IPM Challenges for the Turfgrass Sector

GLAS
City West
July 18th 2019

Colm Dockrell ***BAgrSc(Hort) MS(Agronomy)***
Teagasc Botanic Gardens

Defining IPM

Definitions are many and varied:

" It coordinates the use of pest biology, environmental information and available technology to prevent unacceptable levels of damage by the most economic means while posing the least possible risk to people, property, resources and the environment"

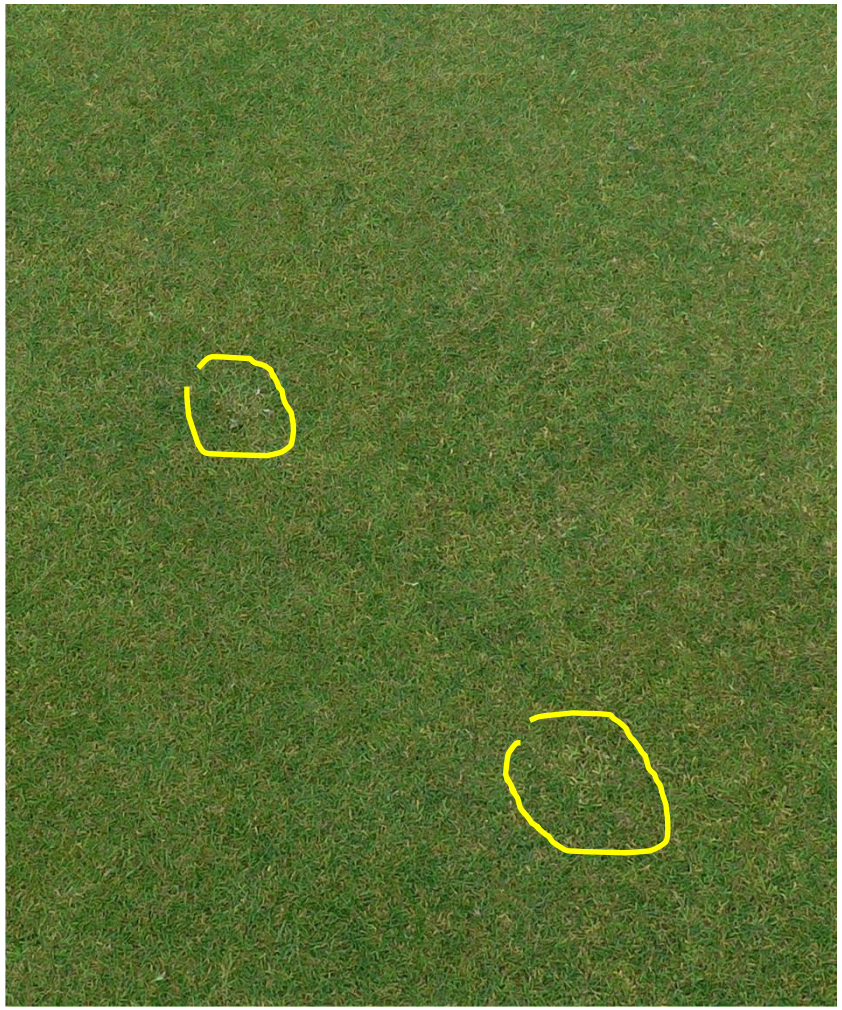
Basis of All IPM Plans

- Certain number of pests and some level of injury is tolerable.
- The questions is how much?
- Concept of:
  - Economic Threshold – Fundamental to crop production
  - Aesthetic Threshold – Amenity and Turfgrass Sectors
- These are more frequently referred to as:
  - **Action Thresholds**

Acceptable Levels of Damage

Poa, Bent, Fescue Golf Green
July 2019

- Plenty of Poa Seed Heads
- Evidence of Anthracnose
- Slight bit of scarring probably from Microdochium
- Cutting Height 4mm
- Rolling at 10 on the Stimpmeter



Eyes of the world are focussed on this green Today

Developing Pest Management Strategies

- An entire approach to reduce or eliminate a pest problem
- For the purpose of this short discussion **“Pest”** will relate to both insect pests and diseases
- Strategy may involve a modification of the host plant, the pest or both
- Four basic approaches adapted:

1. **The “do nothing” approach**

Integrated Pest Management in a Turfgrass System

- **Challenges**

  - Many species of turfgrass grown
  - Diversity of conditions in which turfgrass is grown
    - Diversity of conditions even within a small area
    - Consider the diversity on a golf course
  - Problem of developing thresholds or tolerance levels
  - Tolerance of turf damage
  - Dealing with the "Mono Culture"

DAFM – List of Approved Products for Amenity Grassland ***July 2019***

Product Name	**PCS No.**	**Function**
Scorpio	02551	Fungicide
Medallion TL	04188	Fungicide
Heritage	05062	Fungicide
Dedicate	05614	Fungicide
Instrata Elite	05399	Fungicide
Heritage Maxx	05063	Fungicide
Fusion	06226	Fungicide
Double	05818	Fungicide
Exteris Stressgard	05719	Fungicide

Product Name	**PCS No.**	**Function**
Eagle Green Care	92367	Nematicide

Developing an IPM Strategy for Turfgrass

- Lets consider THREE key considerations in developing a IPM strategy for turfgrass.

1. Monitoring
2. Predicting & Forecasting
3. Establishing Action Thresholds

Developing an IPM Strategy for Turfgrass

- Monitoring
  - Proper monitoring, identification are key for successful implementation of an IPM programme
  - Monitoring has to be accurate and affordable
  - Concentrated on key pests and diseases
  - Include an assessment of agronomic conditions of a site?
- Climate, Microclimate, Soil, Topography, Vegetation etc.
  - Keep good records

Developing an IPM Strategy for Turfgrass - Monitoring

- Problems with **insect pests** tend to be **sporadic**
- Many insect pests are adequately managed by curative means
  - After they are detected but before significant damage occurs
- Action Thresholds
- Some important **diseases** of cool season grasses are more **predictable**
  - Waiting for symptoms of the pathogen before making a

Developing an IPM Strategy for Turfgrass - Monitoring

- Incubation Period for Turfgrass Diseases

  – The time between infection and development of visual symptoms

  – Critical to know this

  – Can range from 48 hours to 14 days <u>depending on disease and prevailing weather conditions</u>

  – Sign of the disease may be present but may only be visible under a microscope

Monitoring Techniques

- Direct Observation
  - Visual inspection for symptoms
    - Off-colour, Grass thinning, Dead patches
  - Problem with turf is that similar symptoms can be caused by different pests and diseases (see over)
  - Close examination – hands and knees + magnifying lens
  - Closer Examination - Microscope

When making observations it is important to record

Which one of these Images is Anthracnose??

Monitoring Techniques - Sampling

- Widely used for **insect pests** to detect presence and density
- **Active** sampling techniques involve
  - Direct observation
  - Trapping
  - Floatation
  - Irritant sampling
  - Soil coring

Predicting Pest Activity

- **Phenology**

–Relates seasonally recurring biological events to climate and other phenomena

–Weather effects plants and pests in similar ways

–Plants can be used to predict certain stages and activities of different pests

–Eg; using fairly recognisable stages of flowering trees and shrubs

- Bud burst, various stages of flowering, leafing etc.

Many examples in vegetable and fruit crops

Predicting Pest Activity

- **Degree Day Models**

  – The development rate of insects and plants is correlated with temperature

  – Using degree day models

1. Calculate the average temperature of each day
2. Subtract the lower temperature (threshold temperature) for the pest or disease
3. Record the accumulated temperature beginning on a pre-determined date

Epidemiology

- Anthracnose develops over a range of temperatures.
- Symptoms of basal rot develop at cooler temperatures (15 to 25°C)
- Foliar symptoms occur at temperatures above 26°C
- Anthracnose foliar blight outbreaks have been **predicted by using a combination of leaf wetness duration and temperature.**

(Tredway, Wong, 2012)

Predicting Pest Activity

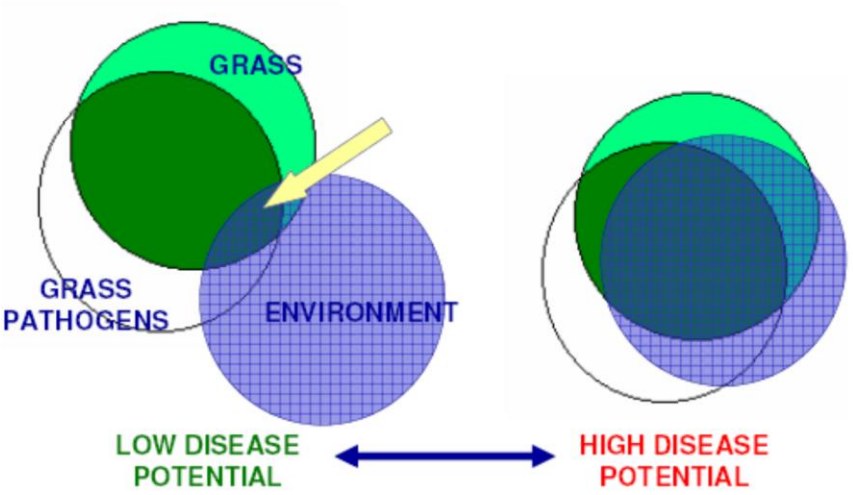
- Weather-based Disease Forecasting Systems
  - Identifying important weather features
- Usually temperature and moisture
- Used in other areas of horticulture
  - Blight forecasting in Potatoes
  - Scab forecasting in Fruit Trees
  - Becoming more accepted as part of turf management
- Models are used **locally**

Pythium Blight, Brown Patch and others

Weather-Based Disease Forecasting Systems

- **Basic premise**
  - **When the correlation between certain weather conditions and disease pressure are well define**
  - **Possible to use this approach t decide on a control strategy using fungicides**

Establishing Disease Potential



Thresholds

- Economic thresholds are easy to establish
- Aesthetic thresholds are more difficult to assign
  - Can we assign a value to turf?
- Hence the concepts of:
  - Action threshold
  - Tolerance levels
- See example over

Action Threshold for Leatherjacket

The following is an extract from the University of Davis, California

Monitoring and Treatment Decisions

Monitor crane fly larvae in spring when the weather has warmed, generally in March. Samples can either

Options for Pest & Disease Management / Control in Sportsturf Management

- **Genetic**
- **Cultural**
- **Biological**
- **Chemical**

Management Strategies

Genetic

- Use turfgrass species and cultivars that have susceptibility or resistance to pests and diseases
- More progress has been made with Warm Season Grasses
- Little progress with Cool Season Grasses
  - Lolium perenne & Poa pratensis – Some resistance to nematodes
  - Lolium perenne & Poa pratensis – Some resistance to ***Pyricularia grisea***

Management Strategies

Cultural

These strategies are well documented and understood

- **Fertility & Nutrition**
- **Mowing**
- **Irrigation**
- **Leaf Wetness Management**
- **Thatch Management**
- **Other Practices**

Cultural Management Strategies

- Fertility / Nutrition -

- Effects of over and under supply of nutrients
  - **(Beard, 1973; Christians, 1998; Turgeon, 2011)**
- Many examples surround the use of Nitrogen
  - Over supply – Occurrence of Microdochium
  - Under supply – Dollar Spot & Red Thread
  - **(Smiley et al, 2005)**
- Also the effects of P, K & Fe are all well documented
- Research on Silicon (Si) on going

Cultural Management Strategies

- Mowing -

- Close relationships between close mowing and increasing disease severity have also been established

  - On Poa annua, the severity of Antrachnose was reduced by raising the mowing height by 0.4mm

- **(Davis & Dernoeden, 1991)**

  - **To date, no research has found any relationship between rolling intensity and disease incidence**

Mowing has also been shown to have variable

Cultural Management Strategies

- Leaf Wetness -

- Most turf pathogens require leaf wetness for infection and spread
- Despite our rainfall patterns in Ireland Dew is probably the most important form of leaf wetness
- The risk of leaf infection increases with the level and persistence of dew **(William et al, 1996)**
- Benefits of using dew dispersants are well documented

Management Tactics

- Thatch Management -

- What is Thatch?

- More common on intensively managed turfgrass

- Can increase the risk and severity of many turfgrass pest & disease problems

  – **(Beard, 1973; Christians, 1998; Turgeon, 2011)**

- Can reduce the penetration and

Biological Control of Plant Parasitic Nematodes & Fungi

Biological Control - Pests

- Conservational Biological Control
  - Conserve natural enemies
  - Their activity can be significantly reduced by synthetic pesticides
- Carbamates
- Organophosphates
- Pyrethroids

- Classical Biological Control
  - Microbial products used in turfgrass Insect pest management include;
- Bacteria
  - Bacillus thuringiensis Bt
- Fungi
  - Beauveria spp
- Nematodes

Plant Parasitic Nematodes

- It has been suggested that a number of Entomapathogenic nematodes may have a role against turf damaging nematodes but research is variable at present
- Biorational products
  - Many are botanicals
- Plant Essential Oils
- Other plant Extracts
- **Garlic products registered for use in Ireland**

Biological Control of Fungal Diseases

- Biofungicides are composed of living organisms
- Bacteria-based fungicides used on turf interact directly with the fungus via anti-biosis
- **(Pal & Gardener, 2003)**
  - Bacteria colonise the surface
  - Release a variety of secondary metabolites
  - Fungal mycellium & spores encounter these metabolites
  - Toxic compounds accumulate in fungal cells

Chemical Control of Turfgrass Pests, Diseases & Weeds in Ireland

- Worldwide, conventional pesticides remain the backbone of turfgrass pest, disease and weed management

  – Why

- **Increased and often unrealistic expectations for turf quality**
- **Limited availability of practical monitoring techniques**
- **Limited amount of effective management techniques**

- The chemistry of pesticides has changed dramatically over the past 10 – 20 years

How are Fungicides Used

- **Preventative**
  - Apply chemical to prevent fungal infection
  - Perhaps the least like approach
  - Difficult to justify from an IPM perspective
- **Curative**
  - Apply chemical after early symptoms appear
  - Perhaps the more common approach
- **Eradicant**

Problems with **Curative** Control Strategy

- The amount of symptomatic tissue is only a small fraction of the total infected tissue

  – Curative approach can give rise to an unseen build-up of inoculum

- More serious disease outbreak in periods of suitable weather

  – May result in a greater economic and environmental risk

- Economic = More fungicides may be required over a season

- Environmental = Fungicides may be used at higher rates and shorter intervals


Enjoy the Open
Questions or Comments ?