litre	400-500 litres	Rate per 500 m ²	Water per 500 m ²				
		50 ml	20-25 litres				

Turn to page 68 for further information on spray targeting and nozzle selection.



Dedicate® contains 200 g/L (18.2% w/w) tebuconazole and 100 g/L (9.10% w/w) trifloxystrobin. USE PLANT PROTECTION PRODUCTS SAFELY, ALWAYS READ THE LABEL AND PRODUCT INFORMATION BEFORE USE. PAY ATTENTION TO THE RISK INDICATIONS AND FOLLOW THE SAFETY PRECAUTIONS ON THE LABEL. (MAPP 17003) Chipco®, Dedicate® and Interface® are registered trademarks of Bayer CropScience Limited. Packshot for illustration purposes only, pack may vary.



Scorpio

- Preventative and curative activity.
- Effective in cool conditions.
- Less packaging reduces disposal costs.
- Mesostemic action.

Diseases controlled

Scorpio is a broad spectrum strobilurin fungicide displaying both protective and some curative activity against Microdochium patch and Red thread in managed amenity turf.

Areas of use include:

- Golf courses.
- Lawns.
- Sports fields.
- Parks.
- Municipal grounds.
- Cemeteries.

Timing of application

Apply at the first sign of disease. Scorpio can also be used in a preventative control programme.



Application rates

Add the required quantity of Scorpio to the half-filled spray tank with the agitation system in operation and then fill to the required level. Continue agitation at all times during spraying until the tank is completely empty, this aids the effective mixing for all fungicides.

Spray immediately after mixing.

After use

Wash equipment thoroughly after use.

Disease management

Scorpio can be applied as part of a disease management programme. It is a perfect partner for Interface or Chipco Green. Visit www.environmentalscience.bayer.co.uk to view the label and safety data sheets.





Application equipment							
Vehicle-mounted	hydraulic sprayer	Knapsack sprayer					
Rate per hectare Water per hectare		Rate per 100 m ²	Water per 100 m ²				
	400-500 litres	7 grams	4 litres				
0.7 kg		Rate per 500 m ²	Water per 500 m ²				
		35 grams	20 litres				

Turn to page 68 for further information on spray targeting and nozzle selection.



Scorpio® contains 500 g/KG (50.0% w/w) trifloxystrobin. USE PLANT PROTECTION PRODUCTS SAFELY. ALWAYS READ THE LABEL AND PRODUCT INFORMATION BEFORE USE. PAY ATTENTION TO THE RISK INDICATIONS AND FOLLOW THE SAFETY PRECAUTIONS ON THE LABEL. (MAPP 12293) Chipco®, Scorpio® and Interface® are registered trademarks of Bayer CropScience Limited. Packshot for illustration purposes only, pack may vary.

Main usage period											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec



Chipco Green

- Curative and preventative control.
- Contact action rapid control.
- Rainfast in 1 hour.
- Approved for 6 turf diseases on key turf areas.

Diseases controlled

Chipco Green is and has been the UK and Ireland's No.1 contact fungicide for over 30 years. Tried and trusted by turf managers on some of the most prestigious turf around the world, Chipco Green is a truly global player.

Areas of use include:

- Golf courses.
- Lawns.
- Bowling areens.
- Cricket pitches.
- Tennis courts.
- Professional sports grounds/stadiums.

Timing of application

Chipco Green can be used preventatively and curatively and can be applied at any time of the year when grass is either dormant or actively growing.

Rainfastness

The special liquid formulation of Chipco Green is rainfast within 1 hour. Once the spray application has dried on the leaf surface, rainfall will not interfere with its ability to control disease.





Chipco Green can also prevent the build-up of morning dew on grass leaves for up to 2 weeks after application. Dew 'Switching' to remove morning dew during this time is therefore usually unnecessary.

Application rates

Add the required quantity of Chipco Green to the half-filled spray tank with the agitation system in operation and then fill to the required level. Continue agitation at all times during spraying until the tank is completely empty, this aids the effective mixing for all fungicides. Spray immediately after mixing.

After use

Wash equipment thoroughly after use.

Disease management

Chipco Green can be applied as part of a disease management programme. It is a perfect partner for Interface or Dedicate.







	Application equipment						
	Vehicle-mounted hydraulic sprayer		Knapsacl	k sprayer			
Disease problem	Rate per hectare	Water per hectare	Rate per 100 m ²	Water per 100 m ²			
<i>Alicrodochium nivale</i> Microdochium patch) <i>Laetisaria fuciformis</i> Red thread) <i>Colletotrichum graminicola</i> Anthracnose)* <i>Puccinia coronata</i> Rust)* <i>Rutstroemia floccosum</i> Dollar spot) <i>Drechslera poae</i> Leaf spot)*	20 litres	500 litres	200 ml	5 litres			

*Useful reduction when present at time of application against the other listed diseases.

Turn to page 68 for further information on spray targeting and nozzle selection.



Chipco® Green contains 255 g/L (25% w/w) iprodione. USE PLANT PROTECTION PRODUCTS SAFELY. ALWAYS READ THE LABEL AND PRODUCT INFORMATION BEFORE USE. PAY ATTENTION TO THE RISK INDICATIONS AND FOLLOW THE SAFETY PRECAUTIONS ON THE LABEL. PROTECT FROM FROST. (MAPP 13843) (PCS 02714) Chipco®, Dedicate® and Interface® are registered trademarks of Bayer CropScience Limited. Packshot for illustration purposes only, pack may vary.



Ryan Golding

Head Groundsman

Leeds Rhinos & Yorkshire Carnegie (Formerly Leeds rugby)

In June 2015 Ryan Golding had a pitch that was completely riddled with Leaf spot. Desperate to combat the problem, he looked at different contact fungicides, and on the recommendation of his peers, applied Interface with StressGard Formulation Technology. As a result, the Leaf spot was eradicated and now Ryan swears by it as a trouble-shooter.

"It was a warm September, we were watering frequently, and still applying typical levels of nitrogen. We also had lots of games on, and the turf grass was pretty stressed from play," says Ryan.

"We noticed a small patch of Leaf spot – around 10 square metres, and applied a contact fungicide to the affected area. We thought this would treat the problem, however, when we came back the next morning, it was all over the pitch," he says.

Ryan had a look at a number of alternative contact fungicides, and chose Interface. "It isn't the cheapest product on the market, but I wanted to treat the problem once and treat it right, rather than do it wrong three times, wasting money and time.

Application was easy and we saw very good results. After a couple of days, and a few cuts, the Leaf spot was eradicated and there was no resurgence of disease," adds Ryan. Preventatives are used on the pitch, and while Interface can be used in this way, as it lessens turf stress, and protects against key turf diseases such as Leaf spot, Ryan uses it as a trouble-shooter instead. This is because he has to swap around the treatments he applies, to ensure the turf doesn't build up a tolerance.

"We use preventatives, but inevitably, with the amount of games we have on, when the conditions are right for Leaf spot, we have to treat immediately. The last thing we want is a yellow pitch, with the amount of high profile games we host, and for this we use Interface.

It's a brilliant product, and a vital part of my armoury. It's shown fantastic results when treating Leaf spot, it's easy to use, works quickly, and is one of the best contact fungicides I've used," adds Ryan.

Section 4 Pest Control



Turf pests

Pests are those species that cause damage to the turf, or create an environment that impacts on turf grass health, performance characteristics, and appearance.

Over the past few years there has been an increasing problem with high infestations of Chafer grubs (*Phyllopertha spp.*) and Leatherjackets (*Tipula spp.*) which has resulted in severe damage to lawns and amenity turf.

Chafer grubs are the larvae of Chafer beetles and Leatherjackets are the larvae of Crane fly (commonly called Daddy longlegs). These small but very destructive larvae can cause severe damage to the root system of turfgrass, whether on golf courses, football pitches or racecourses. Playing surfaces can become unplayable or even dangerous as the turfgrasses influence on surface stability is compromised. In some cases the whole root system can be severed and the turf can be rolled up like a carpet. Secondary damage is then caused by birds, badgers and foxes lifting the turf to feed on the grubs.



Pests



Lifecycle of Chafer grubs

The life cycle of the Chafer grub varies depending on the beetle species and local climatic conditions but can be generalised as follows;

Adult beetles emerge from their pupal cases and begin to fly in large numbers (in heavily infested areas) at dusk from late May to June. Adults fly to nearby trees and shrubs where they mate on mass until dawn at which point the adults return to the soil. Climate influences this behaviour with less flight and mating taking place on cool and/or rainy nights. Several mating flights may be made but eventually the females lay 15-20 eggs over a 2-5 day period. Eggs are laid 15-20 cm deep in the turf and hatch in about 2 weeks. If moisture levels are good the larvae move up toward the surface and begin to feed on plant roots. In drier conditions they may remain lower down in the soil. Larvae feed until around late September when they move deeper into the soil where they overwinter. Pupation then takes place the following Spring (around mid-May) normally 5-15 cm below the surface. Some species of Chafer grubs may feed below ground for 2-3 years before changing into adult beetles. This means that larvae may be found at any time of the year though there will be higher numbers in Spring and Autumn.



Lifecycle of Leatherjackets

Adults start to hatch from pupae in late July/August and may be seen flying until September. After hatching they mate and the females lay eggs in the ground, a process which they accomplish in 24 hours. Eggs hatch in about 10 days and the new larvae start to feed on grass roots. During mild winters feeding can continue through the winter and into the following spring. Larvae stop feeding in May/June after which they will pupate close to the surface of the soil. Leatherjackets have one generation a year. Leatherjacket damage occurs from the autumn to spring but is most severe in the spring when the larvae are reaching maturity.

Integrated pest management practices

You can effectively treat for Chafer grubs between May and July, so it's important to be on the lookout for tell-tale signs of an infestation ahead of the summer months. A key indicator is drought stress, where grass leaves turn straw coloured. This occurs because the grubs, hatched from the eggs that the adult beetles laid in the soil last year, have been feeding on the roots of the turf grass through last summer, and now through the spring. With a damaged root system the grass plant doesn't have access to the water and nutrients it requires, so dies back and turns a bleached straw colour.

Pest Control)





Sometimes, however, if there is ample water available, the grass may not display drought stress. Therefore other signs to look for are whether the grass lifts easily. The grass won't have roots anchoring it to the soil, and in the most severe cases will actually come away from the ground, and peel off like a carpet. An increase in predators such as rooks, starlings, badgers and foxes feeding on the grass is another sign that you may have chafers present. These animals will easily tear up the unstable turf in search of grubs to feed on. Situations like these have been known to cause catastrophic damage to the playing surface, and can take an entire season to rectify, presenting a tough repair challenge. Ultimately, if you suspect Chafer grubs to be present, the best way to check is to remove the turf and see whether they're in the soil. Really bad infestations will have 1000 grubs per square meter. If you have a problem, you will be able to see the adult beetles in flight, usually around mid-May.

Cultural control

Removal of organic matter

Organic matter provides a food source for many turf pests, such as casting worms. Removing excess organic matter through aeration practices such as hollow coring, and diluting any organic matter build up through regular topdressing applications will reduce the available food source to the turf pests.

Acidic pH

Soils that have a high pH (>7.0) provide conditions that are more conducive to worm populations. Maintaining a soil pH between 5.5 and 6.5 will create an environment that is less favourable for worms. The use of sulphur based fertilisers will gradually lower the soil pH over time.

Soil moisture

Eggs laid by certain turf pests such as the

Chafer grubs in early summer, and the Leatherjacket in late summer, require moisture to survive. Dry periods that allow soils to dry will cause the eggs to desiccate and become unviable, leading to fewer eggs hatching. When possible, limit irrigation use at peak periods of insect activity, when they are laying eggs, to reduce egg viability.

Monitor for pests

Prevention is often better than cure, therefore a robust monitoring programme will help identify when pests of turf are present. When identified populations are approaching a threshold limit, at which damage can be anticipated, control measures can be put in place before any widespread damage to the turf occurs.

Fencing

Deter unwanted pests such as rabbits, badgers, foxes and deer by erecting appropriate fencing around the site of the area of turfgrass in use.

Repellents and scarers

Grazing animals such as rabbits can be deterred by the application of an unfamiliar scent or odour to the turf surface. Scarers can also be applied to minimise the more destructive secondary damage caused by birds and mammals. Techniques such as bird scarers, which include hawk kites, helikites, lasers, balloons, propane canons, electronic repellers, ultrasonic scarers, dogs, predators, radio controlled aircraft, and sonic scarers, will provide some deterrent activity.

Change the environment

Change the environment that favours the pest, in other words create the conditions that they do not like, which will vary depending on the pest species present. Most environmental changes will also be beneficial to your turf, for example removing overhanging branches that provide both a site for Chafer grubs to mate, and leaf litter for worms to pull down into the soil will improve the light levels on the turf surface. Other changes include drainage improvements, and maintaining a height of cut that does not provide safe harbourage for turf pests.

Biological control

Predatory Nematodes (Heterorhabditis bacteriophora and Steinernema feltiae)

Nematodes are naturally occurring microscopic wormlike obligate parasites of insects that can provide biological control of certain pest insects.

The nematode does not kill the insect grub but infects it with a lethal bacterium. The dead pest then provides the nematode an environment in which to complete its life cycle. An instant population reduction of a given pest insect is rarely achieved as the nematode population needs to multiply before it gets to a level that can achieve significant control.

The need for correct soil temperatures and an adequate water supply to maintain the nematodes whilst they establish can limit their use to small scale areas.

Chemical control

Chemical control is often quicker and more effective than other methods.

Aluminium phosphide

Approved aluminium phosphide products can be used for the control of rabbits and moles.

Merit Turf

Merit Turf is the only approved product for controlling Chafer grubs and Leatherjackets in the amenity sector. The most effective time to apply it is when adult chafers are flying around. This is when adult insects burrow into the soil and lay their eggs close to the surface before the grubs hatch and start feeding on the grass plant roots.







Insecticides

Merit Turf

- Long term preventative and curative control from one application per year.
- Improvement to turf quality.
- Fast acting proven chemistry.

Insects controlled

Merit Turf is a granular insecticide for the control of Chafer grubs and to reduce populations of Leatherjackets on golf courses, bowling greens, athletic fields, commercial and residential lawns and other managed amenity turf situations.

Merit Turf controls Garden Chafer, Summer Chafer, Cockchafer and Leatherjacket.

Merit Turf works in the following ways:

- Insects that have ingested or absorbed the imidacloprid stop what they are doing or suspend normal behaviour.
- Insects stop feeding immediately and do not survive.
- The grubs will either be affected by eating the turf roots (where the product has been transported systemically) or by absorption through their outer body.

Taking an annual approach to Chafer grub and Leatherjacket control helps reduce the issues which can arise through an infestation by these larvae. Understanding the different pest species and their lifecycles can help gain an insight into the best methods of treatment.

Application

Chafer grub control: There are four common species of Chafer grubs in the UK; the Cockchafer, the Garden Chafer, the Summer Chafer and the Welsh Chafer. These all have differing lifecycles and present a key challenge at multiple stages of their lifecycle.

The most effective control for Chafer grubs is to apply an insecticide treatment like Merit Turf preventatively, when the beetles are laying their eggs. This tends to be in late spring and can be anytime from the end of April through to July. A turf professional may need to apply an insecticide at this time of year, for several years



Visit www.environmentalscience.bayer.co.uk to view the label and safety data sheets.





Insects	Rate per hectare	Rate per 100 m ²	Rate per 1 m ²	
Cockchafer (Melolontha melolontha)				
Garden chafer (Phyllopertha horticola)	20 kg	200 grama	2 grama	
Summer chafer (Amphimallon solstitialis)	SU KY	SOU grains	o grains	
Leatherjacket (Tipula paludosa)				

depending on the species of Chafer and level of infestation as not all grubs will be eradicated with just one application.

Leatherjacket control: Leatherjackets (*Tipula spp*) are a common pest of lawns and protected ornamentals. The larval adult stage can cause extensive damage to turf roots. Adults emerge from June onwards but are most abundant in late summer or early autumn. Most eggs are laid just below ground level from mid-August to the end of September; eggs hatch about 14 days later. Merit Turf should be applied prior to the eggs hatching, ideally when the adult crane flies are visible as this is when they will be laying eggs.

Merit[®] Turf contains 5 g/KG imidaclopid. USE PLANT PROTECTION PRODUCTS SAFELY, ALWAYS READ THE LABEL AND PRODUCT INFORMATION BEFORE USE. PAY ATTENTION TO THE RISK INDICATIONS AND FOLLOW THE SAFETY PRECAUTIONS ON THE LABEL, (MAPP 12415, PCS 02896) Merit[®] is a registered trademark of Bayer CropScience Limited. Packshot for illustration purposes only, pack may vary.



Visit www.environmentalscience.bayer.co.uk to view the label and safety data sheets.

Merit Turf requires accurate and even application with calibrated equipment. Merit Turf is a granule product and should be applied at a rate of 30 kg per hectare (3 g/m^2) . It's preferable to apply when there's low light intensity to avoid any potential damage to the granules through exposure to high levels of ultra violet (UV) light. It's also important that the treated area is irrigated as soon as possible after application - to knock the granules off the leaf (to minimize exposure to sunlight) - and to wash them into the soil to the target region of the soil where the Chafer grubs/Leatherjackets and turf roots are. A minimum of 5 mm depth of water will be required, and if there's a significant thatch layer the irrigation rate should be increased to 10 mm depth of water or more, depending on thatch level.

Hand held, drop type and rotary type spreaders can be used to apply Merit Turf. The Bayer list of recommended spreaders includes:

- EarthWay's EV-N-SPRED Flex Select spreader.
- SS-2 drop spreader.
- TMA 2 applicator.

Merit Turf should not be bulked up with fertiliser or sand at application, because of the different densities of these materials. Do not apply Merit Turf when it is raining or in windy conditions.

For spreader calibration check out the Bayer Turf Solutions Youtube channel.



Turn to page 86 to find out more about application and equipment.

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lestyn Carpenter

Head Greenkeeper,

Corhampton Golf Club 18-hole private course in the South Downs National Park.

Before lestyn started to work at Corhampton in early 2010, distinct areas of the course were being damaged by birds and animals feeding on Chafer grubs. In 2008 and 2009 Merit Turf was used to treat small areas. Then in September 2009 extensive damage was caused to a number of tees, greens and bunkers which required re-turfing to bring the course up to a good condition.

On visiting the course before starting work at the Club, lestyn saw the damage and said *"I've never seen a golf course destroyed so much by chafers".* After receiving a report on previous years he realised that all the staff were doing was repairing damage causing the programmed development work and routine maintenance to always fall behind schedule. He suggested we needed to continue attacking the cause.

Noting that the areas previously treated with Merit Turf had remained clear he felt confident in its ability to eliminate the grubs and thus the rooks who fed on them were no longer damaging the turf. The Club backed his recommendation and Merit Turf continues to be applied annually.

lestyn states that the contractors apply Merit Turf once a year in the window between April and June, depending on the weather pattern in the spring. In the first year they treated 22 hectare, so the course was 'bullet proof'. They now treat either 8 hectare of the course to target specific areas or in the alternative year around 18 hectare to include the fairways and places where there are problems.

"It's an excellent product and, as long as you apply it at the right time and in the right way, working around the weather, it's very effective," he says. "It has eliminated the problem and we've completely turned the situation around."

Corhampton is a down land course over chalk which gives it a big advantage as the chalk absorbs water. In the winter this means the course is playable, even if there's above average rainfall, and if there's a dry spell, the water table doesn't drop as far as other local courses, ensuring the grass stays green.

"Just four miles down the road there are courses on heavy clay, and they face totally different problems," he says.

cont overleaf.



CASE STUDY

The combination of beating the Chafer grubs and having an all year round playable course has led to membership levels being maintained, increased green fee income in the winter and now a membership waiting list.

"Merit Turf is an important part of our integrated management strategy and, when turf management is challenging, it's very important to have this product as part of your armoury. When you monitor well, and get your timings right, you just cannot go wrong."

"We'll keep using the product. We can't afford to break the cycle and need to keep on top of the problem. Perhaps it's tempting to stop, because treating adds to our costs, but we must never go back to where we were."

"I swear by it, and by the support and expertise we get from Bayer. Anyone with Chafer grub problems should use Merit Turf."

Section 5 Weed Control





Introduction to weed control

Weeds in turf

A weed is any plant growing in the wrong place. However, some plants we consider to be weeds (wild flowers) in certain situations may be welcome in others as they provide species biodiversity and a habitat for bees as well as a variety of other insects and wildlife. Many broad-leaved plants can become established as weeds in turf areas. The height and frequency of mowing in turf restricts which weed species are able to adopt a low growing habit and invade turf.

Why control weeds?

Weeds can spoil the appearance of lawns and other turfgrass areas. Weeds compete very effectively with grass for nutrients, light, water and space. They can also reduce the drought tolerance of turf due to their larger leaf size and high transpiration rate. Weeds are less tolerant of "traffic" and will reduce the wear tolerance of a lawn or turf surface. Weeds affect the playability of sports turf by creating an uneven surface, which affects the smoothness and trueness of the turf surface. The Weeds Act 1959 legislates that some weeds, such as Ragwort, must be controlled in certain situations.

How to control weeds

Firstly, it is important to note the difference between total and selective herbicides.

Total herbicides are non-selective and will therefore control any plant including grasses, and are suitable for use on paths and other situations where all vegetation is to be removed.

Selective herbicides are specially developed to control broad-leaved plants within a turf area without killing the grass.

Cultural

- Mowing to remove seed heads
- Mowing will kill off annual weeds.
- Pull up weeds (ornamental).

Biologicals

- Cinibar moth for Ragwort
- Grazing animals

Herbicides

• Difference between selective, ornamental and total herbicides.

Selective herbicides

Which products to use

Choosing the correct selective herbicide is dependent on identifying which main weeds species are present.

Application timing

Best results are achieved when application is made whilst the turf is actively growing. The application of a fertiliser prior to treatment will improve weed control. During periods of drought, both grass and weeds are under stress and therefore not actively growing. This will adversely affect the uptake of herbicide, possibly reducing effectiveness, and may lead to scorching of the grass. The age of turf may need to be considered as some herbicides can be damaging, especially on newly established turf. If overseeding is required after weed control, consideration will need to be given to the period of restriction for oversowing on some herbicides.

Mowing

Mowing reduces the leaf area and consequently the absorption of the herbicide by the target plant. Therefore, applications ideally should not be made less than 3-4 days after the last mowing. After spraying a further 3-4 day period without mowing will improve weed control by allowing uptake of the herbicide to continue over this period. Clippings from the first 2-3 mowings following application will contain traces of herbicide. These particular mowings should not be used for composting unless allowed to rot down for at least 6 months.

Application

Ensure all equipment is properly calibrated before use so that the correct rate is applied. Reduce spray drift by setting the nozzle to the recommended height and applying under conditions of light breeze only. Choose the correct nozzle and avoid high pressures, which create smaller droplets more likely to drift. Nozzles should be checked to ensure they produce the correct output and spray pattern and changed if they have worn. Some selective herbicides may cause damage to adjacent broad-leaved vegetation. Therefore, ensuring drift is not permitted onto adjacent areas is important.

Ornamental herbicides Which product to use

The control of weeds in ornamental plantings may be necessary, as weeds will compete with the desired plants for water, nutrients and light.



Herbicide activity

Contact herbicides will control the plant where the product makes contact with the vegetation. This is useful in situations where weed control is required and other shrubs or trees are present. Translocated herbicides not only control the parts of the plant that are above ground but also move within the plant to control the underground parts too, preventing regrowth. In ornamental plantings, care is required to ensure translocated herbicides, such as glyphosate, do not drift onto the green stems and foliage of desired plants as damage may occur. Residual herbicides persist in the soil for a considerable period of time and, therefore, continue to provide weed control.

Application

Application of translocated herbicides should be made whilst weeds are actively growing; warm moist conditions provide the fastest results. Contact and residual herbicides may be applied throughout the year. Residual herbicides are best applied before weed emergence because they prevent weed seedlings becoming established. A much longer period of control can be expected with a residual product. Ensure all equipment is properly calibrated before use so that the correct rate is applied. Reduce spray drift by setting the nozzle to the recommended height and applying under conditions of light breeze only. Choose the correct nozzle and avoid high pressures, which create smaller droplets more likely to drift. Nozzles should be checked to ensure they produce the correct output and spray pattern and changed if they have worn.



Total herbicides

Which product to use

The selection of the most appropriate total herbicide depends on the situation for use. Both Pistol and Finale 150 are total herbicides which control a broad spectrum of weeds including grasses. Finale 150 is fast fast acting and non-residual. Finale 150 is also useful when line-marking for sports turf. Pistol is able to control both pre-emergent and post emergent weeds because the product has residual and translocated activity. If replanting of the treated area is planned then a nonresidual herbicide would be required.

Herbicide activity

Contact herbicides will control the plant where the product makes contact with the vegetation. This is useful in situations where weed control is required and other shrubs or trees are present. Translocated herbicides not only control the parts of the plant that are above ground but also move within the plant to control the underground parts too, preventing regrowth. Residual herbicides persist in the soil for a considerable period of time and, therefore, continue to provide weed control. CDA Vanguish Biactive (glyphosate) is a translocated herbicide. Pistol (diflufenican and glyphosate) is a residual and translocated herbicide. It forms a barrier at the soil surface preventing germination of seeds within the rootzone. Finale 150 (glufosinate-ammonium) is a contact herbicide which is very fast acting.

Application

Application of translocated herbicides should be made whilst weeds are actively growing; warm moist conditions provide the fastest results. Contact and residual herbicides may be applied throughout the year. Care should be taken when residual herbicides are applied to slopes, hard surfaces and gravel paths. Heavy rain following application may wash the herbicide onto other vegetation and cause unwanted damage. Ensure all equipment is properly calibrated before use so that the correct rate is applied. Reduce spray drift by setting the nozzle to the recommended height and applying under conditions of light breeze only. Choose the correct nozzle and avoid high pressures, which create smaller droplets more likely to drift. Nozzles should be checked to ensure they produce the correct output and spray pattern and changed if they have worn. Small amounts of selective and total herbicide may cause damage to adjacent broad-leaved vegetation. Therefore, ensuring drift is not permitted onto adjacent areas is important.

Please remember when using herbicides to adhere to label recommendations and ensure all COSHH regulations are applied.

When applying a contact herbicide to a tall dense canopy, use a higher water rate to ensure the spray penetrates the canopy and achieves the maximum contact with the target plant or plants.



Weeds

Autumn Hawkbit Leontodon autumnalis



Leaves are dark green and narrow with pointed lobes, the branched stem is somewhat scaly at the top. Yellow flowers appear from mid July-September. Found in most soils in moist situations.

Bird's-foot Trefoil Lotus corniculatus



A perennial with creeping stems growing just below the surface. The leaves appear to be trifoliate, but in fact another pair of leaflets is carried close to the stem. Yellow flowers often streaked with red appear from June to August. Fairly common on most soils.

Black Medick Medicago lupulina



A native annual, common on roadsides and grass. Black because seeds are black when ripe. Grows up to 40 cm and flowers April to August.

Brambles Rubus fruticosus



Brambles are thorny plants of the genus Rubus, in the rose family (*Rosaceae*). Bramble bushes have a distinctive growth form. They send up long, arching canes that do not flower or set fruit until the second year of growth. Brambles usually have trifoliate or palmately-compound leaves. They are common weed in hedges and other low shrubby vegetation.

Bristly Oxtongue Picris echiodes



Biennial/perennial plant, found in all soil types. Rosette forming, lanceolate leaves, thickly covered in bristles with swollen white bases and several dandelion-like flowers on each stem.

Bulbous Buttercup Ranunculus bulbosus



Perennial plant found in well drained calcareous soils. Base of stem is swollen and bulb like with three distinct toothed segments. Leaves higher up the plant are narrower with bright yellow, sepals bent back sharply. Flowers March to July.

Cat's Ear Hypochaeris radicata



Perennial plant found in mildly acidic sandy soils which grows and flowers similar to a dandelion, with hairy, toothed leaves. Two flowers on each stem from May to September.

Cleavers Galium aparine



A herbaceous annual climbing plant whose long stems sprawl over the ground and other plants, reaching heights of 1-1.5 m. The leaves are simple and borne in whorls of six to eight. Both leaves and stem have fine hairs tipped with tiny hooks, making them cling to clothes and fur much like velcro.



Weeds continued

Common Chickweed

Stellaria media



An annual whose rounded stem has a single line of hairs down one side. Oval, pointed leaves are borne in pairs. The small, white, star-like flowers may be seen at all times of the year. All soil types, especially new-sown turf.

Common Sorrell

Rumex acetosa



The lance-shaped leaves have two basal lobes pointing backwards. The leaves often turn crimson in late summer. Male flowers which are small and reddish coloured are borne on separate plants to female flowers from May to June. Found in most soil types.

Common Storksbill Erodium cicutarium



Annual plant found in dry soils. Resembles a crane's bill, but with fernlike leaves. Creeping stems are hairy and scaly and has a rosette of leaves arising from a thick tap root. Small pink flowers borne on an erect stalk with beak like fruits.

Corn Spurrey Spergula arvensis



Annual, oily feeling plant. Leaves are linearly awl-shaped, upper surface arched, underside furrowed with sticky hairs in whorly tufts. Flowering from summer to autumn with white flowers. Prefers light acidic soils.



Creeping Buttercup Ranunculus repens

Leafy runners which root at the nodes. The central lobe of the leaf is stalked. Yellow flowers are borne singly or

in clusters from May to August. Found in all soil types and prefers damp conditions.

Creeping Cinquefoil Potentilla reptans



Low growing and invasive perennial with long creeping stems rooting Composed of five to seven wedge shaped leaflets borne on long stems. Flowers June to September with yellow flowers and five petals.

Creeping Thistle Cirsium arvense



disturbed ground. The growth form is stoloniferous up to 90 cm with a smooth stem. The leaves are hairless on the upper side, with cottony white hairs beneath. Flowers purple/lilac clusters from June to September.

Daisy Bellis perennis

A perennial with a rosette of spoonshaped leaves and a fibrous root. Flowers almost all year. Found in all soil types.

Dandelion

Taraxacum officinale



Doves-foot Cranesbill

Geranium molle



Leaves roundish, lobed and covered with soft hairs. Flowers from April to September. Fruits have long beak resembling a crane's bill. Common on dry grassland and wasteland.

Deeply lobed leaves spread to form a

flat rosette. The hollow stem bears large

yellow flowers. Common in all soil types.

Field Bindweed Convolvulus arvensis



Field Bindweed is a climbing or creeping herbaceous perennial plant growing 0.5-2 m high. The leaves are spirally arranged, linear to arrowhead-shaped, 2-5 cm long, with a 1-3 cm petiole. The flowers are trumpet-shaped, 1-2.5 cm diameter, white or pale pink, with five slightly darker pink radial stripes.

Germander Speedwell

Veronica chamaedrys



Creeping perennial which is more robust than Veronica filiformis but less commonly found on turf. It has oval, stalkless, bluntly toothed leaves and bright blue flowers.

Field Wood Rush Luzula campestris



Perennial plant with grass like growth and found in most soils. Leaves are compact tufts covered with long hairs which are easily mistaken for grass. Brown shiny flowers borne on a long stalk from April to May.

Plantago major

Greater Plantain

Tufted plant with broad, oval leaves and strong, fibrous roots. Green spikey flowers appear in summer. Found in all soils, especially in damp situations.

Fat Hen

Chenopodium album



Annual plant with a strong taproot. Leaves are oval to triangular, long and light blue-green in colour. Flowers mid-summer to autumn with inconspicuous, greenish glomerules. Found in almost all soils.





Upright low/short annual, often with a downy stem. Leaves deeply divided with a smooth upper surface. Flowers in loose clusters, yellow and brush-like which are produced all year round. A weed of cultivated, disturbed ground.



Weeds continued

Ground Ivy

Glechoma hederacea



Perennial with a creeping growth pattern found in most soils. It has kidney shaped, toothed leaves borne on long stalks and 2-4 purple flowers held as a whorl on the stem.

Heath Bedstraw

Galium saxatile



Perennial plant found in acidic soils. with a mat forming growth with hairless stems and flowering shoots held upright. Elliptical leaves in whorls of 6-8 which are broadest at their mid-point. Flowers white flowers from June to August.

Hoary Plantain Plantago media



Rosette forming, perennial plant found in dry calcareous soils. Flowers with short, stubby shaped flower spike from May to August and has oval leaves with short stems.

Knotgrass Polygonum aviculare



shaped leaves which are larger on the main stem and swollen reddish knots at the leaf joints. Solitary or small clusters of flowers which are greenish with pink/white edges and flower from June to December.

Annual plant found in bare areas

with a≈low, sprawling growth up to

1m across. It has lanceolate to oval

Lady's Bedstraw

Galium verum

Perennial plant found in acidic soils, with a mat forming growth with hairless stems and flowering shoots held upright. Elliptical leaves in whorls of 6-8 which are broadest at their mid-point. Flowers white flowers from June to August.

Lesser Celandine

Ranunculus ficaria



found in shaded areas, with glossy heart shaped leaves and yellow, solitary flowers which flower from

Lesser Trefoil Trifolium dubium



Spreading annual with trifoliate leaves. Mid leaflet on short stalk with 10-26 vellow flowers borne in flower heads from June to August. Common on most soils.

Mouse-ear Hawkweed Hieracium pilosella



A perennial with a rosette of oval leaves having a few long hairs on the upper surface and short white down covering the lower. Yellow flowers, often tinged red, appear spring-autumn. Found on most soils.

Mouse-ear Chickweed Cerastium holosteoides



Trailing stems produce pairs of hairy, oval leaves forming a dense mat. Small white flowers appear from April onwards. Occurs on all soil types: verv closelv mown turf.

Parsley Piert

Aphanes arvensis



A low growing annual with many stems emanating from a central point, found in drier soils. Pale grey/green, 3 lobed leaves with the lobes oblong and toothed and tiny, petal-less flowers from April to October.

Ribwort Plantain Plantago lanceolata



A tufted perennial with narrow, ribbed leaves. Cylindrical brown flower heads borne on long stalks from May to September. Very common in lawns.

Ragwort Senecio iacobaea



Tall, biennial plant with flat-topped clusters of large yellow flowers from June to November. Typically found on uncultivated ground and grazing land. This weed is poisonous to cattle and horses and produces seeds which are then dispersed by the wind.

Pearlwort

Sagina procumbens



Low growing perennial which produces rooting runners from a central rosette and has grass like, linear leaves with bristle tips. Found in damp, shaded areas with solitary, green flowers from April to September.

Red Clover Trifolium pratense



Hairy, tufted growth perennial found in weakly acid moist fertile soils. It consists of three oval leaflets borne on long stems, each with a white crescent marking. Flowers from May to September with red/purple, unstalked flower.

Ragwort contains pyrrolizidine alkaloids which are poisonous to mammals, especially grazing animals such as horses.

They are also poisonous to humans, so if you pull it up by hand, make sure you wear gloves to prevent it coming into contact with your skin.





Weeds continued

Rosebay Willowherb

Chamerion angustifolium



Medium/tall, more or less hairy perennials. Lanceolate leaves with a toothed edge. Flowers on stalks with four heart shaped petals, ranging from bright pink-purple to light pink, seen between June and August.

Sheeps's Sorrell Rumex acetosella



Characteristic 'fish' shaped leaves are borne on fairly long stalks. The tiny reddish flowers appear in whorls around the spike from May to August. Common on heaths and acid soils.

Silverweed Potentilla anserina



Creeping perennial found in sandy soils with yellow, solitary, five petal flowers from May to August. The leaves are in tufts with about 20 oblong toothed leaflets and a silvery grey underside.

Slender Speedwell Veronica filiformis



Creeping mat forming perennial. Slender stems and pale blue flowers from April to July with four petals, the lower of which is often lighter in colour, April to July. Common in most soil types.



Scentless Mayweed

Tripleurospermum maritimum

Sprawling annual or perennial with feathery leaves and Daisy-like flowers. Common in sandy soil.



Selfheal Prunella vulgaris

> A hairy, creeping plant rooting at nodes. The oval leaves grow in pairs. Purple flowers appear from June onwards. Found in wet, heavy soils.

Sow Thistle Sonchus spp.



A native annual common throughout Britain (apart from the Highlands). Found on waste places, roadsides and cultivated ground. Height up to 1.5m and flowers June to August.

Spear Thistle Cirsium Vulgare



Biennial plant found in fertile disturbed ground with growth us to 1.5m stem spiney. Dull, hairy, short stalked leaves, deeply toothed lobes and teeth with long stout spines. Purple, flat topped flowers from July to October.

Spotted Medick Medicago Arabica



Annual, mat forming plant found in well drained soil. Mat forming growth and trifoliate, heart shaped leaflets toothed near the apex, with dark markings near the centre. Solitary or up to four yellow flowers from April to August.

Thyme-Leaved Speedwell Veronica Serpylifolia



Perennial which is less common than the other speedwell species. Creeping, mat-forming, slender stems with mouse-ear like, stalkless leaves (similar to mouse-ear chickweed). Off-white flowers with sage blue centre, from March to October.

White Clover

Trifolium repens



White flowered, creeping perennial with stems which root at the nodes. Three leaflets, each with a central mark are borne on a long stalk. Favours heavy soils.

Yarrow

Achillea millefolium



Creeping perennial producing fine, dark green leaves. Clusters of white flowers appear from mid-summer onwards, common in all soil types.



Pistol

- Long lasting prevention against weed germination.
- Controls many difficult weeds.
- Two modes of action.

Weeds controlled

Pistol has established itself as the standard in non-selective residual weed control in the UK and Ireland. Pistol has a broad spectrum of activity; it will give initial 'knockdown' and there after residual control of a wide variety of broadleaved weeds and narrow-leaved weeds. Some examples of these weeds include Common Daisy, Common groundsel, Cranesbill, Dandelion, Field forget-me-not, Ragwort, Reddead-nettle. Rosebav willowherb. Sow thistle. Speedwell and Annual meadow grass. With its wide range of uses and high degree of flexibility, the Pistol 'no mixing' formulation is ideal for use by Local Authorities, County Councils, Golf Clubs, Landscapers, Parks Departments, Farmers and many others.

Use areas

Pistol can be applied pre and post emergence to control a wide range of broad leaved weeds and grasses in amenity situations. Use areas include:

- Industrial areas.
- Fence lines and strips of land adjacent to buildings.

Feb

Jan

- Around obstacles (street furniture, signage).

Mar





- Beneath pylons, at power stations and electrical sub-stations.
- Road verges and central reservations.
- Around the base of mature trees (for example trees along streets, in nurseries or shrub beds).
- Open soil areas.
- Railway ballast.
- Farm yards.
- Gravel pathways and car parks.
- Hard surfaces (Ireland only).

Timing of application

Apply Pistol post-emergence of weeds at any time from March until the end of September, provided that the weeds are actively growing. Annual broad-leaved weeds should have at least two fully exposed leaves, and annual grasses should be at the one leaf growth stage or beyond. Some perennial weeds, including Docks, Perennial sow thistle and Willowherb are best treated just before flowering or the setting of seed.

Two modes of action

Aug

Main usage period

Jul

May

Pistol combines the systemic activity of glyphosate with the soil acting residual properties of diflufenican. The two different

Sep

Oct

Nov

Dec

Visit www.environmentalscience.bayer.co.uk to view the label and safety data sheets.





Equipment	Area	Product required	Water volume	
Vehicle-mounted sprayer	1 ha	4.5 litres	200-400 litres	
Knapsack	100 m ²	45 ml	2.0-4.0 litres	

PLEASE NOTE THAT PISTOL CANNOT BE USED ON HARD SURFACES IN THE UK.

active ingredients are specially formulated to provide the ultimate long lasting total weed control. Pistol provides long lasting weed control where soil is not disturbed.

Application

Half fill sprayer with clean water. Add the required quantity of Pistol and complete filling. This aids the effective mixing for all total herbicides. A knapsack fitted with a flat fan nozzle or similar, using a pressure of around 1-2 bar is recommended. Good and even coverage of foliage and soil is essential for optimum activity. For larger areas, hydraulic sprayers can be used to apply this product.

After use

Wash equipment thoroughly after use.

How does Pistol work?



Pistol® contains 40 g/L diflufenican and 250 g/L glyphosate. USE PLANT PROTECTION PRODUCTS SAFELY. ALWAYS READ THE LABEL AND PRODUCT INFORMATION BEFORE USE. PAY ATTENTION TO THE RISK INDICATIONS AND FOLLOW THE SAFETY PRECAUTIONS ON THE LABEL. TRIPLE RINSE CONTAINERS AT THE TIME OF USE, PUNCTURE AND INVERT TO DRY. (MAPP 12173, PCS 02530) Pistol® is a registered trademark of Bayer CropScience Limited. Packshot for illustration purposes only, pack may vary.



CDA Vanquish Biactive

- CDA Vanquish Biactive can also be used at 9 L/ha dose for annual weeds.
- A ready-to-use Controlled Droplet Application herbicide.
- A biactive formulation of glyphosate, offering enhanced uptake and translocation with more movement than tallow amine.



Weeds controlled

CDA Vanquish Biactive is a foliar applied, non-selective herbicide for the control of annual and perennial grass and broad-leaved weeds in amenity and industrial areas. CDA Vanquish Biactive controls emerged weeds: annual and perennial, grass and broadleaved. CDA Vanquish Biactive has shown superior control against many common weeds including Docks, Nettles, Clover and Annual Meadowgrass in comparison to conventional glyphosate products. CDA Vanquish Biactive gives excellent control of susceptible weeds, however weeds that subsequently germinate during the growing season may require a further application.

Optimising CDA Vanquish Biactive

- Ideally treat perennial weeds before flowering.
- Symptoms on weeds take 7 to 21 days depending on species.
- To obtain optimum weed control, leave the weeds undisturbed.

Use areas

The product may be used in all amenity and industrial situations. There are no restrictions on the type of area where CDA Vanquish Biactive can be applied for example hard surfaces, soft surfaces, around shrubs and trees.

Timing of application

Spray when weeds are actively growing and have adequate leaf area to absorb the spray. Perennial grasses are susceptible when tillering and new rhizome growth commences (normally 4-5 leaves). Perennial broad-leaved weeds are more susceptible if treated at or near flowering, but will be severely checked if treated at any time during active growth.

Application equipment

CDA Vanquish Biactive must be applied by specialist CDA equipment with an approved droplet spectrum (VMD min 200 microns).

Cultivation

CDA Vanquish Biactive leaves no harmful residues in the soil, so land can be used for re-planting 7-10 days after application. Grasses may be sown 14 days after treatment.



Visit www.environmentalscience.bayer.co.uk to view the label and safety data sheets.



CDA Vanquish Biactive

Area treated	Weeds	CDA Vanquish Biactive
1 Hectare	Perennials	15 litres
1 Hectare	Annuals	9 litres
500 m ²	Perennials	0.75 litres
500 m ²	Annuals	0.45 litres

After use

Wash equipment thoroughly after use.



Save time with CDA Vanquish Biactive as it is a ready to use product with no mixing required. Just plug and spray.



CDA Vanquish® Biactive contains 160 g/L (11.32% w/w) glyphosate as the isopropylamine salt (equivalent to 120 g/L glyphosate) USE PLANT PROTECTION PRODUCTS SAFELY, ALWAYS READ THE LABEL AND PRODUCT INFORMATION BEFORE USE. PAY ATTENTION TO THE RISK INDICATIONS AND FOLLOW THE SAFETY PRECAUTIONS ON THE LABEL. TRIPLE RINSE CONTAINERS AT THE TIME OF USE, PUNCTURE AND INVERT TO DRY. (MAPP 12586) CDA Vanquish® is a registered trademark of Bayer CropScience Limited. Packshot for illustration purposes only, pack may vary.



Finale 150

- Fast acting weed killer for use on hard surfaces.
- A non-selective, contact herbicide.
- Can be used for preparing sports turf for line-marking.
- Controls a broad spectrum of annual and perennial weeds and grasses.

Finale 150 is a contact acting total herbicide which controls grasses and broad-leaved weeds. It can be used for weed control on hard surfaces and is also ideal for preparing sports turf for line-marking. It can be used in the following situations;

- As a foliar contact herbicide for use as a band application to:
- Fence lines (spray applications must be made within 50 cm of the fence line).
- Managed amenity turf for line-marking preparation.
- As a band or spot application to:
- Natural surfaces not intended to bear vegetation.
- Permeable surfaces overlaying soils. - Hard surfaces.

Weeds controlled

Finale 150 controls a wide range of annual and perennial weeds.

Timing of application

Apply when weeds are actively growing between March and end of September. For optimum results, apply Finale 150 when the weeds have at least 2 expanded leaves and are actively growing.

Main usage period											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec



Application

Add the recommended quantity of Finale 150 to the sprav tank half-filled with the required volume of clean water. Add the remainder of the water with the sprayer agitation system working gently. Agitate gently before and during spraying. Finale 150 must only be applied using low drift nozzles and sprayshield. Do not spray if rain is imminent or likely within 6 hours of application and do not apply to wet foliage if run off is likely to occur. Avoid drift to areas outside those being sprayed, having due regard to the prevailing weather conditions, wind direction and spray quality being used. Do not spray at end of season on sandy soil. Do not leave the sprayer standing with chemical in it.

After use

Wash equipment thoroughly after use.

Visit www.environmentalscience.bayer.co.uk to view the label and safety data sheets.



Application equipment	Vehicle-mounted hydraulic sprayer		Knapsack sprayer	
Weed problem	Rate per hectare	Water per hectare	Rate per 100 m ²	Water per 100 m ²
Seedlings of all species. Established annual weeds and grasses as specified in the 'Weeds Controlled' section on the label.	3 litres	200-400 litres	30 ml	4.5 litres
Established annual and perennial weeds and grasses as specified in the 'Weeds Controlled' section on the label.	5 litres	200-400 litres	50 ml	4.5 litres

Band application

Preparing sports-turf for line-marking.

Line-marking application equipment	Line-marking machine with 7.5 cm swath					
Type of line	Finale 150	Water	Coverage in linear metres			
To reinforce existing lines	30 ml	4 litres	1333 m			
(Finale 150 3 L/ha)	120 ml	16 litres	5332 m			
To create new lines	50 ml	4 litres	1333 m			
(Finale 150 5 L/ha)	200 ml	16 litres	5332 m			

Finale® contains 150 g/L (13.52% w/w) glufosinate-ammonium. USE PLANT PROTECTION PRODUCTS SAFELY. ALWAYS READ THE LABEL AND PRODUCT INFORMATION BEFORE USE. PAY ATTENTION TO THE RISK INDICATIONS AND FOLLOW THE SAFETY PRECAUTIONS ON THE LABEL. (MAPP 16733). Finale® is a registered trademark of Bayer CropScience Limited. Packshot for illustration purposes only, pack may vary.



Longbow

- Powerful combination of 4 active ingredients.
- Controls Speedwell.
- Ideal for use on lawns, sports and managed amenity turf.

Weeds controlled

Longbow is a herbicide with foliar and some root activity against a range of common broadleaved weeds.

It controls a wide range of annual and perennial weeds, including;

- White clover (Trifolium repens).
- Creeping buttercup (Ranunculus repens).
- Daisy (Bellis perenis).
- Dandelion (Taraxacum officinale).
- Deadnettle (Lamium sp.).
- Speedwell (Veronica sp.).
- Self heal (Prunella vulgaris).
- Yarrow (Achillea millefolium).







Timing of application

Longbow can be applied on lawns, sports or managed amenity turf once a year during the whole vegetative period of the weeds (from April to end September).

Application rate

Longbow can be applied by tractor-mounted boom sprayer or by knapsack sprayer. Shake well before use and apply Longbow at the dose rate of 75 ml in 10 litres water/100 m². Half fill the sprayer with clean water, add the required quantity of Longbow and complete filling. This aids the effective mixing of all selective herbicides.

After use

Wash equipment thoroughly after use.









Weed	Application rate (L/ha)	Comments
Speedwell (Veronica sp.), White clover (Trifolium repens), Daisy (Bellis perenis), Shepherd's purse (Capsella bursa pastoris), Field forget-me-not (Myosotis arvensis)and Deadnettle (Lamium sp.).	7.5	Susceptible
Dandelion (<i>Taraxum officinale</i>) Self heal (<i>Prunella vulgaris</i>), Creeping buttercup (<i>Ranunculus repens</i>), Yarrow (<i>Achillea millefolium</i>), Broad-leaved dock (<i>Rumex</i> obtusifolius) and Corn chamomile (<i>Anthemis arvensis</i>).	7.5	Moderately susceptible



Longbow® contains 70 g/L 2,4-D ae, 70 g/L MCPA ae, 42 g/L MCPP-P ae and 20 g/L Dicamba ae under the DMA salt form as a Soluble Concentrate. USE PLANT PROTECTION PRODUCTS SAFELY, ALWAYS READ THE LABEL AND PRODUCT INFORMATION BEFORE USE, PAY ATTENTION TO THE RISK INDICATIONS AND FOLLOW THE SAFETY PRECAUTIONS ON THE LABEL. SHAKE WELL BEFORE USE. (MAPP 16528, PCS 04559) Longbow® is a registered trademark of Bayer CropScience Limited. Packshot for illustration purposes only, pack may vary.

Main usage period											
Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Weed Control)





Chris Gardiner

Managing Director, Gardiners

Complete Construction Services with three separate divisions: Landscape Management, Construction Services and Electrical Engineering.

Chris Gardiner, who heads up the family run business, Gardiners, looks after a number of sites that require a targeted weed control programme. One particular water authority's sewage treatment works based in Birmingham had a real problem with broad leaf and grass weeds.

Traditionally, Chris had used glyphosate to treat the weeds. However, the efficacy of the herbicide was diminishing, and the site had problems with regrowth, post-application.

"The weeds kept coming back, because the affected gravel we were treating was old. It had gaps between stones that held moisture, and was the ideal platform for seeds to germinate.

As soon as we sprayed with glyphosate, and the weeds were treated, new seeds would germinate right away," says Chris.

The water authorities would only pay for three treatments and, during 2013, Chris sprayed glyphosate three times, and the hardy weeds wouldn't budge.

"The only alternative we had used before, sodium chlorate, had its licence removed, and therefore I had to look for a new product. Our distributers, Amenity Land Services, recommended Pistol from Bayer. Pistol is a barrier acting non-selective total herbicide and, because it's a residual treatment that holds in the soil, it has lasting efficacy," he says.

"This innovative product allowed us to limit the amount of herbicide we applied, and achieved much better weed control than any product used before. This is better for the environment, wasn't as costly for the client, and meant we had to travel to the site less.

It's also straightforward to convert to Pistol because it can be applied using the equipment we already had, which is a knapsack or tractor mounted sprayer. We trialled the product in 2013, and have used it every year since. We will continue to use it, as its efficacy here is unrivalled," adds Chris.

Section 6 Application & Usage



Spray targeting

Introduction

Spray targeting optimises the application factors which ensure that the product reaches, and is retained on the surface of the intended target. The diversity of targets; such as insects, fungi, soil and weeds coupled with the variable factors incurred during application, such as spray quality, water volume, spray pressure and travelling speed can complement or detract from the activity of a product.

Choice of nozzle

The nozzle is the key component of the spraying equipment. Developments in nozzle technology can deliver high levels of accuracy in the application when applying pesticides.

The following sections detail the operation of the nozzle; how it atomises the spray solution and how the factors which the operator can control such as pressure; spray angle and nozzle capacity affect the characteristics of the spray produced.

Every nozzle, whether used alone or as part of a set, must be in good condition to carry out its three critical functions:

- It distributes the liquid into a defined spray pattern which breaks the spray solution into droplets atomisation.
- It controls the amount of liquid applied.
- All nozzles produce a range of droplet sizes, from a few microns in diameter up to several hundred microns. A 200 micron droplet is one fifth of a millimetre in diameter.

(1 micron or $\mu m = 0.001$ mm)

Nozzles are made from a range of materials, including stainless steel, ceramic and a range of plastics.



Commerical nozzle types DEFLECTOR nozzles

(flooding or anvil) which generally produce a COARSE or VERY COARSE spray and fairly even deposit, and are thus often used for applying residual or total herbicides from hand-operated/knapsack sprayers.

CONE nozzles

(full or hollow cone) are typically used to produce a FINE spray at higher pressures where good cover is required (e.g. insecticide/fungicide application) but care must be taken regarding possible spray drift.

FLAT FAN nozzles

are available to produce all spray qualities but generally produce a peaked spray pattern suitable for mounting on booms where patterns overlap (if single nozzle use is required e.g. for band spraying with a knapsack lance, use an 'even spray' tip.) Low pressure and pre-orifice tips are available to produce coarser sprays.

AIR INDUCTION nozzles

can be flat fan or hollow cone and generally produce COARSE sprays with reduced drift (but a peaked spray pattern) and require pressures greater than 200 kpa (2 bar) to operate properly. Air induction nozzles do differ in design and therefore performance (primarily a spray quality produced).

ROTARY ATOMISERS

use the centrifugal force of a spinning disc (or cage) to create a spray rather than pressure. The spray quality produced depends on the combination of rotational speed and liquid flow rate and will vary with the specific design.

Categorising nozzles

Nozzle reference codes:

- Nozzle type.
- Spray angle (degrees).
- Flow rate or capacity (litres per minute).
- Operating pressure (bar).

The ISO colour coding for hydraulic nozzles refer to nozzle flow rate based at 3.0 bar pressure.



Colour	Flow rate L/min @ 3 bar
Orange	0.4
Green	0.6
Yellow	0.8
Purple	1.0
Blue	1.2
Red	1.6
Brown	2.0
Grey	2.4
White	3.2
Light Blue	4.0
Light Green	6.0
Black	8.0





Categorising spray quality

There are four categories to describe spray quality – very fine, fine, medium, and coarse. Based on the VMD (Volume Median Diameter) produced at a stated pressure, nozzles are placed in one of these categories. As the droplet spectrum changes with pressure the same nozzle may be found in two categories.

Summary of spray quality categories

- Very Fine (VMD = smaller than 150 µm) These contain a high proportion of small droplets that are less easy to control. They are generally not suitable for outdoor use.
- Fine (VMD = 150-200 μm)

Fine quality sprays contain a high percentage of spray volume of droplets in the 70-120 micron size. Fine sprays deliver more droplets per unit area but they are easily deflected from the target. Fine sprays give higher deposition on the upper surfaces of the target.

• Medium (VMD = 200-300 μm)

The general purpose spray quality. It provides a combination of reasonable cover, penetration and controllability. It contains larger droplets which have the required energy to penetrate plant foliage, sufficient smaller droplets to give good coverage and a small portion of finer droplets which are less easy to control.

• Coarse (VMD = 300-400 μm)

This spray contains more of the droplets in the larger category. These are less well retained on the target as they are prone to run-off or bounce-off. This spray quality is most suitable for soil acting products on application of liquid fertilisers.

VMD = Volume Median Diameter

is the diameter in the droplet spectrum at which half of the spray volume is contained in smaller drops and half in larger drops.







Factors affecting the droplet spectrum

There are several factors which affect the droplet spectrum, these include:

Operating pressure

As nozzle pressure is increased, average droplet size (VMD) is reduced because of an increased number of small droplets produced. Increasing the pressure above the recommended level is not a recommended method to increase the applied volume as the finer droplets produced are more difficult to control and they may not reach their target.

Changing the operating pressure can cause the classification of a nozzle to move to a different spray category.

Spray angle and boom/hand lance height

The spray angle is the angle of the spray produced at the operating pressure.

Spray nozzles are usually 80 degree or 110 degree. There are greater shear forces acting on 110 degree nozzles, this results in smaller droplets being produced, the VMD is again reduced.

The nozzle angle influences the height at which the boom or hand lance should be above the target. With 110 degree nozzles the boom operates closer to the target than with the equivalent 80 degree nozzle. As the distance between spray tip and target increases so does the effect of the wind. Trials have shown that operating at a boom height of 80 cm rather than at the nozzle manufacturer's recommended 50 cm can result in over 10% of the applied spray missing its target, which is both costly and inefficient.

Do not spray at a greater height than that recommended by the spray nozzle manufacturer.

Nozzle capacity

The larger the nozzle orifice the coarser the spray quality and the greater the flow rate at the same pressure resulting in an increased volume applied.

Conversely, the smaller the nozzle the finer the spray quality produced with a consequential increase in the risk that the spray may not hit its target. Selecting the nozzle with the appropriate orifice size is important.

Travelling speed

To give good coverage of small targets, some sideways movement of small droplets is desirable but too much turbulence forces finer spray droplets upwards causing them to miss the target. With faster travelling speeds there is also an increase shear affect at the nozzle tip again resulting in finer droplets that are less able to penetrate the plant foliage.

Flat-fan variable pressure nozzles maintain the 1100 spray pattern when operated between 1-5 bars. Travelling at faster speeds increases pressure and will give a finer spray.

Matching the spray to the target

There are several factors to consider when selecting the most suitable spray quality for a particular target and spray situation.

The target

Targets vary in size, shape, orientation and position. They may be easy or difficult for the spray droplet to reach and importantly to be retained. As plants grow the amount of foliage that can intercept and retain sprays increases significantly. To apply a treatment evenly to a dense plant canopy requires a higher volume than to a sparse canopy or bare soil.



Product type	Target	Spray quality
Contact	Pest/Disease	Fine/Medium
Systemic/ Mesosystemic	Foliage	Medium
Residual	Soil	Medium/Coarse

Fine sprays

Fine sprays, which produce more droplets per unit area, increase the opportunity for successful coverage of small targets – small insect pests and small grasses up to the 3 leaf stage – but only if the canopy does not prevent penetration.

When spraying close to vulnerable areas extra care must be taken especially if wind conditions are not ideal. Fine sprays give relatively higher deposition on the upper surfaces of the target and top leaves of the plant canopy, and are normally used for contact-acting pesticides or when good coverage is required (eg. herbicides on waxy targets eg. Finale 150).

Medium quality sprays

Medium quality sprays are the 'general purpose' sprays. The larger droplets are able to penetrate a plant canopy but with sufficient smaller droplets to provide good coverage and retention. Care should still be exercised when very close to vulnerable areas. A medium quality spray is suitable for many situations (eg. Interface).

Coarse quality sprays

Coarse quality sprays are not suitable for application of foliar acting products as a relatively high percentage of the spray volume is in droplets greater than 350 micron which bounce off the target.

Coarse sprays should be used when spraying next to vulnerable areas, especially water. When the soil is the target it is not desirable or necessary to have large numbers of small droplets. A coarse spray will be acceptable as the product will redistribute in the soil moisture (eg. Pistol).

Product mode of action

The mode of action of the pesticide – whether it is systemic, translocated, contact or soil acting – should influence spray quality choice.









Pre-emergence products

For pre-emergence residual acting products generally spray quality has little influence on product performance as the product will distribute itself withIn the soil profile.

Coarse sprays have the advantage of not moving off the target area.

Translocated products

The more systemic the product the less critical is the choice of spray quality. Provided the target is hit and the droplets are retained on the target, the active material will be translocated to the sites of action. Choice of spray quality should be guided by the other criteria such as the target or weather conditions.

Coarse sprays are unlikely to be retained by the target. Fine droplets increase the risk to off-target areas. Medium spray quality would be the general choice.

Contact products

Contact products must be applied in such a way that good coverage is achieved on the target. There will be little or no movement of the product in the plant tissue.

Matching spray quality to the target is critical, finer droplets are usually most effective in this situation but weather conditions and off-target risks must be taken into account before application.







Weather conditions

Wind speed must be given the greatest consideration when selecting spray quality. Always check the wind speed and direction before and during application. Spray droplets smaller than 100 micron are difficult to control. Even if the characteristics of the target and the product suggest that a fine quality spray will give the optimum results, the number of days on which this could be safely applied is limited. Applications made in the early morning and early evening when conditions are most calm may extend the available spray opportunities. However a medium spray may be more appropriate to protect off-target areas.

The table below gives guidance to the decision to spray in relation to wind speed. When wind speeds approach force 4, spray nozzle pressures should be reduced and/or the nozzle size increased to obtain larger droplets which are more likely to reach the target.

Approx air speed at boom height	Beaufort scale at height of 10 m	Description	Visible signs	Spraying
< 2 km/h (1.2 mph)	Force 0	Calm	Smoke rises vertically	Do not use a fine spray quality
2-3.2 km/h (1.2-2 mph)	Force 1	Light air	Direction shown by smoke drift	Take special care when using fine spray quality
3.2-6.5 km/h (2-4 mph)	Force 2	Light breeze	Leaves rustle, wind felt on face	Ideal spraying
6.5-9.6 km/h (4-6 mph)	Force 3	Gentle breeze	Leaves and twigs in constant motion	Take special care; increased risk of spray movement off-target
9.6-14.5 km/h (6-9 mph)	Force 4	Moderate	Small branches moved, raises dust or loose paper	Spraying inadvisable

Spray volume

The water application volume, in litres per hectare, is provided as part of the product recommendation. The volume used should be chosen from within the recommended range on the product label. Dense canopy crops may require the higher end of the recommended water volume range. Water volumes that are less than those recommended on the label may be used at your own risk, unless the label (or the relevant notice of approval) states one of the following:

- Bans reduced volume spraying; or
- States that Personal Protective Equipment must be worn when the product is at the dilution ready for use; or
- Has corrosive, very toxic, toxic, or risk of serious damage to eyes.

Plant protection spray manufacturers have undertaken various studies and they can advise if reduced volumes are permissible.

Off-target risks

The application of pesticides must be confined to the area intended. Off-target spray movement is often the result of incorrect spray quality choice for the conditions prevalent. It is good practice to use the coarsest spray possible consistent with weather conditions and spray target.

You should always identify vulnerable areas before spraying. These may be areas where bystanders may be present for example schools, neighbours or footpaths. It will also include water and biodiversity features. Once identified a plan can be actioned that determines product choice, weather conditions and spray quality that affords protection of these features.



If applied close to water, certain products require a no-spray buffer zone. Depending on the product this zone may be reduced if the correct nozzle and spray pressure are chosen. If you do reduce this buffer zone there is a legal obligation to carry out and record a Local Environment Risk Assessment for Pesticides (LERAP).

By adopting the label buffer zone there is no need to carry out a LERAP but this decision must be recorded. LERAPs protect water from the risk that certain pesticides may pose to aquatic wildlife. However legislation that protects water from other chemicals is being strengthened. Turn to page 84 to see an example of a LERAP assessment.

Label requirements

Many product labels do not recommend an appropriate nozzle size as spray quality is more often dictated by the plant, target, weather conditions and equipment. Choose the appropriate spray quality taking into account:

- The lowest application volume will give the highest work rate;
- The position of the target;
- The target characteristics.

Make sure you change your spray nozzles annually. Over time they will wear out and will give an inaccurate spray pattern.







Sprayer calibration

To ensure products are applied at recommended dose rates per hectare, accurate calibration and correct use of the spraying equipment is essential. Nozzles wear with use and the spray quality, pattern and capacity will change. They should be changed at least each year. Official recommendations are that nozzle flow rates must be less than 10% above the stated output given by the nozzle data sheet. Should one nozzle be found to be outside this limit then a full set of new nozzles must be fitted. Overdosing by this amount results in wasted product, plant damage risk and a significant cost in additional plant protection products – several times the cost of a new set of nozzles.

The Sustainable Use Directive (SUD) legislation states that:

For boom sprayers equal to or greater than 3 m:

Equipment must pass an inspection by 26th of November 2016 (unless it is less than 5 years old on this date). It should than be inspected at a second interval of less than 5 years and then every 3 years (2016, 2020, 2023, 2026 etc.).

For boom sprayers less than 3 m, granule applicators and boat mounted applicators:

Equipment must pass an inspection by 26th of November 2016 (unless it is less than 5 years old on this date). It should then be inspected every 6 years (2016, 2022, 2028 etc.).





Calibration of knapsack sprayers

Information required from Label:

- DOSE in litres (grams) per hectare.
- WATER VOLUME in litres per hectare.
- SPRAY QUALITY (Coarse, Medium or Fine).

Information to Record:

- T. Time in Seconds to spray 100 metre length.
- A. Area to treat in Square Metres.
- N.O. Nozzle Output in litres per minute.
- W. Width of Spray band chosen.

Calibration Formulae:

SPEED (K.P.H) = $360 \div T$ APPLICATION VOLUME (Litres per hectare) = $(600 \times N.O) / (Speed \times W)$

NB: 1 Hectare = 10,000 square metres 1 Litre = 1,000 millilitres

WATER REQUIRED FOR AREA

- 1. Area in square metres.
- 2. Application volume in litres per hectare.
- 3. Convert to litres per square meter (divide application volume by 10.000).
- 4. Multiply area by volume per square metre = water required in litres.

PESTICIDE REQUIRED FOR AREA

- 1. Area in square metres.
- 2. Dose rate in litres (grams) per hectare.
- 3. Convert to litres per square metre (divide dose by 10,000).
- 4. Multiply area by dose per square metre = pesticide required in litres.
- N.B. Multiply decimals of litres by 1,000 to bring to millilitres for easy measuring.
- PESTICIDE FULL TANK = Tanks Capacity/ Application Volume (L/Ha) x DOSE.



Scan to use Bayer knapsack
 calibration calculator.

Calibration of boom sprayers

Information required from Label:

- DOSE in litres (grams) per hectare.
- WATER VOLUME in litres per hectare.
- SPRAY QUALITY (Coarse, Medium or Fine).

Information to Record:

- T. Time in Seconds to spray 100 metre length.
- A. Area to treat in Square Metres.
- N.O. Nozzle Output in litres per minute.
- N.S. Nozzle spacing (normally 0.5m).

Calibration Formulae:

 $\begin{array}{l} \text{SPEED} (\text{K.P.H}) = 360 \div \text{T} \\ \text{APPLICATION VOLUME} (\text{Litres per hectare}) \\ = (600 \times \text{N.O}) \ / \ (\text{Speed} \times \text{N.S}) \end{array}$

NB: 1 Hectare = 10,000 square metres 1 Litre = 1,000 millilitres

WATER REQUIRED FOR AREA

- 1. Area in square metres.
- 2. Application volume in litres per hectare.
- 3. Convert to litres per square meter (divide application volume by 10,000).
- 4. Multiply area by volume per square metre = water required in litres.

PESTICIDE REQUIRED FOR AREA

- 1. Area in square metres.
- 2. Dose rate in litres (grams) per hectare.
- 3. Convert to litres per square metre (divide dose by 10,000).
- 4. Multiply area by dose per square metre = pesticide required in litres.
- N.B. Multiply decimals of litres by 1,000 to bring to millilitres for easy measuring.

PESTICIDE FULL TANK = Tanks Capacity/ Application Volume (L/Ha) x DOSE.



Scan to use Bayer boom sprayer calibration calculator.





Calibration & application of Merit Turf

For control of Chafer grubs and Leatherjackets in turf at 30 kg/ha (30 g/10 m²)

Merit Turf is a fine material, unsuited to application through spinning-disc applicators commonly used to apply fertiliser (pedestrian or vehicle-operated). Such machines will result in very narrow patterns and uneven application when using Merit Turf. Other types of machinery used to apply fertiliser or sand (e.g. top-dressers) are also unlikely to handle the low dose of 30 kg/ha. Bulking-up of Merit Turf with top dressing or sand is not a recommended solution. Instead, the following applicators are recommended:

Pedestrian spreaders for treatment of smaller areas:

The **SCOTTS SS-2** treats a width of ca. 90 cm. Check output at the spreader's minimum setting at a walking speed of 0.8 m/sec (3 km/h) and adjust as necessary. Precise settings differ on individual machines depending on assembly.

The ****HORSTINE FARMERY ROTASPIN** hand-held applicator treats a width of ca. 1.3 m: suitable for overall work or spot-treatment of turf around trees, shrubs, bunkers and similar areas.

Powered spreaders for treatment of larger areas:

The ****HORSTINE FARMERY ATV-TURF** treats a 3 m width. Fit a 15 mm 18-flute rotor at each hopper outlet: fit a 28-tooth sprocket to drive a 25-tooth sprocket. Check output and adjust as necessary.



Scan QR code to view Merit Turf application video.





The ****HORSTINE FARMERY TMA2** treats a 5 or 6 metre width: a **TMA4** treats a 10 or 12 metre width (depending on fitted spreader plates). Fit one of the following combinations to check output and adjust as necessary.

Drive type	Spread width	Rotor size per outlet	Driving sprocket/ pulley	Driven sprocket/ pulley
	5 or 10 m	23 mm	34 tooth	25 tooth
Chain	6 & 12 m	23 mm	31 tooth	19 tooth
		14 mm deep-flute	34 tooth	28 tooth
	5 8 10 m	23 mm	7 inch	5 inch
Rolt	5 & 10111	14 mm deep-flute	4 inch	4 inch
Delt	6 8 10 m	23 mm	7 inch	4 inch
	0 & 12 111	14 mm deep-flute	5 inch	4 inch

****HORSTINE FARMERY MICROBAND** gravity-flow applicators with 2-outlet or 3-outlet hoppers treating various widths through standard fishtails. Fit one of the following combinations to check output and adjust as necessary.

Type of drive	Rotor size per outlet	Driving sprocket/ pulley	Driven sprocket/ pulley
	5 mm	34 tooth	19 tooth
Chain	8 mm	22 tooth	22 or 23 tooth
	2 x 5 mm	25 tooth	28 tooth
	5 mm	7 inch	4 inch
Belt	8 mm	4 inch	4 inch
	2 x 5 mm	4½ inch	5 inch

Turn to page 43 for more information on Merit Turf.





Regulations & best practice

The use of pesticides is strictly controlled; from the initial trials, to storing and use of chemicals through to the disposal. This is to ensure that best practise is adhered to and legal requirements followed. When using chemicals there are many areas to take into consideration, including;

- Is your warehouse or store within the legal requirements to keep chemicals?
- Do you have the appropriate PPE (Personal Protective Equipment) for handling and use of the product?
- Have you read the label and are you operating within this document?
- How can you dispose of unused chemicals and washings?

As you will have read in sections 3, 4 and 5, there can be alternatives to using chemicals.

Before taking action you should first identify the pest, weed or disease. (Please see at the front of each section for help on identifying a problem). Once the problem is correctly identified you can look at what solutions are available to you. Areas to consider during this process are;

- 1. Environmental impact
- 2. Health and safety risks
- 3. History of the area or problem
- 4. Your resistance strategy

Bayer promotes good practices and responsible disposal of pesticide residues. Bayer is a supporter of the Amenity Forum whose role is to ensure good stewardship and safe use of pesticide products.

For more information please visit www.amenityforum.co.uk

There are many sources of information and guidance on these areas, please see the list below for further reading;

Chemicals Regulation Directorate

www.pesticides.gov.uk/guidance/ industries/pesticides

'Code of practice for using plant protection products'

Pesticides Registration and Control Division www.pcs.agriculture.gov.ie

BCPC

www.bcpc.org 'Safety Equipment Handbook' 'Using Pesticides' 'Small Scale Spraying'

Amenity Forum www.amenityforum.co.uk



Classification, labelling & packaging (CLP)

From 2015 onwards fungicides and other chemical products will undergo a number of changes to the labels that appear on the product packaging. It follows the United Nation's (UN) Global Harmonisation System (GHS) of the classification and labelling of chemicals. GHS has introduced revised hazard symbols, signal words, hazard statements and precautionary statements, in order to create a globally recognised system which will be universal across every country worldwide.

All products that leave the manufacturer or marketing companies must be labelled in accordance with the new CLP regulation. Distributors and users have until the 1st June 2017 to use up stock which still holds the old labelling.

All products now need to conform to the new legislation. Whilst they will be implemented at a worldwide level, the physical label changes will take place at slightly different times across the world. Therefore it is now more important than ever that turf managers and groundsmen stay on top of their stock rotation.

The CLP legislation incorporates all industrial and household chemicals, including all those products used within the turf and amenity sector, such as fungicides, herbicides and insecticides. The updated labels do not reflect any change to the products themselves. The risk that products pose to turf managers and groundsmen, the consumer or to the environment has not changed in any way; it is just the labels themselves that have been updated. However, outside of these CLP changes, it is important to remember that as part of good practice, product labels should be continuously reviewed, in order to keep abreast of any additional changes.

Users of any chemical product will now see a selection of nine new hazard pictograms, depicted within a red diamond, which replace the original square symbols with the orange background. There are new signal words which replace those currently on chemical labels, such as 'Toxic' and 'Harmful' will be replaced with 'Danger' and 'Warning'. A new disposal phrase will also be introduced to the labels.

Product pack before revised hazard symbols and statements.







What has changed?

The changes apply to many chemicals, but in the amenity sector turf managers and groundsmen will now see that all the products they use, whether it be fungicides or fertilisers, hold a selection of nine new hazard pictograms, depicted within a red diamond, replacing the current boxed warning symbols with the orange background. There are also new signal words replacing those currently on chemical labels, and a new disposal phrase will also be introduced to the labels.

Why have the changes been brought in?

The Classification, Labelling and Packaging (CLP) label changes are happening following the UN's Global Harmonisation of the classification and labelling of chemicals. The overarching aim of these changes is to create a globally universal system.

What does this mean for applying products?

Nothing will change to the product itself; the label rates, application method or the level of Personal Protective Equipment (PPE) needed when applying the product will all remain the same. However, it is important to be aware of the new hazard symbols and warnings.

By what date does old labelled stock need to be used up?

Distributors and users have until the 1st June 2017 to use up stock which still holds the old labelling.



Corrosive to Skin

Skin Irritation

For further information please contact our Turf Solutions team by calling 00800 1214 9451 or by e-mailing turfsolutions@bayer.com.



1. Site address			
2. Pest/Weed/Disease			
3. Briefly describe the task/process			
4. Who is at risk	Operator 🗆	Public 🗆	Environment 🗆
5. Substance/product name and description			
6. How is the supplied substance to be used and quantity			
7. Manufacturer			
8. Classification			
9. Route of exposure			
10. State the risks to health from ide	ntified hazards		
11. Control measures			
12. Personal Protective Equipment (P	PE)		
13. First Aid measures			
14. Storage & transport			
15. Spillage			
16. Disposal of substances & contam	inated containers		
Assessed by:		Date:	Review date:





Example of a LERAP assessment

Local Environment Risk Assessment for Pesticides. For the latest advice on completing a LERAPS assessment please see: www.pesticides.gov.uk (search LERAPS)

LERAP asessment/record

Draw a map showing watercourse location(s) relative to the field (always check size/status of watercourse at time of spraying)



Wind speed direction	Other relevant information (eg. weather, soil conditions, incidents, harvest, interval, re-entry period)	Operator's name	COSHH Assessment	Date of LERAP	Completed by	Product Category	Product dose ¹	Low drift star rating	Size of watercourse ²	Buffer zone used (m)

1 full; 3/4, 1/2, 1/4, of permitted maximum dose for intended use. 2<3 m; 3-6 m; >6 m; dry ditch.





Example of a spray record sheet

Date	Reason for treatment (eg. weed, pest disease)	Product(s)*	Dose rate	Water volume	Spray quality	Spray start	/ time end	Total hours	No. of tanks	Area sprayed

Section 7 Innovation at Bayer





Research & development

As a lifescience company Bayer puts huge resources into research and development activities, which are closely aligned to market needs and geared towards continuous improvement.

Baver activities are supplemented by an international network of collaborations with leading universities, public-sector research institutes and partner companies that continue to expand in alignment with the company's main areas of research and development. This network allows the pooling of expertise,

Formulation vs. generics

With spending pressures across all business sectors there can be a temptation to opt for low cost generics containing the same active ingredient as a branded treatment. This approach however, overlooks the added benefits of a branded formulation.

The efficacy of a treatment relies heavily on the correct formulation technology, to help the active ingredient be as effective as possible, such as by adhering to and being absorbed

Latest innovations

TurfXpert app

The Bayer TurfXpert app contains photographs and information on over 100 turf weeds. diseases and insects found in the UK and Ireland. Users have the option of browsing through high resolution images of weeds and diseases using an A-Z list, or if help is needed with identification there is the option of a simple to use identifier tool which allows for quick and easy identification while in the field. In the case where the turf problem cannot be

helping Baver to rapidly translate new ideas into successful products. Even so, it can take up to 10 years, the analysis of 100,000 potential active substances and about £300 million to bring each new and innovative product that customers come to expect from Baver, to market,

Bayer is committed to sustainable development, R&D and regularly invests in local R&D projects to help improve the future quality and management in the turf and amenity sector.

by the leaf and ensuring the sprayer doesn't

ingredient to feature in different formulations

but the presence alone of an active ingredient

does not ensure the efficacy of the product for

any one situation. Another factor to consider is

resistance build-up. If just one active ingredient

is applied for a season, then a significant risk of

easily identified, Bayer has provided a camera

option allowing photographs to be uploaded

and sent direct to their Technical Support for

personalised identification. The app offers

• The situation, occurrence and treatment

• The identification, life cycle and problems

• A camera option to help identify unknown

It is not uncommon for the same active

resistance build-up would occur.

become blocked.

advice on:

for each turf problem.

caused by turf insects.

weeds or diseases.

- The thresholds for treatment.
- The app is designed for all those responsible for maintenance and development of all types of managed turf.

The app is free and available to download now for iPhone and Android, to find out more visit www.environmentalscience.bayer.co.uk

StressGard Formulation Technology

Bayer are dedicated to the development of new formulation technology; an example of this is Interface with StressGard Formulation Technology, a fungicide specifically designed for turf. Please turn to page 9 to find out more about StressGard Formulation Technology.

Smartline packaging

Baver Smartline packaging is aimed at saving spraver operator's time through better pouring. handling, emptying and rinsing. In addition, the Smartline packaging uses less material and offers better anticounterfeiting measures, including tamper proof caps. Improved handling has been achieved by having a seal-free closing system and a more comfortable grip, which makes the shaking-up of products easier - plus the wider, shorter neck makes for glug-free pouring. Bayer estimates that the reduced packaging will save around 230 tonnes of plastic each year, as well as reducing energy use in packaging production and transport.

Better performance:

emptying and rinsing.

Improved handling:

Secure:

seal-free closing system

and more comfortable grip.

improved pouring, handling,

Smart/ine

Easy twist cap: even with gloves. Wide mouth: for easy pour and glug-free emptying. Tamper resistant Seal-free secure closing system Foil-free caps for easier recycling



shaking-up of product.

Translucent bottle: allows level to be easily viewed. Easy to rinse container shape **Reduced packaging**

for better grip and



with tamper proof caps.

Sustainable: less material uses less energy to produce and transport.



(Interface



Innovation at Bayer)

5Le



Phytobac

The Phytobac system has been developed as a simple and highly effective spray residue management system. Evolving from the biobed design, a Phytobac helps tackle the problem of point source pollution.

In order to promote best practice and environmental stewardship, Bayer have developed a process to manage the environmental impact of using pesticides. This system is called the Phytobac and completes the lifecycle of an active ingredient from cradle to grave. Phytobac is an efficient system which collects and breaks down contaminants which can be found in

Protecting a precious resource

washings from rinsing down a sprayer. Correct management of these effluents can decrease the impact on surface water. Phytobac is a natural process under control; it is the activity of soil microorganisms that degrade contaminants.

Phytobac®

Bayer CropScience

Section 8 Bayer & Partners



Science For A Better Life

Bayer carefully develops products and services which are designed for the wellbeing of people by improving their quality of life. These efforts are in line with the Bayer commitment to sustainable development.

PROTECTING TOMORROW... TODAY

is the Bayer vision which declares a contribution to global sustainability. It is the guiding principle on which the Bayer operative and cultural strategy is based. Bayer recognises that success is possible only by means of long-term commitment to protect sustainability. This concerns not only the products and services offered, but also directly through the practice of the company as well as of the Bayer suppliers, distributors and end customers. Sustainability is not new to Baver who have a history of innovation, training and management and have always taken into account providing solutions which are aimed at improving quality of life, with minimal impact to the environment.

What is sustainable development?

Sustainable development is a commitment to conduct economic development which meets the needs of present generations, without compromising those of future generations. This globally accepted approach, which envisions economic growth whilst respecting the environment, and without damaging the planet or exhausting its resources.

The Bayer vision of the future

Bayer maintains the Bayer Group Sustainability guidelines, with particular attention to:

Environment: attentiveness to the environment

For responsible support of Bayer products throughout their entire life cycle, in order to guarantee safety for:

- The operator; by means of development of new molecules and innovative formulations.
- The environment; by manufacturing in accordance with the Responsible Care principles.

Social: partnership and development with operators in the field

To create a sense of sustainability in the daily activities, Bayer co-operate with public and private organisations for the purpose of:

- Improving well-being and environmental health.
- Providing modern technologies.
- Promoting responsible use of our products by means of technical support and educational activities.

Economic: re-planning the future

By means of continual investments in research and development, Bayer are committed to providing new sustainable products, services and technologies which meet the needs and expectations of Bayer clients. Bayer encourage:

- Research and development at all levels.
- Co-operation with Bayer clients and partners in order to make improvements in terms of efficiency and productivity.
- Work aimed at sustainable success.

The Bayer commitment and contribution to honey bee health and safety

Bayer has an inherent interest in promoting sustainable agriculture and preserving bee health. In managing a plant breeding business, Bayer relies on honey bee pollination and fully acknowledges the value of honey bee pollination services to agriculture.

Bayer is committed to finding solutions to enhance honey bee health and safety by:

- Providing Varroa management products and exploring potential new treatments;
- Ensuring the sustainable use of pesticides through research and promotion of 'bee-responsible' farming practices;
- Sharing knowledge and expertise with relevant stakeholders in the beekeeping and agricultural communities and with scientific and governmental institutions, NGOs, policymakers and regulators.

At the heart of the Bayer commitment to honey bee health lies a portfolio of Varroa mite management products. Bayer are evaluating a number of synthetic and natural products, as well as novel application methodologies for use in a number of different countries. Additional innovative solutions for bee health are currently underway and reaffirm the Bayer commitment.

To ensure that bees will continue to thrive in the future, Bayer is contributing to find solutions for improved honey bee health and safety. To that end, Bayer is cooperating in a variety of projects with scientific and governmental institutions.



of the BEENOW magazine.





Industry bodies

Amenity Forum

The Amenity Forum is the leading organisation within the UK amenity sector for promoting safe and environmentally friendly use of pesticides. For more information on the Amenity Forum please see www.amenityforum.co.uk



BASIS

BASIS is an independent organisation set up to establish and assess standards in the pesticide industry relating to storage, transport and competence of staff. For more information on BASIS please see www.basis-reg.co.uk

BIGGA

Bayer is a partner of the British and International Golf Greenkeepers Association (BIGGA) which is an association dedicated to the continuing professional development of its members through education and training. For more information on BIGGA please see www.bigga.org.uk

IOG

Bayer is a member of The Institute of Groundsmanship (IOG), which is a membership organisation representing the whole of the groundscare industry and all those involved in it. For more information on IOG please see www.iog.org

STRI

The Sports Turf Research Institute (STRI) is the world's leading sports turf consultancy, providing independent advice to around 2,100 sports clubs and leisure facilities every year. For more information on STRI please see www.stri.co.uk



BIGGA



CORPORATE PLUS



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