

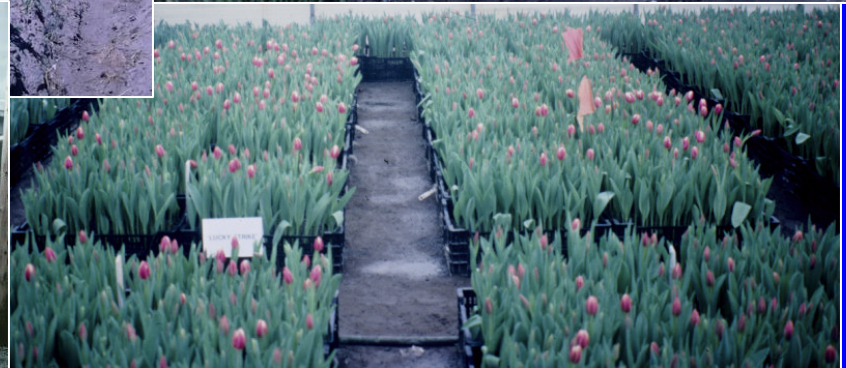
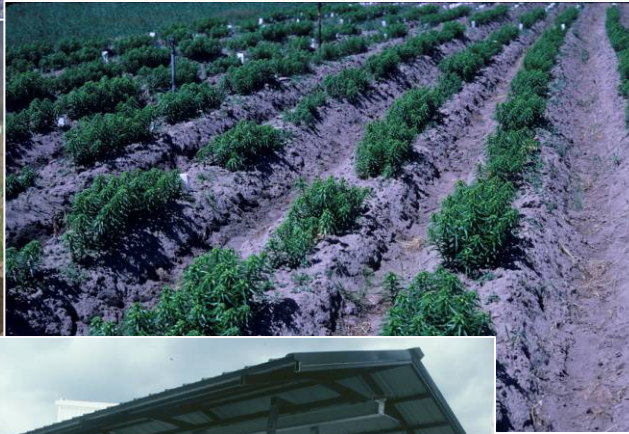
Prevention and Management of Daffodil Diseases

Dr. Gary Chastagner
Washington State University

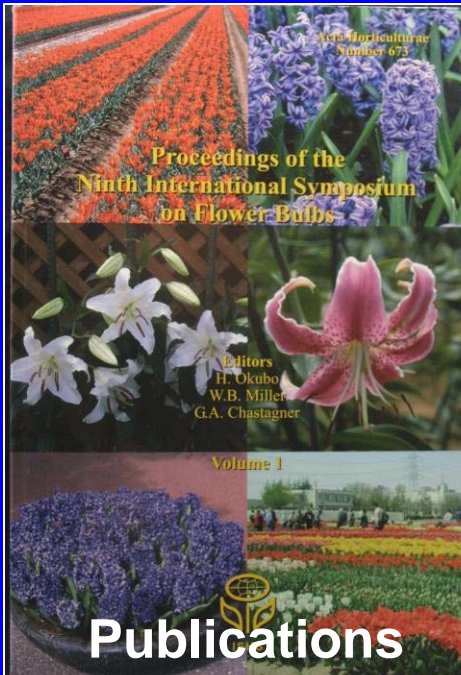


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WSU Puyallup Disease Research Program



Dissemination of Information



Publications

Field Days



Grower Conferences



Grower Quizzes



Topics Covered Today

Bulb fly

Nematodes

Basal rot

HWT

Foliar diseases



Source: Gordon Hanks
Warwick HRI, Kirton Research Centre,
University of Warwick, UK

Bulb Fly

- Greater is a primary pest
- Lesser is a secondary pest

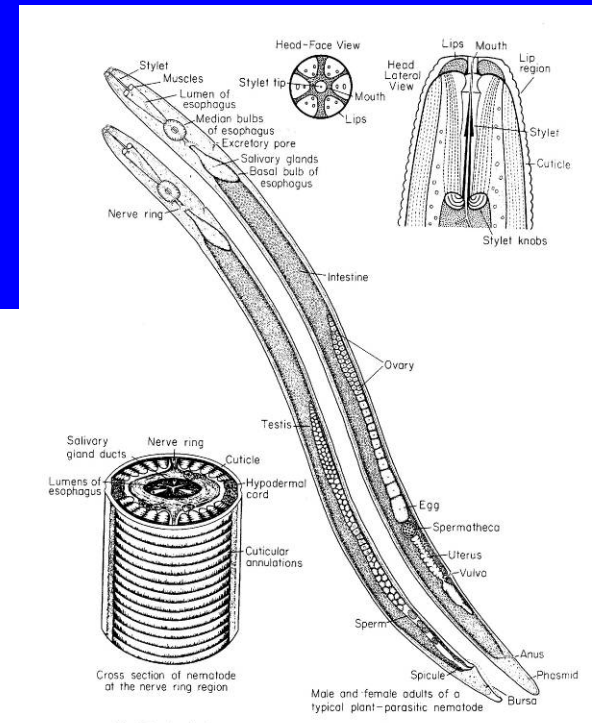
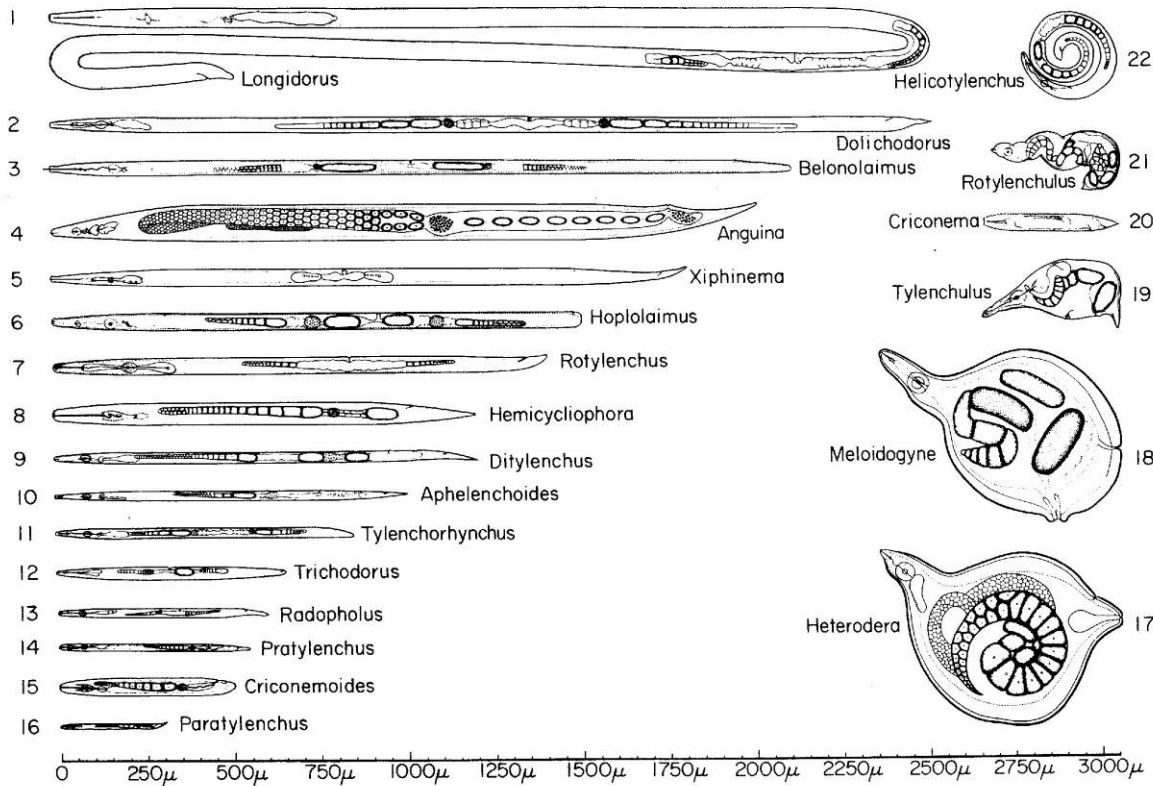


- Flies lay eggs at the bases of the leaves
- Windy areas tend to be less prone to fly problems
- Early defoliation and digging may avoid infestation
- Lack of registered products to control adults at egg-laying
- Hot water treatment

Picture Source: Gordon Hanks
Warwick HRI, Kirton Research Centre,
University of Warwick, UK

Nematodes

Small worm-like pathogens that feed on leaves, bulbs and roots





Root Lesion Nematode – *Pratylenchus penetrans*

Symptoms

- Premature death of foliage
- Lack of roots

Conditions that favor development

- Sandy, warm soils
- Survives in the soil, not on bulbs

Management

- Wide host range, so cultural practices like crop rotation, fallowing, etc. are usually not effective
- Soil fumigation, biofumigation, solarization



Bulb and Stem Nematode – *Ditylenchus dipsaci*

- A serious disease that occurs throughout the world
- Early 1900's regulatory restrictions on the movement of daffodil bulbs



Stem and Bulb Nematode

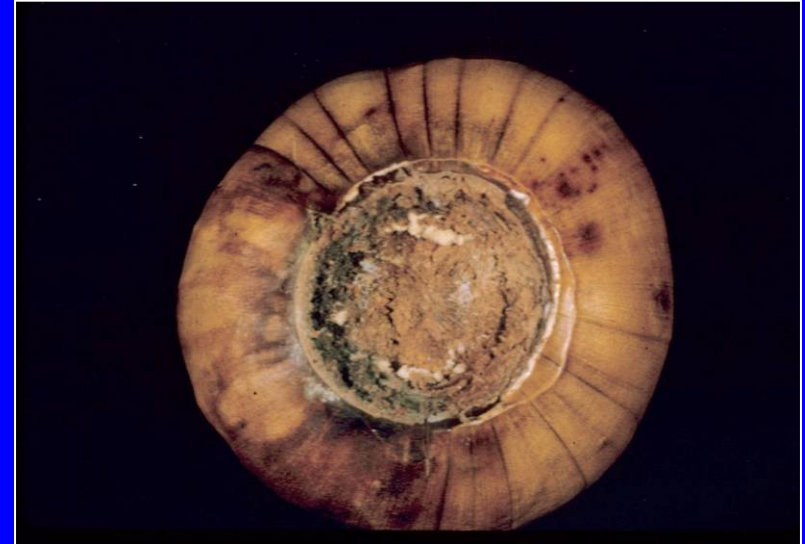
Symptoms on leaves and stems can include basal swollen thickenings, marginal swellings and discolorations, and discolored “pimples or spikkels”



Stem and Bulb Nematode



Symptoms on bulbs initially consist of yellow spots on the neck region, followed by mealy or spongy rings of brown scales between healthy scales, partial to complete rot, and whitish masses of nematodes on the basal plate and necks



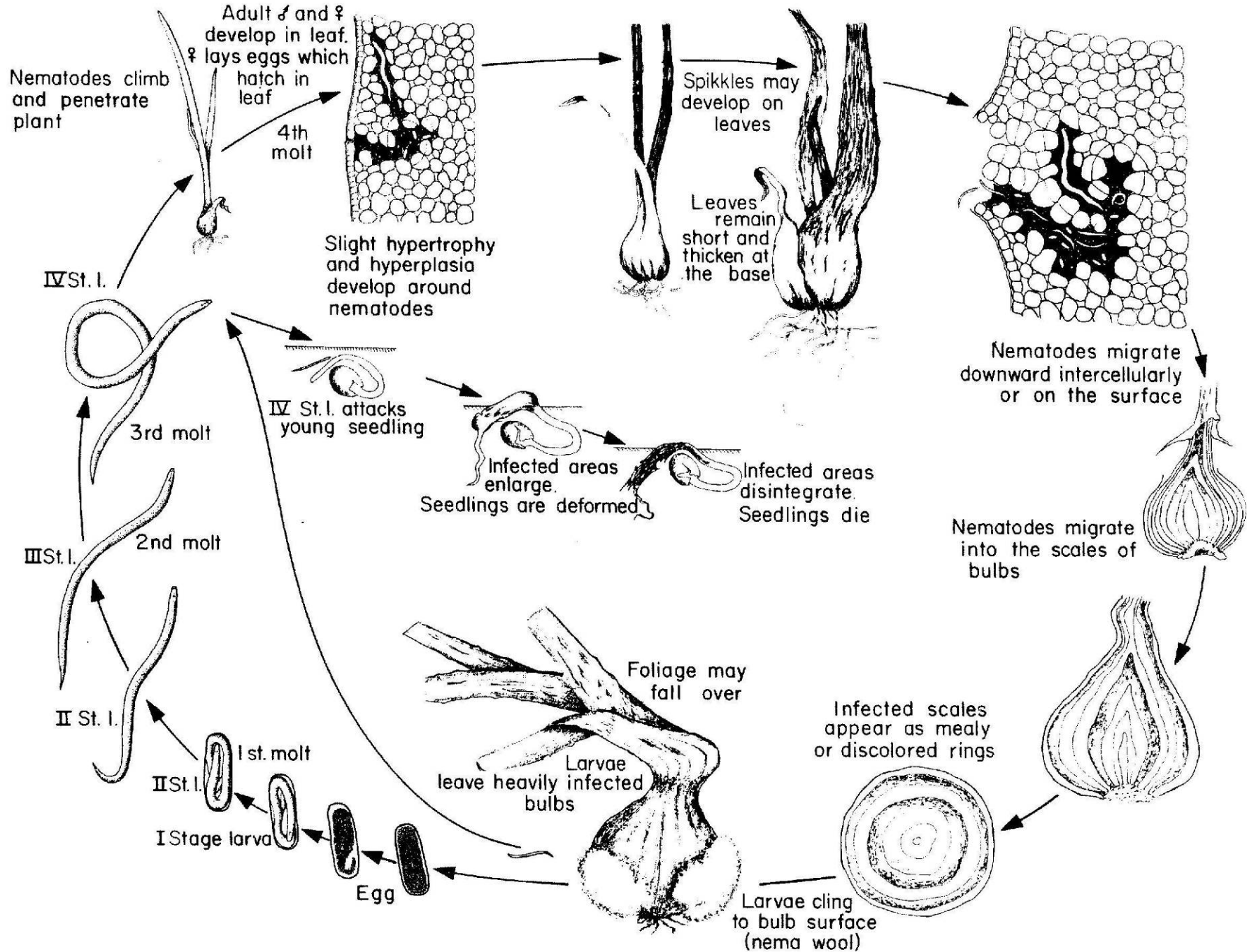


Fig. 127. Disease cycle of the stem and bulb nematode *Ditylenchus dipsaci*.

Stem and Bulb Nematode

Management

- Avoid spreading infested soil and plant material
- Dig early
- Discard severely infected bulbs
- Hot water treatments
- Disinfect trays, tools, etc.
- Nematocides (?)



Basal Rot



- **Tulip**
Fusarium oxysporum f. sp. *tulipae*
- **Bulbous iris**
F. oxysporum f. sp. *gladioli*
- **Lily**
Fusarium oxysporum f. sp. *lilii*
- **Daffodil**
F. oxysporum f. sp. *narcissus*

Basal Rot Development is Favored by:

- Planting in warm, moist soils.
- Shallow planting in light textured soils.
- High rates of nitrogen.
- Wounds and other injuries, particularly during digging and processing.
- Slow drying of harvested bulbs.
- Poor ventilation.
- Storage under warm conditions.

Management of Basal Rot

- Basal rot is an extremely difficult disease to control on susceptible cultivars.
- A combination of cultural practices, hot water treatment and fungicide dips are needed for control. **NO SINGLE TREATMENT IS EFFECTIVE.**

Cultural Management of Basal Rot

Cultural Management

1. Dig bulbs as early as practical; keep them as dry as possible.
2. Avoid wounding, bruising, and sunburning.
3. Discard diseased bulbs.
4. Store bulbs in thin layers under cool (55 - 60°F) and well-ventilated conditions.
5. Reduce planting density in infected stocks.
6. Plant in cool, well-drained soil as deep as practical.
7. Rotate out of bulbs for 3 to 4 years.
8. Plant resistant cultivars

Breeding for Basal Rot Resistance - John Carder - UK



Narcissus viridiflorus

'St Keverne' x *N. viridiflorus* crosses



Picture Source: Gordon Hanks
Warwick HRI, Kirton Research Centre,
University of Warwick, UK

Management of Basal Rot

- Fungicide treatments are commonly recommended for controlling this disease.
- Dip in fungicide shortly after digging and/or just before planting. To maximize treatment effectiveness, treat within 24 to 48 hours of digging.
- Hot water treatment.



Hot Water Treatments

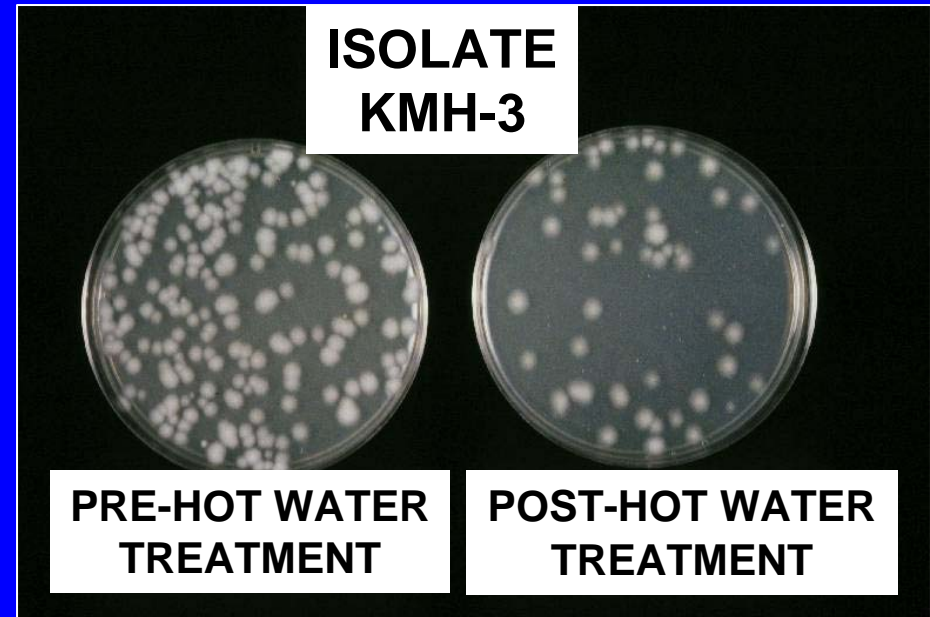
- When combined with a disinfectant like formaldehyde, HWT is an important all-round treatment to assist in the control of:
 - Nematodes
 - Bulb fly, mites, and aphids
 - Basal rot
 - Other fungal pathogens (Smoulder, Scorch, etc.)

Hot Water Treatments

- **Correct storage and HWT are vital to control stem nematode, basal rot, bulb fly, etc.**
- **Optimum temp for the basal rot pathogen is 20-30° C.**
- **Ideal storage is at 17-18° C, with air circulation to prevent fungal growth and premature rooting**
- **'pre-warming' - 2 weeks at 18° C before HWT reduces HWT damage and extends the safe window for HWT**
- **Late-June to mid-August for 4 hours at 43-44° C (110-111° F)**
- **Bulbs are treated whether or not infested (or suspected) with stem nematode. Pre-soaking bulbs increases effectiveness against heat-tolerant nematodes**
- **There is always a temptation to shorten the duration used!**

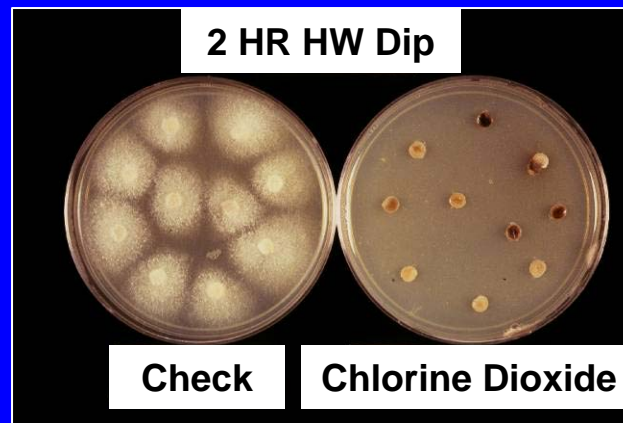
Hot Water Treatment

- To prevent the spread of basal rot spores during the hot water treatment of bulbs formaldehyde is typically added to kill spores.
- Chlorine dioxide is an effective replacement for formaldehyde.



Comparison of Formaldehyde and Chlorine Dioxide in Controlling the Spread of Basal Rot During HWT of Daffodil Bulbs

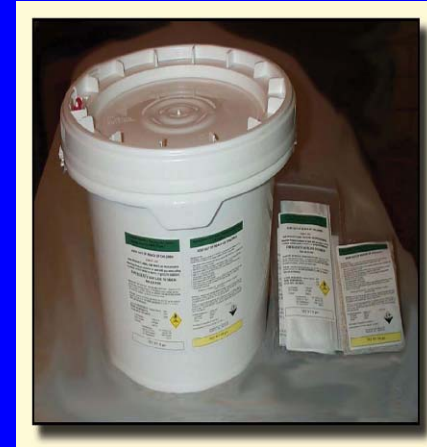
<u>Treatment</u>	<u>Concentration</u>	<u>No. of bulbs w/ BR</u>
Dry check	-	12.4 b
Formaldehyde	0.5%	18.2 b
Chlorine dioxide	5 ppm	16.4 b
Chlorine dioxide	10 ppm	15.2 b
Water	-	98.2 a



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Your Help is Needed



I am looking for basal rot infected bulbs for a project to develop a PCR-based soil and bulb assays for *Fusarium* species

**Contact Gary Chastagner –
chastag@wsu.edu**

Management of Foliar Diseases of Daffodil

Fire – *Botryotinia (Botrytis) polyblastis*

Smoulder - *Botrytis narcissicola*

White Mold - *Ramularia vallisumbrosae*

Leaf Scorch - *Stagnospora curtisii*

Fire is a severe foliar disease on daffodils



Botryotinia (Botrytis) polyblastis

Sclerotia germinate to produce apothecia, which produce ascospores that can only infect flowers



Under favorable conditions, disease can develop rapidly (fire)





Management of Daffodil Fire

Cultural

- Removal and destruction of old foliage residues
- Annual harvest and crop rotation
- Removal of flowers

Protection with fungicides

- Application coverage and timing are important
- One or two applications starting in late March



Smoulder

Botrytis narcissicola

Host - Daffodil



Smoulder

Cultural Management

1. Annual harvest and crop rotation
2. Early digging
3. Improved drainage
4. Disease free planting stock
5. Destruction of foliage residues
6. Hot water treatment

Chemical Management

1. Fungicide bulb dips
2. Foliar sprays

White Mold

Ramularia vallisumbrosae

Host - Daffodil



White Mold

Cultural Management

1. Annual harvest.
2. Crop rotation.
3. Destruction of foliage residue

Chemical Management

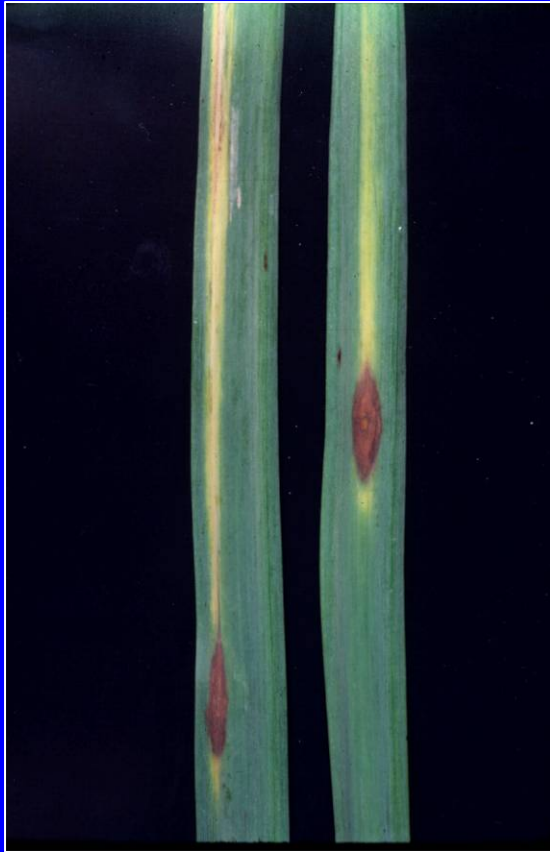
1. Foliar sprays

Leaf Scorch

Stagnospora curtisii



Leaf Scorch



Leaf Scorch

Cultural Control

- Annual harvest
- Crop rotation
- Improved drainage
- Destruction of foliage residues
- Hot water treatment

Chemical Control

- Foliar sprays

Thank You

Note: Always check the label prior to application of any pesticide to make sure you are using properly registered products in your disease management program.

