

# Focus on Fusarium

*the foremost disease of UK turf*

Dr Terry Mabbett takes an indepth look at the most prolific turf disease in the country

Typical circular tan-coloured areas of Fusarium Patch caused by *Microdochium nivale* (Picture courtesy Vitax)

**At first sight turf appears to suffer from surprisingly severe foliar disease given the relatively small proportion of grass shoot and leaf displayed on frequently cut and well managed swards.**

However, with wider and deeper consideration it is easy to see why a perennial ecosystem perpetually wounded by mowing, stressed in summer from drought and heavy traffic then flushed with fertiliser under moist misty autumn conditions is susceptible to fungal infection and disease spread.

Fungal pathogens are present





year round in thatch and spread by traffic and turf machinery to gain easy entry through cut leaf surfaces and develop more rapidly on physiologically 'under-par' turf grass.

Sports turf in the United Kingdom suffers from around a dozen different foliar diseases but one stands 'head and shoulders' above the rest in spread, severity, damage caused and cost of control. Surveys show how over 90% of all UK greenkeepers expect to deal with Fusarium patch disease in any one calendar year.

More than half of all professional football pitches are affected by

Fusarium on an occasional basis and one fifth of local authority pitches where disease monitoring is generally less.

As much as 80% of all fungicide applications to UK sports turf are targeted at Fusarium although other diseases are managed at the same time especially by broad spectrum fungicides.

That said, new products released onto the market have Fusarium at the top of the fungicide label's target list even though a wider range of diseases will invariably fall within the activity spectrum.

Fusarium is a fast moving disease

and once established can only be eradicated by the use of fast acting curative fungicides.

However, there is still a lot the greenkeeper and groundsman can do to minimise infection and reduce the rate spread and damage caused should Fusarium patch disease appear.

Success lies in deep knowledge of the pathogen and the disease and by establishing through the seasons and over the years those management practices which minimise infection and subsequent spread and development.

This scenic golf course was carved out of natural forest but excessive shading of greens could encourage Fusarium





### Microdochium nivale

Fusarium patch is caused by a fungus now called *Microdochium nivale* after mycologists changed the name from *Fusarium nivale* some years ago. The disease is additionally called pink snow mould because symptoms may appear as a distinct pink colouration after periods of prolonged snow cover. There was talk of changing the common name to *Microdochium Patch* (as in North America) but everyone in the UK knows the disease as *Fusarium Patch* and that is the way it should stay.

Pink snow mould is still appropriate because it reminds Managers in areas with regular snow cover that turf is particularly susceptible to *M. nivale* at this time. Closely related pathogens including *Fusarium culmorum* and *Fusarium avenaceum* which are sometimes found in infective association with *M. nivale* on grasses maintain the *Fusarium* name.

*Microdochium nivale* success is multi-fold. First and foremost the fungus is present in turf year round on the thatch in saprophytic

(feeding on dead decaying organic matter) or weakly parasitic mode. Secondly the pathogenic fungus is active over the wide range of temperature typically found in cool temperate climates during the calendar year being capable of growing at temperatures as low as 21 °F (-6 °C) and up to about 86 °F (30 °C).

Thirdly the fungus is not too fussy about the type of turf grass attacked and is found infecting all mainstream turf grasses including *Agrostis*, *Festuca*, *Poa* and *Lolium* species. Equally important is pathogen preference for fertile soil, especially where excess nitrogen has been applied in autumn during inappropriate attempts to boost grass growth and green up turf after summer drought and heavy wear and tear.

The fungus grows over a wide range of temperature but other conditions are required before it can move into top parasitic gear. Prolonged periods of high humidity and surface wetness coinciding with cool temperatures make *Fusarium* a high risk disease for spring as well as autumn, especially after overdone nitrogen fertiliser application.

### Symptoms of Fusarium patch

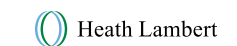
General descriptions of plant disease are largely subjective and in the eye of the beholder and that documented for *Fusarium Patch* is no exception.

General consensus has *Fusarium* down as circular patches on the turf, first appearing as water-soaked spots less than two inches (5 cm) in width, then quickly changing in colour from orange brown to dark reddish brown and eventually to tan or straw colouration.

If the disease goes unchecked small sized reddish brown spots may start to appear in lines where spores (conidia) have been spread by mowers. Ring-like patches may appear on low cut turf.

Under suitable conditions small spots of *Fusarium* infection will quickly enlarge and coalesce to form extensive patches of disease on the turf.

Under snow cover and other saturated conditions thin and fluffy coverings of white mycelium are seen on matted grass leaves, and as the snow melts the affected areas appear as straw coloured patches



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with a pink tinge intensifying in sunlight.

Under the microscope *M. nivale* has septate (cross walled) hyphae (mycelium) and produces pink or white sporodochia (fruiting bodies) with spores, particularly in cool weather conditions.

The tiny asexual spores (conidia) are lunate (new moon shaped) with cross walls and width x length dimensions of 2.5-5.0 x 10-30 microns (µm); 1 micron (µm) is one thousandth of a millimetre.

**Survival in thatch and subsequent spread**

*Microdochium nivale* has no trouble in surviving unfavourable conditions, including hot dry summers, because it 'rests up' on grass debris provided by thatch.

When conditions become favourable the pathogen infects the leaves of living grass plants through fungal hyphae growing up from the thatch or via germinating conidia.

The disease may grow and spread slowly at first with some weeks passing before detection, but under wet and overcast conditions and within a wide range of temperature [freezing point to 60 °F (16 °C)] will start to spread rapidly.

Huge numbers of conidia produced at this time are readily and rapidly spread along and around the green on wheeled equipment (mowers, spreaders and sprayers), on boots and the feet of animals.

The pathogen slows down and becomes inactive during periods of warm sunny weather which cause the grass canopy to dry out.

Slow growing turf with deep thatch provides the ideal substrate for *M. nivale*. Such situations exist during cool wet conditions (32 to 46 °F [0 – 8°C]) and when turf grass is covered with snow.

Specific conditions that encourage spread of the fungus include drizzle, fog, frost occurring night after night and alternating thawing and snow cover.

Poor drainage favours Fusarium Patch as does long uncut grass leaves becoming matted down to creating a humid microclimate within the canopy.

**Which turf grass?**

Most cool climate turf grass species are susceptible to Fusarium Patch disease although there are some marked differences which can be exploited.

Annual meadow grass (*Poa annua*) is particularly susceptible to Fusarium especially in the autumn



ABOVE AND LEFT: Trees are an essential integral part of a well laid out and managed golf course but not so near as to permanently shade the greens

when cool and moist environmental conditions bearing down on summer-stressed turf are ideal for disease development.

*Poa annua* is not a resilient grass, being highly susceptible to heat stress and drought stress and prone to cold injury, all of which clearly contribute to high disease susceptibility through autumn and into winter.

*Agrostis* species including *Agrostis stolonifera* (creeping bentgrass) are very susceptible to Fusarium Patch. Browntop bent (*Agrostis castellana* Highland) is more prone than cultivars of *Agrostis capillaris*. *Lolium perenne* (perennial rye grass), *Poa pratensis* (smooth stalked meadow grass) and *Festuca* species are somewhat less susceptible.

They have a low to medium thatching tendency compared with *Poa annua* and *Agrostis* species which is medium to high.

There appears to be positive correlation between high thatching tendency and frequency of foliar disease including Fusarium Patch.

High nitrogen availability which generates soft succulent growth increases turf susceptibility to Fusarium Patch, while high available soil potassium has the reverse effect.

**Factors pre-disposing to Fusarium Patch**

Pre-disposing factors related to

climate, weather, soil conditions and management practice provide ideal conditions for infection by *M. nivale* and its subsequent development and spread. They include:

- Humid atmosphere, shade and surface wetness especially when accompanied by cool temperature conditions
- Inadequate circulation of air above the grass sward
- Rapid, forced, soft and succulent growth especially in autumn from late application of fertiliser especially nitrogen
- Soil pH in the neutral to alkaline range (pH 7+) and inappropriate use of lime that raises pH to alkaline levels.
- Overambitious use of fertiliser especially if poorly balanced
- Damaged turf grass due to high



BELOW: High moss infestation indicative of wet turf and higher risk of Fusarium patch



wear or irregular cutting which may cause 'shaving', too low cuts resulting in 'scalping' and insufficiently sharp blades that tear rather than cut and therefore cause leaves to have cut jagged edges which are more prone to infection.

### Best practice

Many good management practices minimise opportunities for *M. nivale* to infect grass plants and spread across the turf. Examples of good practice are:

- Remove early morning dew and other surface water by sweeping or swishing and improve air circulation above the sward by good pruning and management of adjacent hedges and overhanging trees. Maintain good air circulation within the turf and ground by regular aeration. Minimise shade but where shade is unavoidable adjust (reduce) fertiliser levels accordingly.

- Maintain thatch at optimum height and density for the particular sports surface situation. Box off and remove grass clippings and do not smother turf when applying top dressing by making sure it is well worked into the turf.

- Establish a regular programme of mowing with correctly set and adjusted blades for height of cut and self-sharpening.

- Appraise seed mixtures and turf composition for maximum resistance to Fusarium Patch disease and minimise annual meadow grass content.

- Maintain surface acidity using applications of sulphate of iron to toughen and green up grass for autumn and winter and to additionally deter casting earthworms and control moss.

- Take care to balance soil fertility and increase the proportion of potassium relative to nitrogen when going into high risk autumn situations.

Apply nitrogen early enough in the late summer/early autumn period so that grass can harden off sufficiently before winter.

Do not allow grass to go into winter too high and ensure drainage is adequate.

### Fall back on fungicides

The foregoing management practices may not completely avoid Fusarium patch but will decrease incidence and severity should it appear.

Fungicides are required to completely eradicate Fusarium patch but adherence to best management

practice should reduce the required frequency and intensity of use.

There is a bewildering range of fungicides for Fusarium control carrying increasingly sophisticated claims by manufacturers on activity and action. However, there are several salient points greenkeepers can use as markers to assess whether a fungicide product will deliver.

Fungicides are essentially protectant or curative in action. Protectant fungicides remain on the leaf surface and protect the grass plant against infection and as such deposits must be on the leaf surface before infection is attempted by the pathogen.

Curative fungicides can move into the grass plant to eradicate established infections. Fungicides may enter the plant through the leaves, the roots or both, and move around the entire plant in which case they are said to be truly systemic.

Some which do not move out of the leaf they pass into are termed trans-laminar. Curative fungicides may also deliver significant protection depending on how long they remain on the leaf surface before moving into the plant.

Protectant fungicides and systemic fungicides that only enter through the leaves are essentially lost once they drip off (or are washed off) the leaves and into the soil. Those which can additionally enter via the roots may be taken up and used to good effect.

There may be a grey area for some essentially protectant fungicides that migrate a short distance into the leaf and therefore provide some marginal curative action.

Products which contain two or more different active fungicides may deliver protectant and curative action depending on the nature of the individual active fungicides they contain.

Greenkeepers (and groundsmen) are in a unique situation with regard to fungicide application and foliar disease control.

Every time turf is mowed grass plants are 'wounded' thus facilitating easy pathogen entry through the cut surfaces of leaves.

At the same time mowing is removing any fungicide that is on or inside the excised portion of leaf.

*Microdochium nivale* is ever present on the thatch component of turf, ready and waiting for the right physical conditions (temperature, humidity, leaf wetness) and biological conditions (inherently susceptible and physiologically stressed turfgrass plants) to move into full parasitic disease mode.



ABOVE: Fusarium patch and fallen leaves invariably occur at the same time – in autumn

BELOW: Best turf management practice is the key to minimising incidence, spread and severity of Fusarium patch (Picture courtesy Vitax)

BOTTOM: Fungicide spraying is needed to eradicate established infections but sound turf management practice will minimise the frequency and intensity of application required.

