70th Annual Southeastern

TURFGRASS CONFERENCE

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UGA TIFTON CAMPUS CONFERENCE CENTER
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Organized By:
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Turf Fungicide Performance

Getting the Best Results

Southeastern Turfgrass Conference

Large Patch on Zoysiagrass

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Introduction

- Fungal organisms cause more diseases on turf than other microorganisms
- As of 2002, fungicides have been described as the most highly and consistently used pesticides on golf courses
  - Accounting for 80% or more of total pesticide used.

Brown patch

Introduction

- This means a lot of money is spent on these important tools
  - For maintaining the quality and appearance of these turfs
- One issue important to managers is how to optimize the performance of the fungicides they use
  - And avoid wasting money and fungicide.

Pythium

Introduction

- Sometimes, poor performance in controlling turf diseases can be due to resistance of the pathogens to the fungicides being applied
- However, resistance should not be the first conclusion when a fungicide does not work as well as expected
  - Many other factors are involved in fungicide performance
    - Some of which are easily overlooked.

Fungicide Performance

- Factors other than efficacy of the active ingredient or resistance that influence fungicide performance include
  - Deposition factors:
    - How do we get the fungicide where it needs to be
  - Depletion factors:
    - What happens to it after it gets to the plant
  - Disease pressure:
    - The force that acts on disease progress and
      - includes aspects of the host plant, pathogen and environment.

Fungicide Performance

- While fungicide depletion and disease pressure are important influences that superintendents must consider in planning and implementing a turf disease management strategy,
  - Fungicide deposition can be readily managed,
  - Is key to disease management and
  - Is the focus of this presentation.

Deposition Factors

- Deposition factors involve the application of fungicide to the turf
- These include:
  - Application Rates and Intervals
    - The amount of fungicide (application rate)
    - The time between sprays (application interval)
  - and Surface Coverage
    - The volume of water used
    - The type of spray nozzles.

Deposition Factors
Application Rates and Intervals

- Application Rates and Intervals
  - Are usually stated on the fungicide label
    - For most diseases, a range of rates and intervals is specified
    - Giving the superintendent the option to tailor a disease control program according to
      - The perceived severity of the threat and
      - The available resources (budget).

Deposition Factors
Application Rates and Intervals

- For example,
  - The Daconil Ultrex label lists 1.0 – 1.8 oz / 1000 ft^2 for dollar spot control on a 7 to 10 day schedule,
  - But higher rates (1.8 – 3.25 oz) are advised for longer intervals between sprays
- A superintendent's disease management objective is to find a combination of rate and interval
  - That provides disease control without excessive expenditures.

Deposition Factors
Application Rates and Intervals

- It is assumed that the highest rates at the shortest interval will give the best control
  - But these are the most expensive options
- Superintendents ask “Which is more efficient: low rates and short intervals or high rates and longer intervals?”
- This issue was addressed in a cost-benefit analysis.

Deposition Factors
Application Rates and Intervals

- A cost-benefit analysis was done comparing results for Daconil Ultrex® and Chipco 26GT®
- Costs were determined
  - by calculating the expense associated with fungicide for each application rate and labor for spraying 3 acres of greens
- The benefit was defined as the number of days during the experimental period
  - That disease in the plots remained at or below the threshold for acceptable turf disease (0.5%).

Deposition Factors
Application Rates and Intervals

- For both fungicides tested,
  - Lower application rates applied at shorter intervals were effective and most efficient for disease control
  - Which would seem to make the decision easy,
- However, the logistics of frequent applications must also be considered:
  - Closing the course or restricting play for time to apply fungicides and allow them to dry may seriously limit revenue
    - To the point where 7 day applications are not practical.

Deposition Factors
Application Rates and Intervals

- Skilled superintendents must use their experience to select appropriate fungicides and rates to limit disease risk
  - While remaining within their budgets.

Heritage® 50WG
Site Specific Systemic
Acropetral Penetrant

Daconil Ultrex®
Multisite Contact

Torque® 3.6F
Site Specific Systemic
Acropetral Penetrant

Compass 50WG
Site Specific Systemic
Local Penetrant

Deposition Factors
Surface Coverage

- Surface Coverage: “The proportion of the target surface area covered by a fungicide”
- Complete (100%) coverage is impossible to achieve and
  - Research shows it is hardly necessary for satisfactory fungicide performance.


Pythium Blight


Spring Dead Spot

Deposition Factors
Surface Coverage

- On field crops, significant amounts of foliar blight can be tolerated as long as yield is not affected, however
- On turf, smooth, attractive playing surfaces are needed, so superintendents do not have the luxury of tolerating high levels of disease:
- Disease tolerance is extremely low (0.5% or less for fairways)
  - So coverage must be more extensive for turf surfaces.

Deposition Factors
Surface Coverage

- Surface coverage is determined by two factors:
  - Application volume and the type of spray nozzle
- Application Volume:
  - “The amount of water used to apply the fungicide to the turf”
  - A function of:
    - Nozzle configuration
    - Delivery pressure
    - Ground speed.

Deposition Factors
Surface Coverage: Application Volume

- Application Volume
  - Usually expressed as gallons per 1000 ft^2 or gallons per acre (GPA)
- Recommendations vary, even within the same fungicide class:
  - One DMI product may recommend a specific range, while another may direct the product be applied in “sufficient water to ensure thorough coverage”
- There is no single standard application volume among fungicide products.

Deposition Factors
Surface Coverage: Application Volume

- The question of which spray volume optimizes fungicide performance has been the subject of many investigations
- Results differ depending on the pathogen and fungicide
- Spray volume trials showed varying results: some showed a weaker response below 1 gal/1000ft^2; others below 2 gal/1000ft^2 and a third showed no differences at either 2 or 4 gal/1000ft^2.

Deposition Factors
Surface Coverage: Application Volume

- While there is no single application volume that provides the best control for all diseases,
- For appropriate application rates efficacy is not diminished when fungicides are applied within a range of 1 – 2 gal/1000ft^2 (43.56 – 87.12 GPA)
  - Within that range, application volume is probably only significant for contact fungicides
  - However the time required to treat fairways is an issue and applications can be made more quickly at 1 gallon than at 2 gallons/1000ft^2.

Deposition Factors
Surface Coverage: Spray Nozzles

- Spray Nozzles
  - Influence application volume and
  - Determine
    - Spray droplet size
    - Spray pattern
    - Spray coverage
  - Some nozzles are made to produce very fine spray droplets
  - Others generate larger droplets to minimize drift.

Deposition Factors
Surface Coverage: Spray Nozzles

– Spray nozzles and droplet sizes:

Category	Symbol	Droplet Size
Very Fine	VF	<150 microns
Fine	F	150-250
Medium	M	250-350
Coarse	C	350-450
Very coarse	VC	450-550
Extremely coarse	XC	>550.

Deposition Factors
Surface Coverage: Spray Nozzles

- Droplet size:
  - Theoretically, fine or very fine droplets should provide the most extensive and uniform coverage
    - But for application volumes greater than 1 gal/1000ft^2 they are not efficient in terms of the time necessary to treat fairways
    - They also have a greater potential for drift
      - Decreasing pressure and increasing nozzle orifice size will reduce drift potential

Deposition Factors
Surface Coverage: Spray Nozzles

- In general, medium or coarse droplets provide the best coverage for the application volumes used for turf fungicides
- Air-induction nozzles offer the drift reduction benefit of large droplets without sacrificing coverage
  - By producing large air-filled droplets that shatter into smaller droplets on impact with plant surfaces
- All nozzles require regular maintenance:

Deposition Factors
Surface Coverage: Spray Nozzles

– Nozzle maintenance guidelines:

1. Observe the output pattern frequently during every use
2. Remove nozzles and clean tips regularly
3. Use clear, clean water and detergent to clean nozzles
4. Gently rub surfaces with a soft bristle brush to remove residues.

Deposition Factors
Surface Coverage: Spray Nozzles

– Nozzle maintenance guidelines (cont'd)

5. Use compressed air to remove obstructions from the nozzle orifice
6. Clean and flip nozzle gaskets during maintenance
7. Replace components that consistently cause problems
8. Always wear appropriate personal protective equipment.

Deposition Factors
Surface Coverage: Spray Nozzles

- Several nozzle types commonly used for turf applications have been compared for dollar-spot control with a contact fungicide and a penetrant fungicide
  - Nozzles included turf-jet, raindrop, flat fan, and air induction
- Few differences were found for either type of fungicide
  - With reduced performance noted only for nozzles producing extremely coarse droplets.

Deposition Factors
Surface Coverage

- To summarize Surface Coverage
  - Superintendents have a wide latitude in selecting a combination of spray volumes and nozzles for applying fungicides
  - Applications within a range of 1 – 2 gal/1000ft^2 with nozzles that produce medium to coarse droplets
    - Provide sufficient coverage while economizing on the amount of time required to make the application.

Deposition Factors
Surface Coverage

- Surface Coverage Summary (cont'd)
  - Coverage is more of an issue with contact fungicides than with penetrants
    - Whose active ingredients move within the plant
  - Among penetrant fungicides it is reasonable to assume coverage is less of an issue for xylem-mobile fungicides (acropetal penetrants) than for local penetrants
    - that move only across leaf surfaces.

Fungicide Performance
Summary

- For optimum performance

1. Keep fungicide rates near the low side of the recommended range
2. Make applications as often as the label guidelines allow
   - Within the time frame allowable by time and cost
3. Use nozzles that will deliver medium- to coarse sized droplets.

Fungicide Performance
Summary

- For Optimum performance:

4. Calibrate and maintain application equipment regularly
5. Observe environmental conditions that can affect disease progress, such as
   - Temperature, turfgrass condition and growth rate, and hours of leaf wetness,
     - Any of these can indicate a need to shorten application interval or raise rates.