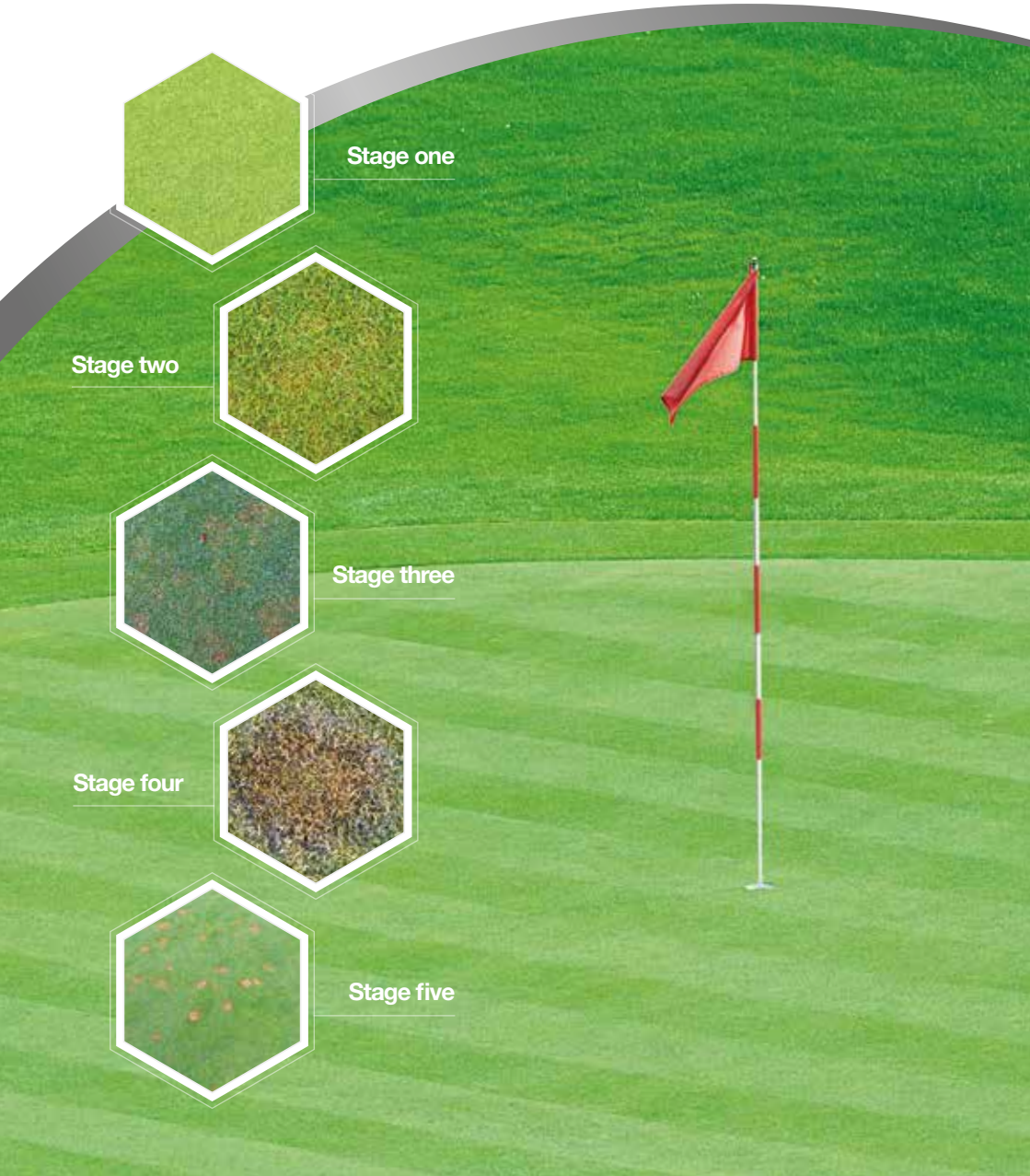
Bayer Turf Solutions

Guide to managing Microdochium Patch



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.

Contents

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 campus in Clayton, US.

Bayer UK offers;

Extensive product portfolio

The UK and Irish product portfolio consists of turf fungicides and herbicides which Bayer distributes through a number of distributors throughout the UK and Ireland.

Direct contact with turf managers and ground maintenance professionals

Bayer has formed Customer Advisory 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 million to bring each new active ingredient to market.

Bayer has turf research centres including Monheim, Germany and Clayton, US. Clayton has a golf course on site meaning that the solutions that Bayer offers 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 4 to find out more about the team.

Turf Solutions team

The Bayer UK and Irish team consists of former greenkeepers and groundsmen that combine the expert scientific knowledge of Bayer with a practical understanding of how the 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.

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.

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.

Lewis Blois

Lewis brings over 10 years of experience to the Turf Solutions Team. Focusing on the amenity side of the business, a key part of his role is working closely with distributors and vegetation management customers. Like the rest of the team, Lewis is an expert in his field, and he's fully BASIS qualified.

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

Turf Solutions
Backed by **Bayer**

- **Technical support**
- **Tailored advice**
- **Training & seminars**

You can also subscribe to receive regular updates from the team at **www.environmentalscience.bayer.co.uk**

1. Introduction

1.1 What is Microdochium Patch?

Microdochium Patch (*Microdochium nivale*), more commonly, but incorrectly, referred to as Fusarium patch, is a leaf tissue disease of turf grass which is a facultative saprophyte. This means that it is an organism that is ordinarily parasitic, existing on another living host organism (turf grass), but may occasionally live on dead or decaying organic matter, such as thatch lying in the rootzone.

The disease is known to occur on 90% of golf courses at some point in the year, typically in milder, wet conditions below 15.5°C, between September and March.

Outbreaks of the disease typically occur when the rate of grass growth slows due to lower temperatures. This is because there is less natural regeneration of the grass plant, so it will have difficulty recovering from abiotic (non-living) and biotic (living) stress factors (see section 1.3).

Another reason why Microdochium Patch is prolific at lower temperatures, is because other turf diseases are less active or have become dormant, so outbreaks are more noticeable.

1.2 Why is Microdochium Patch a problem?

Microdochium patch is a commonly occurring disease of turfgrass in the UK and has the ability to spread very quickly. It is problematic for greenkeepers, turf managers and groundsmen, because it causes dieback of the leaf tissue. When this occurs on areas such as putting greens, where an even surface is required, the uniformity of the playing surface is affected and depressions in the sward are formed. This reduces playability and negatively effects ball roll, as well as being visibly unappealing.

Annual meadow (*Poa annua*) grass is the most commonly found grass species on golf greens, and is also the most susceptible variety to Microdochium Patch.

Example of Microdochium patch

1.3 What factors lead to Microdochium Patch?

There are several stress factors that can lead to the development of Microdochium Patch, these are split into two categories: abiotic and biotic. Some examples of these stresses are detailed below

Abiotic stresses are caused by non-living factors, and can include:

a. Temperature extremes: High temperatures cause transpiration in the plant, where the plant emits water onto the leaf surface in an attempt to cool down. Additionally evaporation from the soil occurs which, when combined with transpiration, is referred to as “Evapotranspiration”. This can lead to drought stress that weakens the plant and causes the plant to be more vulnerable to disease

b. Humid conditions: High levels of moisture in the air leave the turf damp, creating favourable conditions for disease to thrive

c. Reduced air flow: In areas with a lot of trees or shrubs, air flow is reduced, meaning that it takes longer for the leaf to dry out, again creating favourable conditions for disease

d. Low solar radiation: In shaded areas and during the shorter daylight hours of winter, photosynthesis is reduced due to a lack of sunlight, so it is more difficult for the plant to generate energy and recover from disease

e. Low mowing heights: A shorter height of cut reduces the leaf area in which the plant can photosynthesise, again making recovery from disease harder

f. Poorly drained rootzone: Compacted soils can be prone to poor drainage and surface water pooling if they are not managed properly. Leading to increased wetness on the leaf

Biotic stress factors are caused by living organisms that stress and weaken the plant by causing damage, these can include the following:

g. Other disease threats

h. Insects, such as chafer grubs feeding on and damaging the plant roots

i. Weeds that compete with the plant for both nutrients and sunlight

j. Plant parasitic nematodes that feed on the root system which can reduce the roots ability to take up water and nutrients

1.4 What can be done to manage Microdochium Patch?

There is no single solution to Microdochium Patch management, so an integrated approach to control should be considered in order to minimise the likelihood of an outbreak of the disease.

Many every day practices can be factored into a programme that can aid in the prevention of Microdochium Patch.

- Ensure turf nutrition levels are adequate. This helps to maintain healthy development of new leaf tissue, in order to recover from stresses. However nutritional supplements should not be applied in excess as this can lead to excessive growth of soft leaf tissue, making the grass plant more susceptible to disease outbreaks. This in turn can lead to an increase in cutting frequencies, which can also stress the plant further
- Keep the turf surface as dry as possible, as damp conditions are favourable for disease development
- Remove excess organic matter (thatch) from playing surfaces, as this takes away a key disease host material
- Increase the height of cut when mowing. This creates a larger leaf surface area for sunlight to penetrate, and in turn maximises the rate of photosynthesis for plant development which is limited during the autumn and winter months when Microdochium patch is most active.

If Microdochium Patch is already present, there is currently an array of chemistry available on the market for the treatment of the disease, and it is important to ensure that the appropriate product is used for the situation. (See section 3.3.1 for further information)

The Bayer TurfXpert app...

Enables greenkeepers and turf managers to recognise most diseases present in turf. The disease will be immediately identified by selecting a number of symptoms from a list.

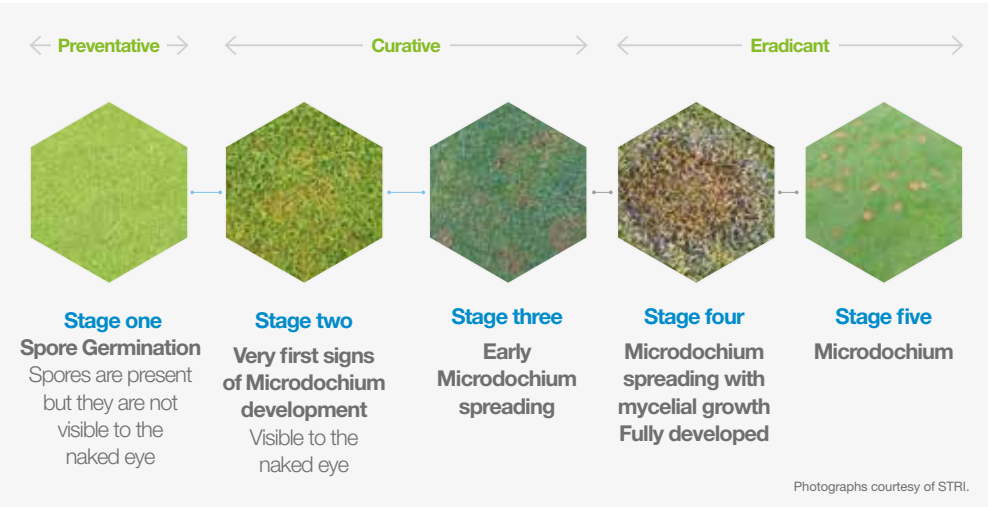
If the weed, pest or disease is unidentifiable, then there is an 'identify' button which can be used to take up to three photos and submit them directly to the Turf Solutions Team for feedback on the disease identity and the most appropriate treatment for it.

Scan the code to download the FREE app from the Apple App Store or the Google Play Store.

2. Quick guide to identifying Microdochium Patch

Microdochium Patch often occurs in the autumn months as a small reddish-brown spot in the turf that starts at around 2.5 cm in diameter and can reach up to 20 cm if left untreated.
At times of high fungus activity, a brown ring can form around the edge of the spot and the inner circle may become a pale brown colour with a greasy or wet look.

In most cases, Microdochium Patch will appear in stages, and the earlier it is treated the less likelihood of scarring and disrupted play on a given surface. The images below illustrate each development stage of the disease.



Photographs courtesy of STRI.

3 How to control Microdochium Patch

For the most effective control of Microdochium Patch, an integrated management programme should be implemented to prevent or minimise the occurrence of the disease. However, if it is already present in turf, there is a number of control methods that can be used to tackle the problem (see section 3.3 for further details).

Integrated management programmes comprise of a combination of management techniques that include cultural, biological and chemical practices. However, it is important that greenkeepers and turf managers consider the use of cultural and biological controls before applying chemicals.

3.1 Cultural controls

Cultural control methods should be the first port of call for the management of any disease. The following practices can be used to help relieve disease pressure.

- **Aeration:** This helps to relieve compaction and drought stress by allowing the roots to grow deeper into the soil and take up a greater volume of water and nutrients. This also facilitates gaseous exchange (CO_2 out, O_2 in) and the removal of thatch
- **Sharp cutting blades:** Blunt cutting edges can tear the grass leaf tissue, leaving a large wound and a greater surface area for disease to infiltrate the plant, so it is recommended to use sharp blades for a clean cut
- **Organic matter control:** Practices such as scarifying, hollow coring and the application of suitable top dressing material will physically remove or dilute thatch and improve air movement into the rootzone. This removes a host material for disease and also allows soil microbes to further reduce thatch by feeding on it
- **Irrigation:** As Microdochium Patch favours damp conditions, it is recommended that if irrigation is necessary, then it should be carried out just before dawn
- **Keep surfaces dry:** Remove dew by switching or brushing
- **Correct feeding:** Microdochium Patch can be encouraged by excess fertility, so it is important that nutrition is adequate, but not in excess. Optimum nutritional requirements vary depending on the time of year, weather conditions, grass species, soil type and other management regimes, so these measures should be carefully assessed before making a fertiliser application

Top tips for a preventative approach to disease control:

- Monitor the weather forecast, to identify when conditions are becoming conducive for disease activity
- Keep the turf surface as dry as possible
- Raise the height of cut to promote turf health and development
- Minimise thatch build up by carrying out practices such as scarifying or hollow tining
- Maintain adequate nutrition

3.2 Biological controls

Biological forms of disease control use other living organisms to eradicate or alleviate disease pressure, these include a variety of different practices such as:

- Introducing new grass species with proven tolerances to stress factors which would otherwise encourage Microdochium Patch. For example, grass varieties such as Red Fescue (*Festuca rubra*) and bents (*Agrostis sp.*) are the better adapted traditional grass species for a golf green environment. For further information please refer to the Turfgrass Seed booklet
- Microbial inoculants can be used to enhance the microbial population in the rootzone, this helps with the breakdown of organic matter, therefore releasing vital nutrients to the plant. However, an analysis of the turf should be carried out prior to treatment to determine if a microbial inoculant is required

3.3 Chemical controls

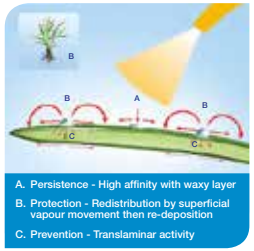
Chemical controls should always be the final activity after cultural and biological practices have been carried out. It is important that the correct fungicide is selected to suit the situation.

3.3.1 Choosing the right fungicide

To achieve the most successful control of any disease, you should first correctly identify the disease present, or the disease likely to occur. Then establish whether the turf in question is actively growing or dormant. This will determine whether a contact or systemic fungicide is required.

- **Actively growing turf – apply a fungicide with systemic properties**

  Systemic fungicides are absorbed into the plant tissue and transported around the plant, offering some after infection protection



- **Dormant turf – apply a fungicide with either contact or systemic properties**

  Contact fungicides remain on the leaf surface after application, and some contact fungicides, will penetrate the leaf, providing a barrier against infection. However, these are not as long lasting as systemic fungicides if applied to actively growing turf as they are quickly removed from the leaf when mowing

3.3.2 Rotation of chemical groups and resistance

When developing a fungicide programme, in order to reduce the potential for resistance to occur, it is essential that fungicide groups, and not just active ingredients are rotated.

There are currently six fungicide groups available to greenkeepers in the UK, and each active ingredient belongs to one of these. Each group has a specific mode of action, which is characterised by the way in which the chemical controls a particular disease pathogen, or where it is active within the pathogen.

FRAC guidelines

The Fungicide Resistance Action Committee (FRAC) provides guidelines on resistance management and detail how to use specific areas of fungicide chemistry for effective disease control on numerous crops while maintaining a good anti-resistance strategy.

For more information please visit www.frac.info/about-frac/frac-guidelines

Fungicide group	Active ingredient (A.I)	FRAC Code	Mode of action
Phthalonitrile	Chlorothalonil	M 05	Contact: affects fungal cell function
Phenylpyrrole	Fludioxonil	12	Contact: inhibits spore germination
Dicarboximide	Iprodione	2	Contact and local penetrant: inhibits spore germination and fungal growth
Strobilurins	Azoxystrobin Pyracolstrobin Trifloxystrobin	11	Acropetal penetrant Local penetrant Mesostemic These all prevent electron transfer in mitochondria (mitochondrial complex III), leading to insufficient energy and therefore decreased fungal growth
Demethylation inhibitors (DMI)	Propiconazole Tebuconazole Difenoconazole	3	Acropetal penetrant Acropetal penetrant Acropetal penetrant These all disrupt ergosterol production and therefore prevent growth
Succinate dehydrogenase inhibitor (SDHI)	Fluopyram	7	Acropetal penetrant These all prevent electron transfer in mitochondria (mitochondrial complex II), leading to insufficient energy and therefore decreased fungal growth

Top tips for using curative disease controls:

- Monitor your turf on a daily basis, and as soon as signs of stress occur, act accordingly
- Use the right product for the stage of disease development and turf growth
- Use the appropriate water volume for the product and conditions, in general short grass needs a low water volume and longer grass needs a higher water volume

3.3.3 Good stewardship practice

It is important that all professionals applying any plant protection product follow not only legal guidelines on product labels but also stewardship guidelines to protect both the environment and the operator and end user.

Before taking action to tackle disease, it is essential that the problem is identified, and there are a number of areas to consider when selecting a product to apply including:

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

In order to ensure that best practice in product use is easier and more manageable, Bayer has developed two innovative, environmentally friendly solutions to complement any integrated turf management strategy.

easyFlow

The easyFlow is a contamination-avoiding, enclosed self-cleaning transfer system for liquid plant protection products, that can be secured onto any product bottle for tank mixing or filling.

This state of the art system has been proven to improve operator health and safety by up to 96% by reducing spillage and exposure with its closed transfer and rinsing system, that not only saves money by reducing waste but also speeds up the rinsing process.

Phytobac

To ensure that products are disposed of correctly, Bayer has also designed a system for waste chemical disposal, called the Phytobac, and the blueprints for building this are available to download for free on the Bayer website www.environmentalscience.bayer.co.uk/Turf-Management/Turf-Support-Materials/Innovative-Solutions/Phytobac.

The Phytobac is similar to a bio-bed, which is filled with soil and barley straw that harbours bacteria, which feed on waste chemicals and sprayer washings to dispose of them naturally, without harming the external environment.

Top tips for following stewardship guidelines:

- Make sure your sprayers are tested and up to date. Visit www.nsts.org.uk to find your nearest test centre
- Ensure you keep detailed spray records, you can use the TurfXpert app to record, store and email these details
- Ensure you follow the buffer zone guidance on the fungicide bottle, this will detail how close it is permissible to spray adjacent to a water course or other defined area
- Ensure that your spray tank is washed out and chemical containers are triple rinsed and disposed of correctly

3.3.4 Legal obligations

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

- Does your warehouse or storage facility comply with the legal requirements to keep chemicals?
- Do you have the appropriate PPE (Personal Protective Equipment) for the 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?

Why are buffer areas & LERAP important to your spray operation?

- Buffer Zones next to watercourses are intended to give additional protection to aquatic life
- A label requirement for a 5m buffer zone next to a watercourse indicates a product poses a particular risk to aquatic plants and/or animals
- LERAP offers practical benefits as it may allow a reduction in the width of the watercourse buffer zone whilst still ensuring the environment is adequately protected
- Before you begin spraying near water you must know if your product requires a watercourse buffer zone and also what width it should be

3.3.5 The Label

The label on a fungicide bottle provides a wealth of information to help the user understand various aspects of product use, including when to apply, where to apply, how to apply, and how often you can apply the specific product. Other legal requirements, such as buffer zones to be applied around watercourses are also documented on the label.

IMPORTANT INFORMATION

FOR USE ONLY AS A PROFESSIONAL HORTICULTURAL FUNGICIDE

For Use on Amenity Grassland and Managed Amenity turf.
Maximum individual dose: 1 L/ha
Maximum number of treatments: 4 per year

Other Specific restriction:
A minimum of 28 days must be observed between applications.

READ THE LABEL BEFORE USE. USING THIS PRODUCT IN A MANNER THAT IS INCONSISTENT WITH THE LABEL MAY BE AN OFFENCE. FOLLOW THE CODE OF PRACTICE FOR USING PLANT PROTECTION PRODUCTS.

SAFETY PRECAUTIONS

Operator Protection
Engineering control of operator exposure must be used where reasonably practicable in addition to the following personal protective equipment:
WEAR SUITABLE PROTECTIVE CLOTHING AND SUITABLE PROTECTIVE GLOVES when handling the concentrate, applying by hand-held equipment or handling contaminated surfaces.

However, engineering controls may replace personal protective equipment if a COSHH assessment shows they provide an equal or higher standard of protection.
DO NOT BREATHE SPRAY
WHEN USING DO NOT EAT DRINK OR SMOKE
WASH ANY CONTAMINATION from the eyes immediately
IF YOU FEEL UNWELL seek medical advice, show label where possible
WASH HANDS AND EXPOSED SKIN before meals and after work

Environmental Protection

Do not contaminate water with the product or its container (Do not clean out application equipment near surface water. Avoid contamination via drains from farmyards and roads)

LERAP B

DO NOT ALLOW DIRECT SPRAY from horizontal boom sprayers to fall within 5 m of the top of the bank of a static or flowing waterbody, unless a Local Environmental Risk Assessment for Pesticides (LERAP) permits a narrower buffer zone, or within 1 m of the top of a ditch which is dry at the time of application. Aim spray away from water.

Application Equipment			
Vehicle-mounted Hydraulic Sprayer		Knapsack Sprayer	
Rate per hectare	Water per hectare	Rate per 100 m²	Water per 100 m²
1 Litre	400-500 litres	10 mls	4 -5 litres
		Rate per 500 m²	Water per 500 m²
		50 mls	20-25 litres

Application Timing

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

If grass is being mown, DEDICATE should be applied after cutting and further mowing should not take place until AT LEAST 48 hours after treatment. This is to allow adequate movement of the systemic active ingredients throughout the plant.
Allow at least 28 days between applications of DEDICATE.
Alternate with a fungicide having a different mode of action.
DEDICATE can be applied year round.

Resistance Management:

DEDICATE contains trifloxystrobin which belongs to the QoI class of chemistry and also contains Tebuconazole, of the Dimethylation class of chemistry which are two separate classes of fungicide with different modes of action together in one product should reduce the chance of resistance appearing however the possible development of diseases resistant to DEDICATE® cannot be excluded or predicted. Certain fungal pathogens are known to develop resistance to QoI products when used repeatedly.
The use of DEDICATE should conform to resistance management strategies. Such strategies may include rotating with products containing active substances with different modes of action, or limiting the total number of applications per season.
Bayer recommends responsible product stewardship to ensure effective long term control of the fungal diseases on this label.
Do not apply more than 2 sequential applications of DEDICATE or any product containing a QoI fungicide.

This product qualifies for inclusion within the Local Environment Risk Assessment for Pesticides (LERAP) scheme. Before each spraying operation from a horizontal boom sprayer , either a LERAP must be carried out in accordance with CRD published guidance or the statutory buffer zone must be maintained. The results of the LERAP must be recorded and kept available for three years.

Storage and Disposal

KEEP OUT OF REACH OF CHILDREN.
KEEP IN ORIGINAL CONTAINER tightly closed in a safe place.
WASH OUT CONTAINER THOROUGHLY, empty washings into spray tank and dispose of safely.
DO NOT RE-USE CONTAINER for any purpose.
KEEP AWAY FROM FOOD, DRINK AND ANIMAL FEEDING STUFF

DIRECTIONS FOR USE:

IMPORTANT: This information is approved as part of the Product Label. All instructions within this section must be carefully read in order to obtain safe and successful use of this product.
Dedicate may be applied year round to managed amenity turf sites including:

Golf courses, Sport turf (football and rugby pitches, tennis, bowls and cricket pitches) Ornamental turf (parks, institutional, commercial and residential lawns, municipal grounds, cemeteries

RESTRICTIONS:

Do not apply during drought conditions or to frozen turf.
If grass is being mown, DEDICATE should be applied after cutting and further mowing should not take place until AT LEAST 48 hours after treatment.

APPLICATION:

For control of Fusarium Patch, Red Thread, and Dollar Spot use 1L of DEDICATE ® in 400-500 litres of water per hectare of turf. Control of Leaf Spot and a reduction of Anthracnose and Rust may also be achieved. For use with knapsack sprayers or vehicle mounted hydraulic sprayers.

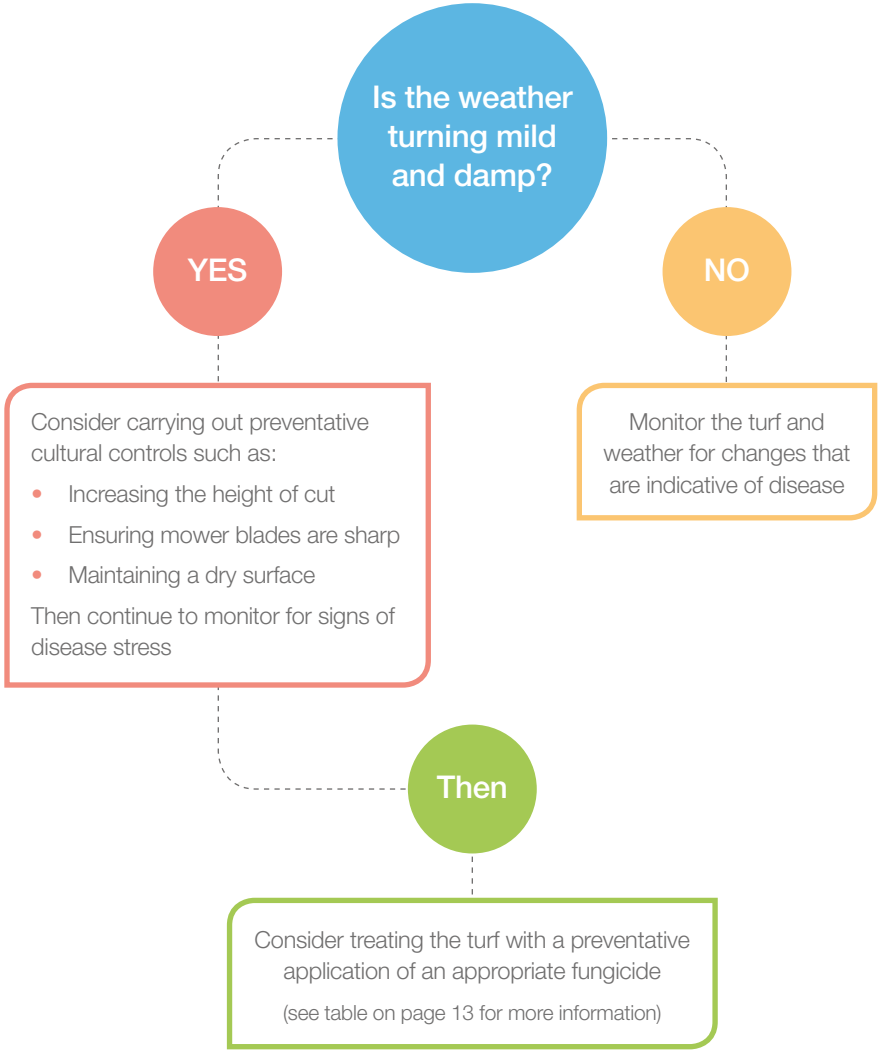
Alternate with a fungicide having a different mode of action.
Do not apply more than 4 applications per year of any product containing a QoI fungicide.
For further advice on resistance management in turf contact your agronomist or specialist advisor and visit the FRAG-UK website.

Mixing:
Sprayers should be THOROUGHLY CLEANED before use and filters and jets checked for damage and blockages.
Thoroughly shake the pack before use.
Half fill the sprayer tank with clean water and agitate. Add the required amount of DEDICATE. Mix thoroughly and make up to the required volume of water while still agitating. Spray immediately after mixing. Continue agitation at all times during spraying and stoppages, until the tank is completely empty.
Wash out all spray equipment thoroughly with water immediately after use.

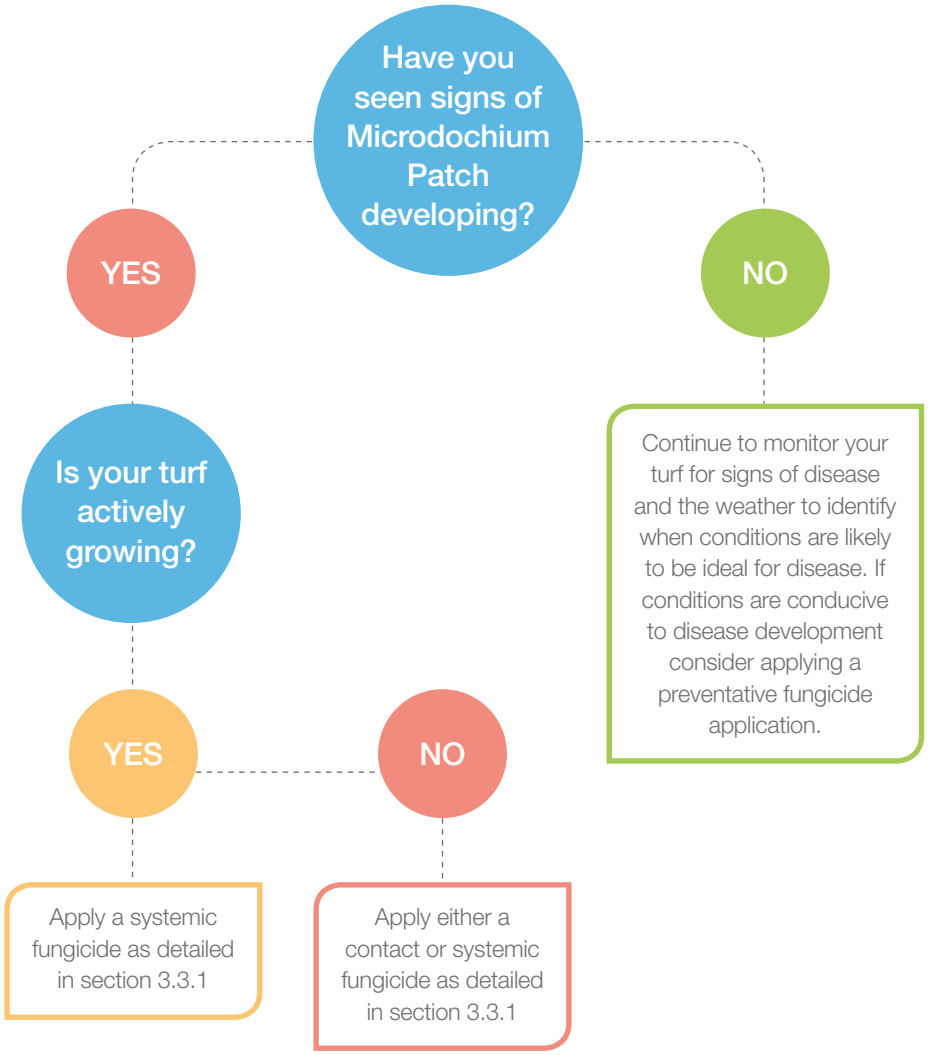
DEDICATE® is a registered trademark of Bayer CropScience

4. FAQs

Do I need to apply a preventative fungicide?



What type of fungicide should I apply?



Notes

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

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