TURFGRASS DISEASE MANAGEMENT

Introduction

- We will be discussing turfgrass diseases - their cause, diagnosis and treatment.

Definition of a Disease

- A plant disease caused by a **pathogen** consists of the interaction between a plant and plant pathogen which disrupts the normal growth and appearance of the plant.

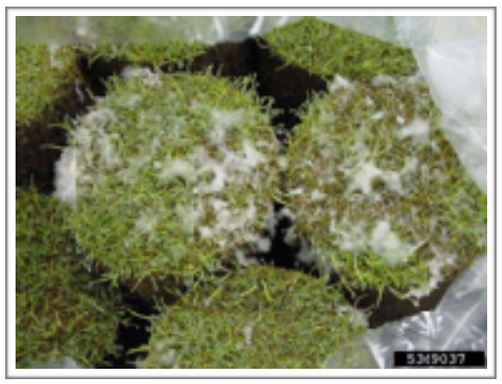
TURFGRASS DISEASE MANAGEMENT

- A turfgrass that has been managed improperly is more likely to become diseased.

- A turfgrass that has been maintained correctly is less likely to become diseased.

TURFGRASS DISEASE MANAGEMENT

- …"any stress placed on the turf weakens it, making it more susceptible to diseases."



TURFGRASS DISEASE MANAGEMENT

- Fungi cause plant diseases.

- Most fungi living in a lawn are beneficial, decomposing the grass clippings and old roots.

- Only a very small number of fungi cause plant diseases.

TURFGRASS DISEASE MANAGEMENT

- Three items must be present for a plant disease to occur. These are: 1. Plant Pathogen; 2. Vulnerable Host; 3. Proper Environment.

- A fungal pathogen continues to live at a site even when it is not actively attacking the plant. It is surviving "in a state of dormancy".

Disease Process

- Step 1: **Inoculation**. The moment at which a pathogen comes in contact with a susceptible plant.

- Step 2: **Infection**. The moment at which a plant pathogen enters a plant.

- Step 3: The pathogen becomes established within the plant host. (It is at this moment that the plant pathogen begins to disrupt the normal growth and appearance of the plant).

Disease Symptoms

There are two common patterns of disease symptoms. These are:

1. A circular patch of turfgrass (small or large) that is no longer uniformly green.

2. Spots on the leaves.

DISEASE SYMPTOMS

- When a disease is likely present, examine the roots and leaves of the affected area and visit the affected turf area early in the morning looking for fungal mycelia in the early morning dew. (Fungal mycelia look similar to cotton candy.)

- Check for localized patches of wilt or drought symptoms in the early afternoon. This could be an indication of root or crown diseases.

- When examining turf spots, one should look at the shape and color of the spots. Keep in mind that there are factors other than disease that can also cause leaf spots.

TURFGRASS DISEASE MANAGEMENT

"Disease control recommendations are aimed at (1) altering the environment so it is less favorable for disease development, (2) suppressing pathogen growth, and (3) decreasing stress on turfgrass."

"An integrated management program that includes cultural and chemical methods is the key to preventing and controlling turfgrass diseases."

3 Steps to Disease Management

- Correctly identify the disease.

- Identify the conditions that promote the disease.

- Identify the management techniques that will alter or eliminate the conditions that promote the disease.

Cultural Control Practices

- Turfgrass Selection
- Mowing Practices
- Water Management
- Fertilization
- Thatch Management
- Soil Management

Turfgrass Selection

This involves selecting:

1. Turfgrass Species
2. Turfgrass Cultivar

Mowing Practices

- Sharp mower blades that cut rather than tear the grass.
- Mowing a grass too low can cause stress, making the grass more vulnerable to diseases, especially root rots.
- Raise the mowing height when a disease is present.
- Mow any diseased areas of a turfgrass site last
- After mowing a diseased lawn, wash the mower with water to remove any leaf clippings.

Water Management

- The length of the dew period is a critical factor for leaf disease development.

- Irrigate when the dew is already present.

- A good time to irrigate is between 2 a.m. and 8 a.m..

Water Management

- Irrigate only when drought stress is observed.

- Apply enough water to saturate the root zone of the turfgrass.

Nutrition Management

- Nitrogen levels that are too low or high promote disease development.

- Excessive nitrogen promotes brown patch and gray leaf spot.

- Very low nitrogen encourages dollar spot.

Nutrition Management

- Potassium is an important element in preventing disease.

"To maintain healthy turfgrass, the amount of elemental potassium applied should be the same or greater than the amount of nitrogen."

"In an area prone to disease, it is beneficial to increase the amount of potassium."

Thatch Management

- A large amount of thatch at a site can cause a lawn mower to sink due to the sponginess of the thatch layer.

- Excessive thatch at a site can be reduced by physical removal.

Soil Physical & Chemical Status

- Soil Compaction may cause an area to remain too wet.
- High soil pH may affect nutrient uptake.
- Dry spots can be caused by building materials being buried underground.

Chemical Control Practices

- It is important to properly identify a disease since most fungicides control only a limited number of fungi.

- The only way a plant appears better after treating for a disease is for new growth to replace the disease damaged tissue.

- When a disease tends to reoccur at a site, it is acceptable to apply a fungicide on a preventative basis.

- Do not mow a site for at least 24 hours after a fungicide application.

Fungicide Categories

There are 4 basic fungicide categories. These are:

1. Contact
2. Systemic
3. Local-penetrant
4. Mesostemic

Contact Fungicides

- Generally applied to leaves and stems
- Used to prevent disease
- Remain on the plant surface and do not enter the plant
- Any fungi within the plant at the time a contact fungicide is applied will not be affected.
- Leaves that emerge after a contact fungicide is applied are not protected.
- While contact fungicides are usually used to control foliar diseases, they are also used to control Pythium root rot.
- Contact fungicides have a broad spectrum of disease control and are used extensively in the turfgrass industry.

Contact Fungicide Examples

Chemical Group	Common Name	Trade Names	Mode of Action
Aromatic Hydrocarbons	Chloroneb	Tersan Terrazole	Lipids & membrane synthesis
	Etridiazole	Terrazole	Lipids & membrane synthesis
Chloronitriles	Chlorothalonil	Daconil	Multisite contact activity (M5)
Dithiocarbamates	Mancozeb	Dithane Fore	Multisite contact activity (M3)
Inorganic Metals	Copper Hydroxide	Kocide	Multisite contact activity (M1)
PhenylPyrroles	Fludioxonil	Medallion	Signal transduction

Systemic fungicides

- After penetrating the plant surface, systemic fungicides are then translocated (moved) within a turfgrass' vascular system.
- Systemic fungicides move within the xylem only and not the phloem. The only exception is fosetyl-Al (Aliette) which moves within both the xylem and phloem tissue of the turfgrass.
- Generally speaking, systemic fungicides have both preventative and curative properties along with extended residual activity.
- "Once a systemic fungicide is inside the plant, it cannot be removed by water or degraded by sunlight."
- Systemic fungicides usually have a very specific mode of action and do not have a broad spectrum of disease control.
- There are systemic fungicides on the market that cure both foliar and root pathogens.
- As stated, the majority of systemic fungicides are xylem limited and thus, should be watered into the soil to obtain maximum effectiveness.

Systemic Fungicides

Chemical Group	Common Name	Trade Name	Mode of Action
Acylalanines	Mefenoxam	Subdue Maxx	Nucleic Acid Synthesis
Acylpicolides	Fluopicolide	Stellar	Delocalization of spectrin-like proteins
Carbamates	Propamocarb	Banol	Lipids & membrane synthesis
Carboxamides	Boscalid	Emerald	Respiration (complex II)
	Flutolanil	ProStar	Respiration (complex II)
Demethylation Inhibitors	Fenaromil	Rubigan	Sterol biosynthesis in membranes
	Metconazole	Tourney	Sterol biosynthesis in membranes
	Myclobutanil	Eagle	Sterol biosynthesis in membranes
	Propiconazole	Banner Maxx	Sterol biosynthesis in membranes
	Triadimefon	Bayleton	Sterol biosynthesis in membranes
	Triticonazole	Trinity, Chipco Triton	Sterol biosynthesis in membranes

Systemic Fungicides (continued)

Chemical Group	Common Name	Trade Name	Mode of Action
Phosphonates	Fosetyl-Al	Chipco Aliette Signature	Unknown
	Phosphorous acid	Alude	Unknown
		Resyst	Unknown
		Magellan	Unknown
Polyoxins	Polyoxin D zinc salt	Endorse	Glucan & cell wall synthesis
Qol quinone outside inhibitors	Azoxystrobin	Heritage	Respiration (complex III)
	Fluoxastrobin	Disarm	Respiration
	Pyraclostrobin	Insignia	Respiration
Thiophanates	Thiophanate methyl	3336	Mitosis & cell division

Local Penetrant Fungicides

- The majority of the applied fungicide remains on the plant surface.

- Capable of penetrating the plant surface but only move a very short distance

- Do not enter the xylem or phloem

- Protective in nature not curative

Local Penetrant Fungicides

Chemical Group	Common Name	Trade Name	Mode of Action
Dicarboximides	Iprodione	Chipco 26GT, Iprodione Pro	Signal transduction
	Vinclozolin	Curalan	Signal transduction

Mesostemic Fungicides

- This is a new class of fungicides which includes trifloxystrobin (Compass).

- Trifloxystrobin is strongly attracted to the plant surface, absorbed by the waxy layers of the plant, appears to continuously penetrate the leaf surface but is not translocated through the xylem or phloem.

- Works best as a preventative fungicide.

- Reapplication intervals are 14 - 21 days since it is not directly exposed to weathering factors.

Mesostemic Fungicides

Chemical Group	Common Name	Trade Name	Mode of Action
Qol quinone outside inhibitors	Trifloxystrobin	Compass	Mesostemic

Chemical Names

- Chemical name
- Common Name
- Trade Name(s)

Read Labels

- "Except for chemicals used to buffer the water pH, do not add any additive to a fungicide unless the label specifically states this is acceptable."

- Never mix a fertilizer solution with a fungicide without first determining compatibility. This is especially true for fungicides that contain metals such as mancozeb, fosetyl-Al, and chlorothalonil with zinc.

Biological Control Practices

There are beneficial microorganisms within a turfgrass ecosystem that help reduce diseases caused by pathogens. Beneficial microorganisms do this by:

1. competing with plant pathogens for food.

2. producing chemicals that inhibit the growth of the pathogens.

3. physical exclusion of pathogens by occupying the space first.

In light of the above information, it is important that the soil microbial population at a turfgrass site be maintained in a healthy state. Limiting the number of pesticide applications made at a site is one way to do this.

Summary

- A disease caused by a plant pathogen occurs when the plant pathogen disrupts the normal growth and appearance of a plant.

- The core steps in disease management are 1. correctly identify the disease, 2. identify the conditions promoting the disease, and 3. Identify and implement the steps that will alter or eliminate the conditions that promote the disease.

- Turfgrass selection, proper cultural practices with fungicides being applied as a last resort in most instances lie at the heart of any good disease management program.