

Turfgrass Disease Management

A GUIDE TO FUNGICIDE SELECTION FOR QUALITY TURF



Facing the Challenge of Turf Disease Control

Today's turf managers are under ever increasing pressure to deliver high quality playing surfaces all year round. Every golfer wants to putt on Augusta quality greens; every footballer to play on a Premiership pitch.

An outbreak of turf disease can ruin all the hard work put into preparing the best possible playing conditions for any sporting event.

Turf disease problems are on the increase for all turf managers:

- Earlier disease attacks
- More aggressive pathogens
- New diseases appearing
- Season long infection

Turf disease issues are being exacerbated by:

- Climate change
- Environmental pressures reducing options
- Player demand for ever higher quality turf

Integrated Turf Management (ITM) has an essential role in countering disease through effective nutrition, irrigation and maintenance.

ITM can help to mitigate the effects of disease, but in many practical situations it can not eliminate the problem sufficiently to maintain high quality turf. Fungicides remain a key component of turf disease control within an ITM programme.

Disease identification, helped by the Syngenta Guide to Turf Disease poster and www.greencast.co.uk is essential to understand the disease threats, the tools available for their control and the best way to use them.

The Turf Disease Triangle

The Turf Disease Triangle

For turf disease to occur three factors must all be present:

■ The Environment

Turf stress, brought on by conditions such as drought, water logging or excess growth, can make plants more susceptible to disease infection. However, if environmental conditions are not suitable – if it is too cold or too dry, for example – disease development will be slower, or may cease altogether.

Most environmental conditions are outside the turf managers' influence, however some factors can be controlled, including:

- Irrigation
- Drainage
- Turf nutrition
- Mowing height
- Maintenance programmes

■ The Pathogen

In most fine turf situations many disease pathogens are already present in the thatch or basal leaves; awaiting the right conditions to break-out. Other disease pathogens will be present at lower levels, but may never cause visible symptoms, unless conditions change.

Diseases can also spread from outside sources. Domestic lawns, roadside verges and untreated amenity grass areas can all give rise to foliar disease infection.

Effective use of fungicide programmes will ensure high quality turf in the short term, as well as reducing disease pressure to enable the best use of ITM practices in the future for long term solutions. Syngenta now has fungicide programmes to control all major UK turf diseases (see page 7).

■ The Turf

The grass species and variety of turf are key components of disease susceptibility. Although turf managers can influence the turf composition in the longer term, through seeding and management, in most instances they have to manage what is there.

For high quality golf and bowling greens, Bent grasses and Fescues provide the most consistent premium playing surfaces. The inherent disease and stress resistance of Bents and Fescues play an important role in ITM strategies, however on many soil types they can prove difficult to maintain at the low cutting heights traditionally used to achieve satisfactory ball speed.

Poa annua is found in many fine turf situations and, with the right management, can produce excellent playing surfaces. *Poa* is generally more susceptible to disease attack, with heavy play and low cutting height likely to make problems worse.

Rye-grass provides the most hard wearing, resilient sports turf surface. Historically it has proven difficult to create high quality tight-cut turf with Rye-grass, although new cultivars can be cut as low as 5mm. Most Rye-grass varieties still require an intensive management and nutrition regime to maintain quality.



Turf managers must decide which factors of the Disease Triangle they can successfully influence and where the role of fungicides can help to manage problems more effectively.

Key turf disease pathogens in the UK include:

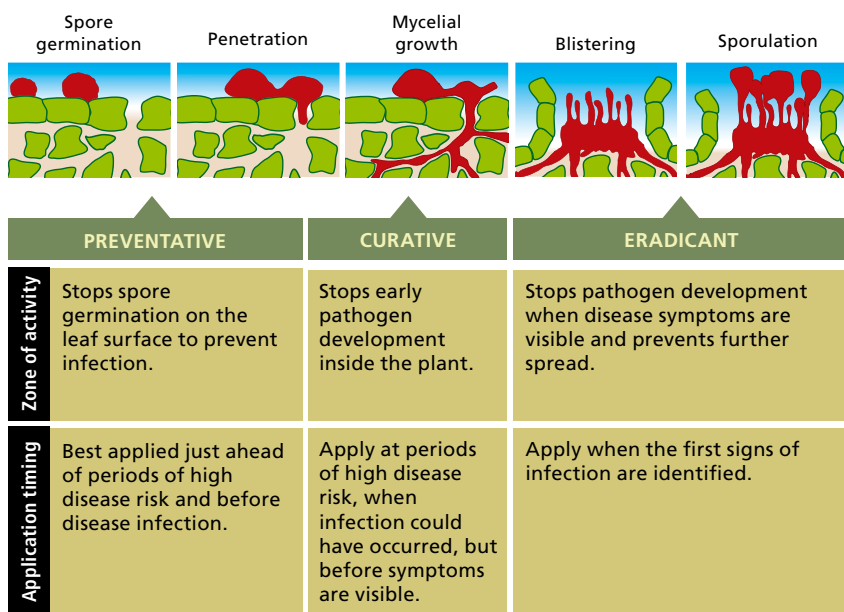
- Fusarium Patch (*Microdochium nivale*)
- Dollar Spot (*Sclerotinia homeocarpa*)
- Anthracnose (*Colletotrichum graminicola*)
- Rust diseases (*Puccinia* spp.)
- Take All Patch (*Gaeumannomyces graminis*)
- Brown patch (*Rhizoctonia solani*)
- Fairy Rings (*Basidiomycetes* spp.)
- Leaf spot / Melting out (*Drechslera poae*)

	Bents	Fescues	<i>Poa annua</i>	Rye-grass
Fine turf quality	★★★★★	★★★★ (★)	★★★ (★)	★
Wear durability	★★★	★★★	★★	★★★★★
Ease of maintenance	★★	★★	★★	★★★★
Disease resistance	★★★	★★★	★	★★★(★)

Fungicide Activity

Fungicide Activity

Most fungicides work at different points in the disease pathogen life cycle. Understanding how each individual product works is essential to get the application timing right and achieve the best results.



Knowing the stage at which a fungicide is most active is important in deciding the optimum application timing and the suitability for different situations. The Syngenta fungicide portfolio has a selection of products to counter all points of disease development.

	Preventative Early curative Anti sporulant	Systemic
	Preventative Early curative Eradicant	Contact
	Preventative Early curative Eradicant	Systemic

Fungicides also interact with the turf plant in different ways, which can be crucial in selection of the appropriate product for the situation.

■ **Systemic fungicides**, such as HERITAGE and BANNER MAXX, are readily absorbed and move within the plant. They are highly suited to periods of turf growth through spring, summer and early autumn. The movement within the plant avoids the active ingredient being removed with cutting.

Systemic products, such as HERITAGE and BANNER MAXX, which move within the xylem of the plant, give prolonged disease control. The systemic movement also gives greater flexibility in application technique.



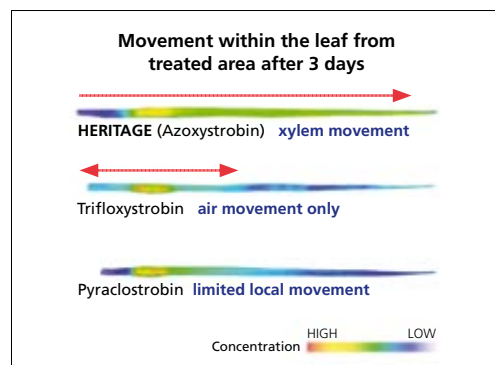
Decision support for fungicide selection

The interactive web-based decision support system – www.greencast.co.uk – provides valuable help with appropriate fungicide selection and timing of application.

GreenCast provides:

- Early warning of local disease risk – enabling preventative fungicides to be applied ahead of likely infection.
- Alerts of potential disease infection – for more effective curative product timing if an infection period has recently occurred.
- ITM disease profiles – for improved disease identification and effective eradicant product selection.

STRI trials and evaluation of GreenCast has demonstrated application timing of HERITAGE based on disease prediction can achieve better levels of control from a reduced number of applications, compared to routine applications (prophylactic).



HERITAGE is the only strobilurin which is absorbed through leaves, crown and root and has systemic activity to move fungicide protection through the plant to protect new growth.

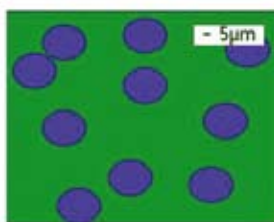
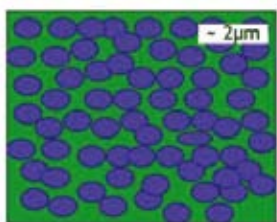
Fungicide Activity

■ **Contact fungicides** are best suited to autumn and winter applications, when turf is only growing slowly. DAPONIL WEATHER STIK also has an important role in the mid-season programme to target specific diseases and enable effective fungicide rotation (see page 4).

Contact fungicides are entirely dependent on good coverage of the leaf surface, with application technique extremely important to achieve the best results.

Manufacturing quality of the product can also significantly affect results with contact fungicides. The very fine milled particles in new DAPONIL WEATHER STIK, for example, give dense coverage of the leaf surface, whereas the larger particles of other Chlorothalonil products manufactured to lower tolerances give far less surface area coverage and could leave leaves vulnerable to infection.

When grass is actively growing, the use of PRIMO MAXX growth regulator to slow down vertical grass growth, thereby reducing frequency of mowing, could help to achieve important extra days of activity from contact fungicides. Use the web site www.primomaxx.co.uk for further information and advice.



Other Chlorothalonil

◀ The fine milled particles of DAPONIL WEATHER STIK ensure the whole leaf can be covered and protected from infection; coarse particles leave vulnerable gaps in protection.

Contact and Systemic Fungicides – WHEN TO USE

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CONTACT												
CONTACT/ SYSTEMIC												
SYSTEMIC												

High risk periods for key turf diseases

Fusarium												
Anthracnose												
Dollar Spot												
Take-all and Fairy Ring												

Turf managers need to match the appropriate mode of action and strengths of specific products on the disease pathogens present when making their fungicide selections.

Fungicide Changes Beat Disease

Fungicide changes beat disease

With disease pathogens constantly evolving there is the potential that they could develop the capability to resist the effects of some fungicide groups.

However, turf managers can significantly reduce the risk of disease resistance developing by using programmes that rotate fungicides from different chemical groups – effectively stopping the build up of any disease pathogen with resistant genes.

■ Rotation: Rotation: Rotation

Fungicide rotation is an essential part of an ITM disease control programme to retain the full beneficial effects of each fungicide group for the future.

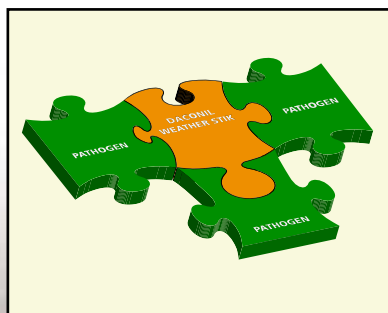
Resistance to one fungicide product is likely to confer resistance to all other fungicide products from the same chemical group; many fungicides have been developed from similar chemical groups (see STRI table on page 5).

Disease pathogens that have developed resistance to one group of fungicides, however, can still be effectively controlled with a switch to an alternative group.

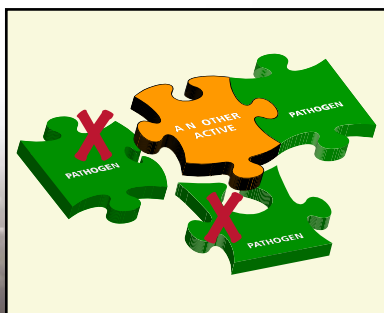
By rotating fungicides with different modes of action, turf managers can effectively maintain the performance of fungicides in the long term.

■ To achieve the best results from fungicides turf managers must also pay attention to:

- Application technique
- Application rate
- Avoiding turf stress
- Application at the appropriate stage of pathogen development



Resistance is less of a risk for fungicides with a multi-site mode of action, such as **DACONIL WEATHER STIK**, which affect the disease pathogen at a number of points in its life-cycle.



Reliance on one single-site fungicide product, applied repeatedly through the season, significantly increases the risk of resistance developing.



Mode of Action: **QOI**





Mode of Action:
Multi-site



Mode of Action:
DMI

Rotating fungicide modes of action ensures the most effective approach for long term disease control. Insert: (See STRI table on page 5 for details of QOI and DMI modes of action).

Top Tips on Managing Resistance

- Avoid repetitive and sole use of a particular fungicide, or those with the same mode of action.
- Always try to mix or alternate appropriate fungicides with different modes of action (always consult manufacturer for advice on tank mixing).
- Do not reduce rates of strobilurin fungicides in tank mixes.
- Integrate fungicide use with cultural control methods

Fungicide Changes Beat Disease

Main fungicide groups available for disease control on turf							
Fungicide group	Active Ingredient	Example Products	Physical mode of action	Biochemical mode of action	No. of action sites	Risk of resistance*	Notes
Phthalonitrile	Chlorothalonil	DACONIL WEATHER STIK	Contact	Affects fungal cell function	Multi site	Low	Broad spectrum, protectant fungicide.
Dicarboximide	Iprodione		Local penetrant	Inhibits spore germination and fungal growth	Single-site*	Medium to high	*Iprodione has historically been listed as multi-site. However, due to widespread resistance in <i>Botrytis cinerea</i> , it is suspected that it does not have true multi-site action and so should be considered as single-site.
Strobilurins (QOI)	Azoxystrobin	HERITAGE	Acropetal penetrant	Prevent electron transfer in mitochondria, leading to insufficient energy and so prevents fungal growth	Single-site	High	All strobilurins have the same biochemical mode of action but differ in their physical mode of action. Azoxystrobin has upward movement in the xylem, pyraclostrobin is primarily stored in the waxes of the leaf cuticle and trifloxystrobin is described as mesostemic (binds to the leaf cuticle and also has vapour phase activity that can move the product over short distances in the leaf canopy).
	Pyraclostrobin		Local penetrant				
	Trifloxystrobin		Local penetrant				
Demethylation inhibitors (DMI)	Fenarimol		Acropetal penetrant	Disrupts ergosterol production, preventing growth	Single-site	Medium	Resistance risk is considered to be medium, as the resistant isolates do not appear to be fit for survival in the absence of the fungicide. Resistance problems result in a slow decrease in product performance leading to increased dose rates and/or more frequent applications to achieve the same level of control.
	Myclobutanil		Acropetal penetrant				
	Propiconazole	BANNER MAXX	Acropetal penetrant				
	Tebuconazole		Acropetal penetrant				
	Prochloraz		Local penetrant				
Methyl benzimidazole carbamates (MBC)	Thiophanate-methyl		Acropetal penetrant	Affects fungal cell division, preventing fungal growth and spore germination	Single-site	High	Field resistance suspected but unproven at present.

This listing of fungicides is not definitive and is for information only. STRI (The Sports Turf Research Institute) do not accept any responsibility for omissions, errors or future amendments.

Source: STRI, January 2007

Syngenta retains a close watch on disease populations and potential resistance development, with a comprehensive global testing network based in the UK, Switzerland and the US. All Syngenta fungicides are developed with a programme of recommendations to minimise the risk of resistance.

The Syngenta turf fungicide portfolio contains three distinctly different options from different chemical groups, to target disease at different stages in the life cycle. Using a combination from the Syngenta portfolio turf managers have the tools to maintain a high level of control of disease pathogens for many years to come.

Fungicide Choice

Fungicide Choice

Some fungicides are inherently more powerful and effective than others. Some may be effective against one pathogen, but far less robust against other diseases.

The natural origins of HERITAGE as an inhibitor of a wide range of forest fungi gives it a high level of activity on the widest range of key turf diseases. HERITAGE also gives more effective, reliable and consistent control than other strobilurin fungicides.

■ Formulation

Product formulation also makes a significant difference in performance. Syngenta invests heavily in product formulation research and development to achieve the best performance in practice; the same commercially available active ingredient incorrectly formulated could give 50 to 75% lower performance.

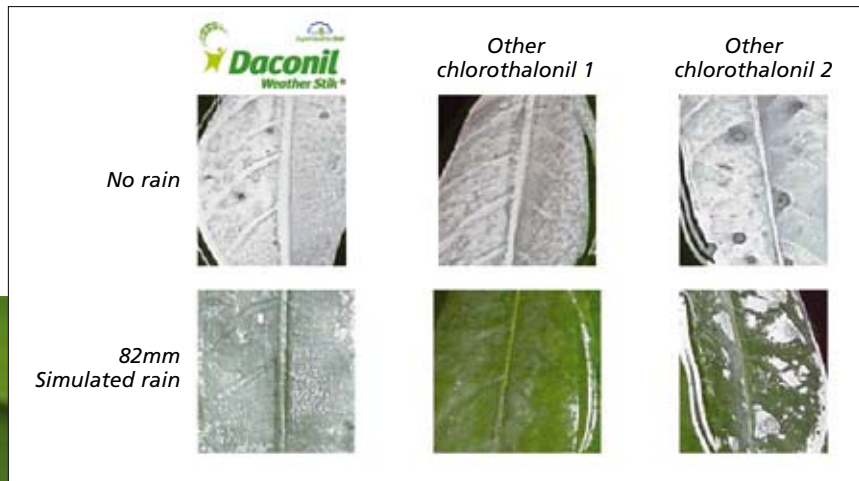
The DACONIL WEATHER STIK formulation bonds the active ingredient to the waxy layer on the leaf surface and protects it from being washed off by rainfall.

■ MAXX formulation advantages

Formulation differences can also have a significant effect on stability in the tank, product uptake by the plant and turf safety. Syngenta MAXX formulations have been specifically designed for use in turf, delivering excellent efficacy combined with safety to the grass.

Top Tips on Fungicide Choice

- Select fungicides that will achieve the greatest control of key pathogen risks.
- Chose fungicides with a mode of action appropriate to the pathogen disease stage and turf growth.
- Always follow label guidelines to achieve the best results.
- Check turf safety of fungicide formulations.



Trials demonstrate the exceptional hit and stick properties of DACONIL WEATHER STIK, even on a difficult to coat shiny laurel leaf. After heavy rain the high level of protection remains, when lower quality chlorothalonil products have been washed off the leaf surface. Better fungicide retention on the leaf surface equals better disease protection.




Fungicide Programmes to Stay in Control

Fungicide Programmes to Stay in Control

Syngenta now has a complete programme of high quality fungicides to help turf managers stay in control of disease.

The Syngenta fungicide portfolio contains products from different fungicide groups and with different modes of action for all diseases and all situations.

Selecting from the Syngenta range coupled with the use of information from www.greencast.co.uk, turf managers can now pick the optimum fungicide right through the season.

	 Chlorothalonil	 Azoxystrobin	 Propiconazole
Activity	Contact Preventative Curative Eradicant	Systemic Preventative Early curative Anti-sporulant	Systemic Preventative Curative Eradicant
Diseases on Label	Fusarium Patch Dollar spot Anthracnose Red Thread	Fusarium Patch Take All Anthracnose Fairy Ring Leaf Spot Brown Patch Rusts	Fusarium Patch Dollar Spot Anthracnose Brown Patch
Additional Effects	Leaf Spot		Leaf Spot

Individual diseases programmes for high risk situations

DISEASE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Fusarium Patch	DACONIL WEATHER STIK		DACONIL WEATHER STIK	BANNER MAXX		HERITAGE	BANNER MAXX		HERITAGE	BANNER MAXX	DACONIL WEATHER STIK	
Anthracnose						BANNER MAXX	HERITAGE	BANNER MAXX	HERITAGE	DACONIL WEATHER STIK		
Dollar Spot					BANNER MAXX	DACONIL WEATHER STIK	BANNER MAXX	DACONIL WEATHER STIK	BANNER MAXX			
Brown Patch						HERITAGE	BANNER MAXX	HERITAGE				
Take All Patch						HERITAGE	HERITAGE					
Leaf Spot					HERITAGE	HERITAGE						
Fairy Ring							HERITAGE	HERITAGE				
Rust								HERITAGE	HERITAGE			

Syngenta fungicides cover a broad spectrum of diseases; a HERITAGE application for Fusarium Patch in July, for example, will also control Take All Patch, Fairy Ring, Brown Patch and other diseases.

Programmes to Tackle Turf Disease

Disease control programmes to tackle turf disease

Syngenta fungicides are designed to tackle a broad spectrum of turf diseases; an application for one disease, will also have a beneficial effect across a wide range of other diseases.

Fusarium Patch control



Apply HERITAGE in the autumn when GreenCast® predicts a medium to high risk of infection. When soil conditions have cooled and grass growth is slower, switch to the contact activity of DACONIL WEATHER STIK to knock-down disease present. Maintain applications through the winter, using GreenCast to predict when the risk of disease infection is present. BANNER MAXX provides an alternative mode of action and enables rotation of chemical groups through spring and summer applications.

HIGH RISK SITUATIONS

- Wet or humid conditions
- Areas in shade and/or poor air movement
- Over-fertilised soft grass growth
- Alkaline rootzone conditions
- Excessive thatch layer

ITM measures to reduce the risk of Fusarium Patch include good drainage, thatch removal and avoiding heavy topdressing during conditions conducive to infection.

Anthracnose control



A preventative summer application of HERITAGE should be applied when GreenCast indicates a high risk of infection from June onwards. This should be alternated with a follow up application of BANNER MAXX 14 to 28 days later if weather conditions have remained conducive to disease. DACONIL WEATHER STIK gives a further option to rotate the fungicide mode of action and is a good option for late season applications targeting both Anthracnose basal rot and Fusarium Patch.

HIGH RISK SITUATIONS

- Compacted soils
- Drought
- Low fertility
- Nematode damage
- Low cutting height

ITM measures to reduce the risk of Anthracnose include alleviating turf stress caused by drought or heavy wear. Applications of PRIMO MAXX to condition turf may help reduce impacts of disease and enable cutting height to be raised without compromising playing surface quality.

Dollar Spot control



Start a preventative fungicide programme when GreenCast predicts high disease risk, typically from May onwards. Begin with an application of BANNER MAXX, and alternate with DACONIL WEATHER STIK through the summer whilst conditions remain conducive to disease. This programme can also provide effective protection from Anthracnose and early Fusarium Patch infection.

HIGH RISK SITUATIONS

- Temperatures above 20°C
- Low fertility
- Surface moisture
- Compacted soil surface
- Low cutting height

ITM measures to reduce the risk of Dollar Spot include irrigating less frequently, but with sufficient water to reach the root zone. Avoid leaving surface moisture. Aerate regularly and feed the turf adequately.

Take All Patch control



HERITAGE is the only fungicide approved for control of Take All Patch. Apply in June or July when GreenCast forecasts indicate a high risk of disease. Summer applications of HERITAGE will also have a beneficial effect in preventing Fusarium Patch, Anthracnose, Brown Patch, Leaf Spot, Fairy Ring and early Rust infection.

HIGH RISK SITUATIONS

- Newly constructed greens
- Alkaline rootzones
- Alkaline irrigation water
- Application of lime
- Poor drainage
- Manganese deficiency

ITM measures to reduce the incidence of Take All Patch include avoiding raising the pH of soils and maintaining a balanced feed for turf. Aerate regularly to avoid a build up of thatch and improve drainage.

Fairy Ring control



Fairy Ring can affect any turf, in most soil types. The disease manifests itself in a number of different guises. HERITAGE is the only fungicide approved for Fairy Ring. Applications are typically made through the summer, from June to the end of August.

HIGH RISK SITUATIONS

- All soil types
- Dry conditions
- Excessive thatch

ITM measures include retaining adequate soil moisture and reducing thatch. Preventative fungicide applications have an important role.

Integrated Turf Management Plans

Integrated Turf Management Plans

Integrated Turf Management involves turf managers using all possible proactive management strategies to minimise the damaging effects of pests, weeds and disease on turf.

ITM can have a significant impact on 'The Environment' effect of the Disease Triangle (see page 1). Most turf managers carry out some form of ITM to a greater or lesser degree – from basic tasks such as taking dew off turf surfaces in the morning to minimise risk of Fusarium and other diseases, through to a full and comprehensive plan of action for managing a particular turf area. An ITM plan is an actual document that sets out how an overall approach to ITM can be implemented and managed.

An ITM plan is designed to help manage turf in a more proactive way, without sacrificing turf quality.

How do you make an ITM plan?

There is no set example of how a plan should look or how it should be set out, it really depends on how much time you want to put into making and working with the plan.

The following points form the basic structure of the plan. Each point should make up a separate section of the plan. As much information as possible should be included for each point, including maps of the turf area to be managed, photographs of diseases and affected areas etc.

- Site assessment – Identifying what pests and disease are likely to pose a threat and where the risk is highest. Create a map of high risk situations.
- Monitoring – Accurate identification of pests and disease is essential to put in place the right plans; on-going training and advice is important.
- Set thresholds – Decide how little or how much is acceptable to managers and players, and when action will be required.
- Identify management options – Look at all available options, including cultural, biological, genetic and chemical. How should each one be used and to what degree?
- Build pest profiles – Record outbreaks on your turf area: type of disease; conditions that favour it; treatments to control etc.
- Create a pro-active turf management plan – How you are actually going to treat the problem. Record work carried out to control the pests and disease.
- Evaluation – monitoring the plan and continue to update: did the treatments work?; can anything else be done to improve conditions in future?

TURF DISEASE POSTER OFFER

The SYNGENTA GUIDE TO TURF DISEASE poster provides turf managers with valuable information to gain a better understanding of turf diseases and their management.

With accurate disease identification an essential element of fungicide selection, the pictorial guide will help with making better decisions.

For a copy of the wall poster* contact Syngenta, or visit the web site www.greencast.co.uk where all the information is available, along with a wealth of other on-line advice for more effective turf disease management.

WWW.GREENCAST.CO.UK
WWW.GREENCAST.IE

ON-LINE ADVICE TO MAKE
GOOD TURF GREAT

*Available while stocks last



syngenta

ALWAYS READ THE LABEL. USE PESTICIDES SAFELY.

DACONIL WEATHER STIK® contains chlorothalonil (MAPP 12636, PCS 2680), BANNER MAXX® contains propiconazole (MAPP 13167, PCS 02715), HERITAGE® contains azoxystrobin (MAPP 13536, PCS 02092), PRIMO MAXX contains trinexapac-ethyl (MAPP 13374, PCS 02273) DACONIL WEATHER STIK®, BANNER MAXX®, HERITAGE® and PRIMO MAXX® are registered trademarks of a Syngenta Group Company © Syngenta 2007

Syngenta Crop Protection UK Ltd, CPC4, Capital Park, Fulbourn, Cambridge, CB21 5XE

Technical Enquiries: 0800 1696058

Email: customer.services@syngenta.com

Web: www.greencast.co.uk & www.greencast.ie



BANNER MAXX, DACONIL WEATHER STIK, HERITAGE and PRIMO MAXX are distributed in the UK and Ireland by:
Scotts Professional, Paper Mill Lane,
Bramford, Ipswich, Suffolk IP8 4BZ
Tel: 0871 2205353
E-mail: prof.sales@scotts.com
Web: www.scottspprofessional.co.uk