

High Tunnel Production Must-Knows

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High Tunnel and Urban Ag Instructor

501-671-2033

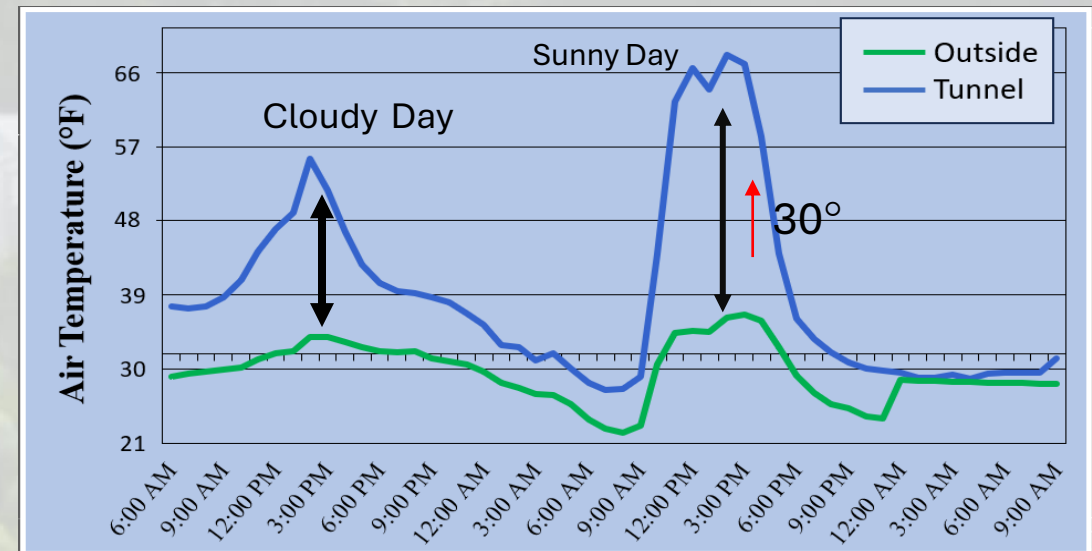
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HIGH TUNNEL
AND URBAN AGRICULTURE

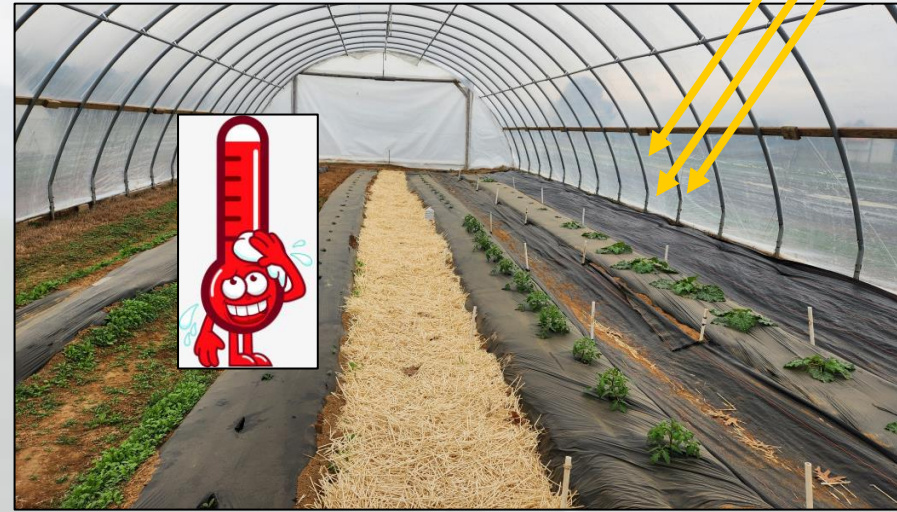
Quick Introduction to High Tunnels:

Plastic covered structures that use solar radiation and wind to raise and lower their internal temperature.



Quick Introduction to High Tunnels:

- Plastic covered structures that use solar radiation and wind to raise and lower their internal temperature.
- No additional lighting
- Plants are grown directly in the existing soil



Benefits and Uses of High Tunnels

- Protect plants from weather events that could stress or kill plants and limit crop production
 - Frost
 - Rain
- Reduce disease pressure
- Reduce the number fungicides sprays
- Some control over a crops' environment

} Proper climate management

Season Extension!

- Strengthens grower/customer relationship by maintaining contact year-round

Plant earlier in the spring

↳ Earlier harvests

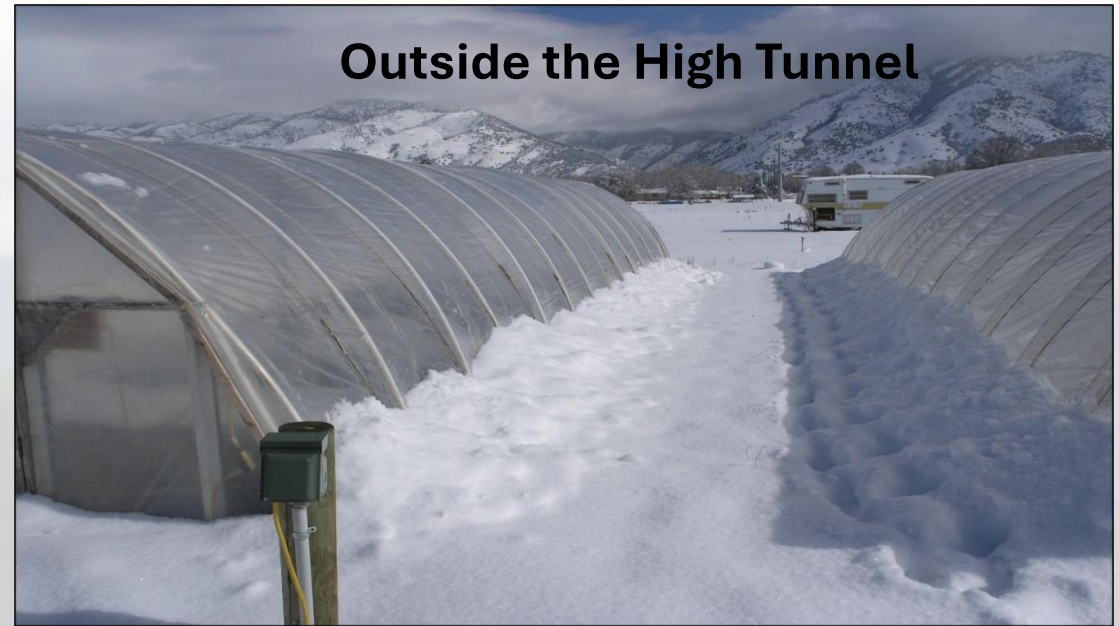
↳ First to the market

↳ \$\$\$

Extend harvest into the fall and winter

↳ Stay longer at markets

↳ Extend farm revenue periods



Site Selection and Preparation

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Key Considerations when Choosing a Location for a High Tunnel:

1. Soil Conditions:

- **Health:** history? compaction? soilborne diseases? nematodes?
- **Soil type:** Sandy type soils are better for out of season production
 - Warm earlier and more quickly
 - Drain well



Key Considerations when Choosing a Location for a High Tunnel:

1. Soil Conditions:

- Health:
- Soil type:

2. Drainage

- Well drained soils – lower disease pressure
- Slope or grade site to divert water away from the tunnel



Key Considerations when Choosing a Location for a High Tunnel:

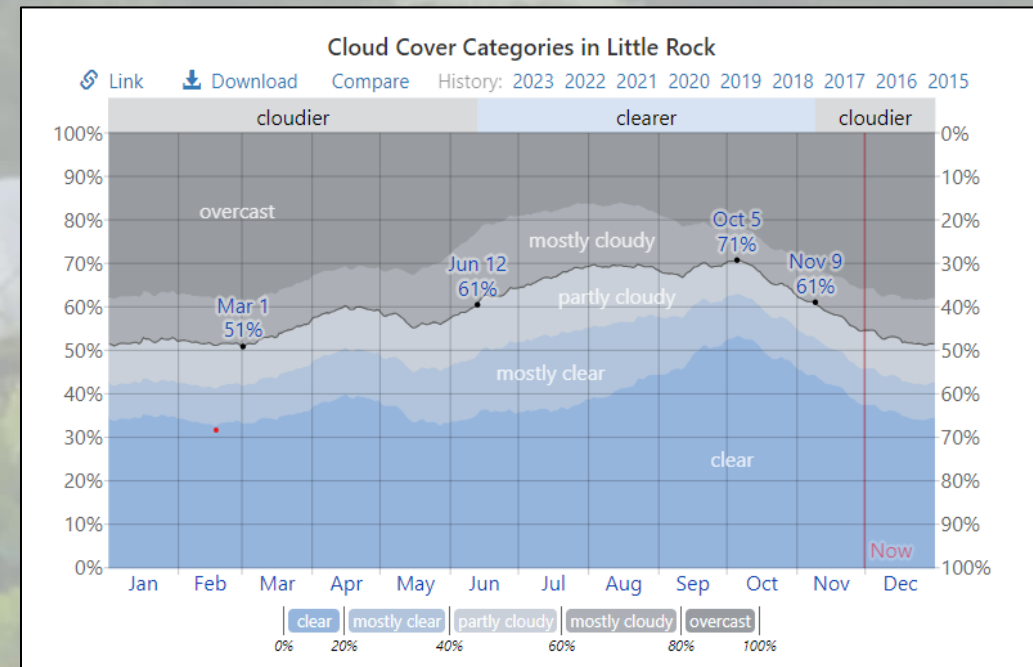
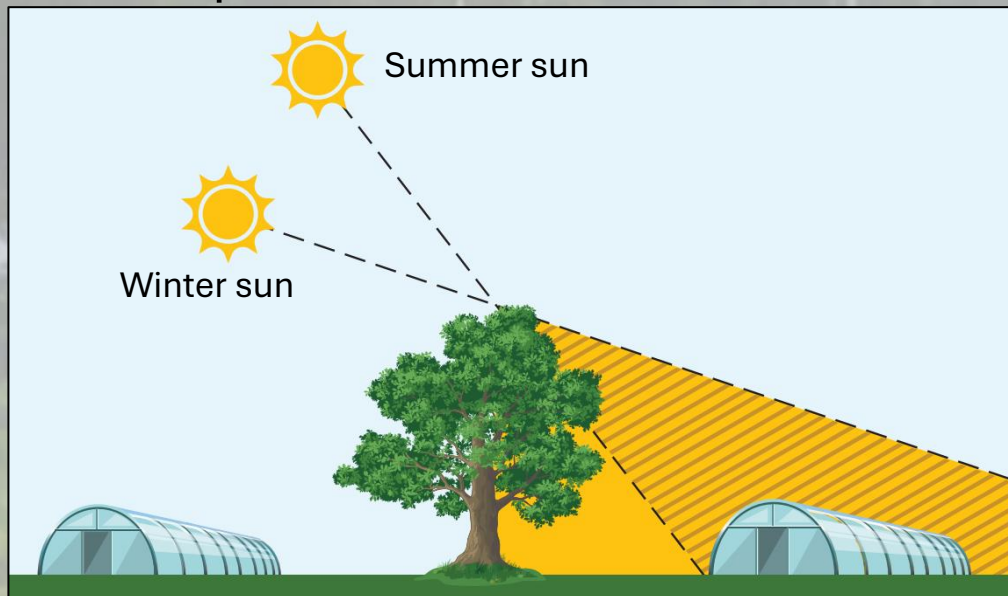
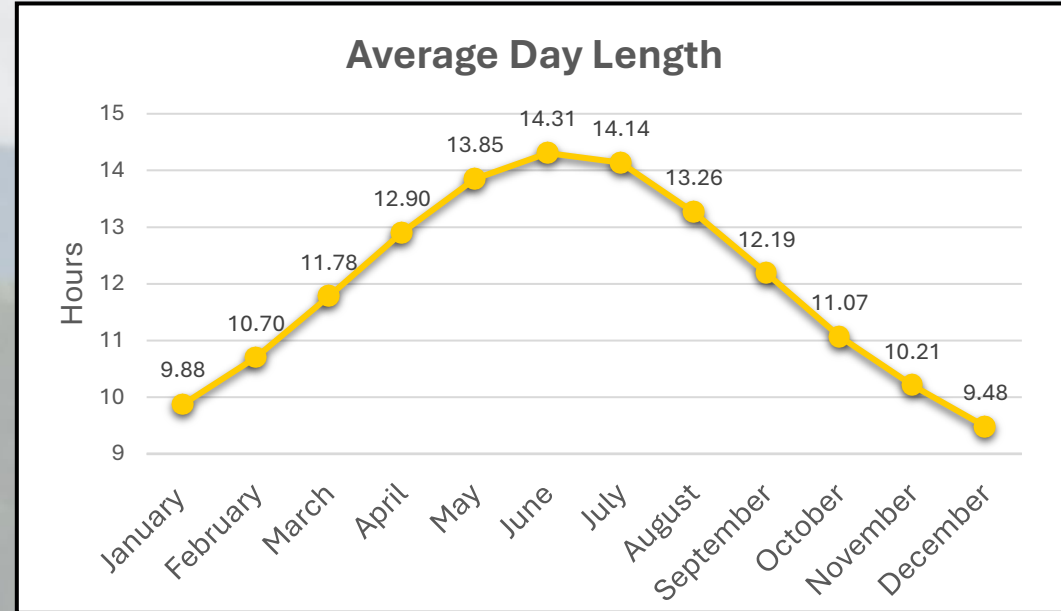
1. Soil Conditions:

- Health:
- Soil type:

2. Drainage

3. Sunlight:

- limited sunlight = slow growth
- important for winter production



Key Considerations when Choosing a Location for a High Tunnel:

1. Soil Conditions:

- Health:
- Soil type:

2. Drainage

3. Sunlight:

limited sunlight = slow growth

4. Wind:

- Temperature and humidity management
- disease suppression

breezy but avoid high winds



Key Considerations when Choosing a Location for a High Tunnel

1. Soil Conditions:

- Health:
- Soil type:

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3. Sunlight:

limited sunlight = slow growth

4. Wind:

breezy but avoid high winds

5. Access to utilities

- Water
- Electricity

6. Orientation

- Sunlight – north/south better light
- Wind - major vents perpendicular to the prevailing wind



Crop Selection and Timing Planting Dates:

Crop Selection:



- Home garden:
 - Any common fruit or vegetable can be grown in a tunnel
- For the Market:
 - Annual vs. perennial crops**
 - Fruits vs. vegetables**
 - Vegetables are most common and most profitable**
 - Tomatoes \$\$\$
 - Lettuces
 - Peppers
 - Cucumbers
 - Eggplant
 - Summer squash
 - Small fruiting crops - strawberries**

Considerations for Planting Date:

Planting date is largely determined by three key things:

1. The crops specific growing requirements:
 1. Temperature
 2. Daylength and lighting
2. Temperatures that can be maintained inside the high tunnel
3. Market times and availability

Crop	Temperature		
	Day	Night	Soil
Eggplant	70 – 80°F	65°F	
Cucumber	70 – 75°F	65°F	70 – 80°F
Summer Squash	70 - 75°F	65°F	65 – 80°F
Pepper	70 – 75°F	60°F	65 – 75°F
Tomato	70 – 75°F	60°F	65 – 75°F
Broccoli	65 – 70°F	60°F	60 – 70°F
Lettuce	60 – 65°F	40°F	60 – 70°F

Considerations for Planting Date:

SPRING likely focus on starting warm season crops early

- More hardy warm season crops:
 - such as tomatoes, peppers
 - transplant 1-1.5 months before your areas frost-free day in the spring
 - may need additional protection – frost cloths
- Tender warm season crops:
 - such as cucumber, summer squash
 - transplant 2 -3 weeks later
 - additional frost protection may be needed

FALL likely focus on establishing cool season crops for winter production OR extend the harvest of warm season crops

- Cool season crops:
 - Full heads/plants: plant early enough that plants are near full maturity before light and temperatures become too low to support growth.
 - Leaves/small plants: later plantings possible – stagger plantings

Remember growth rates will be slower

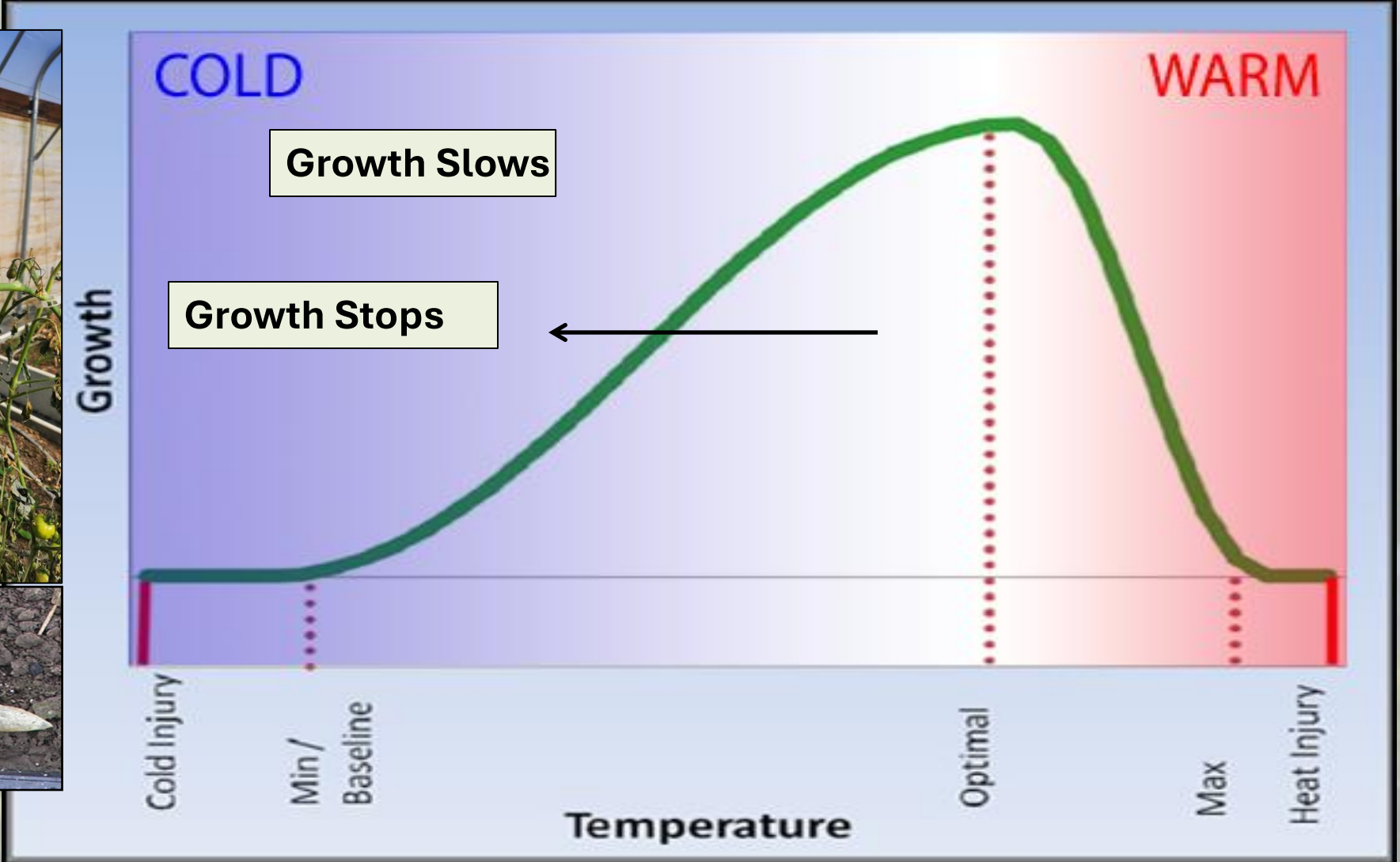
City	Avg. last frost date
Benton	April 5
Bentonville	April 24
Cabot	April 15
Conway	April 13
El Dorado	April 5
Fayetteville	April 27
Fort Smith	April 8
Hot Springs	April 2
Jonesboro	April 12
Little Rock	April 3
Paragould	April 5
Pine Bluff	March 29
Russellville	April 10
Searcy	April 7
Texarkana	March 29
West Memphis	March 29

Climate Management:

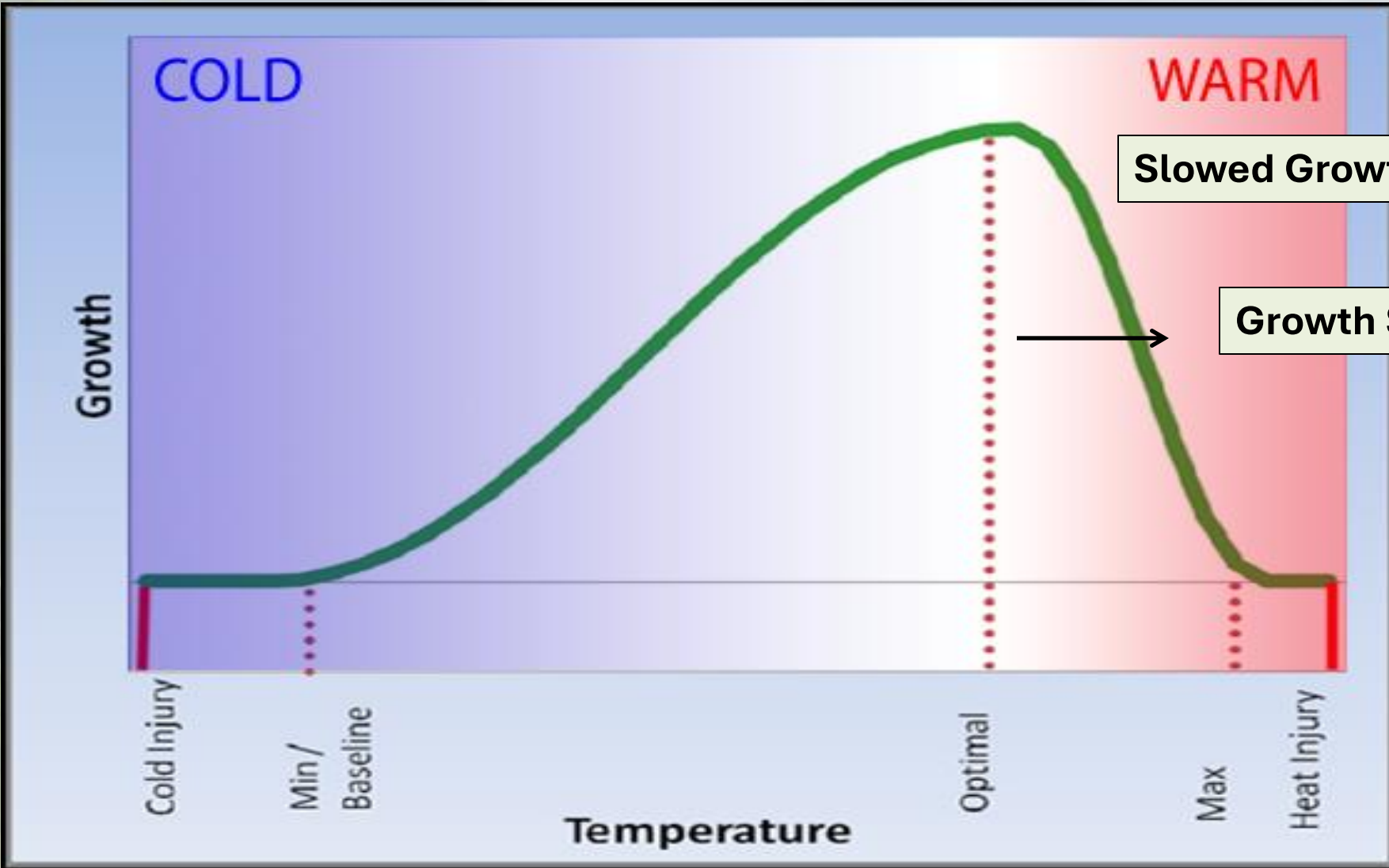
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Plant Growth and Temperature



Plant Growth and Temperature



Plant Growth and Temperature



Cool Season Crops			Warm Season Crops		
Base Temperature	Optimum Temperature	Maximum Temperature	Base Temperature	Optimum Temperature	Maximum Temperature
35-40°F	70-75°F	75-80°F	50°F	75-80°F	90°F



ACCLIMATION

Plant Growth and Humidity

- Increased disease pressure
 - Botrytis
 - Downey mildew
- Affect water movement through the plant
- Cooler air = lower humidity



Plant Growth and Light

Inadequate light = leggy plants
slowed growth

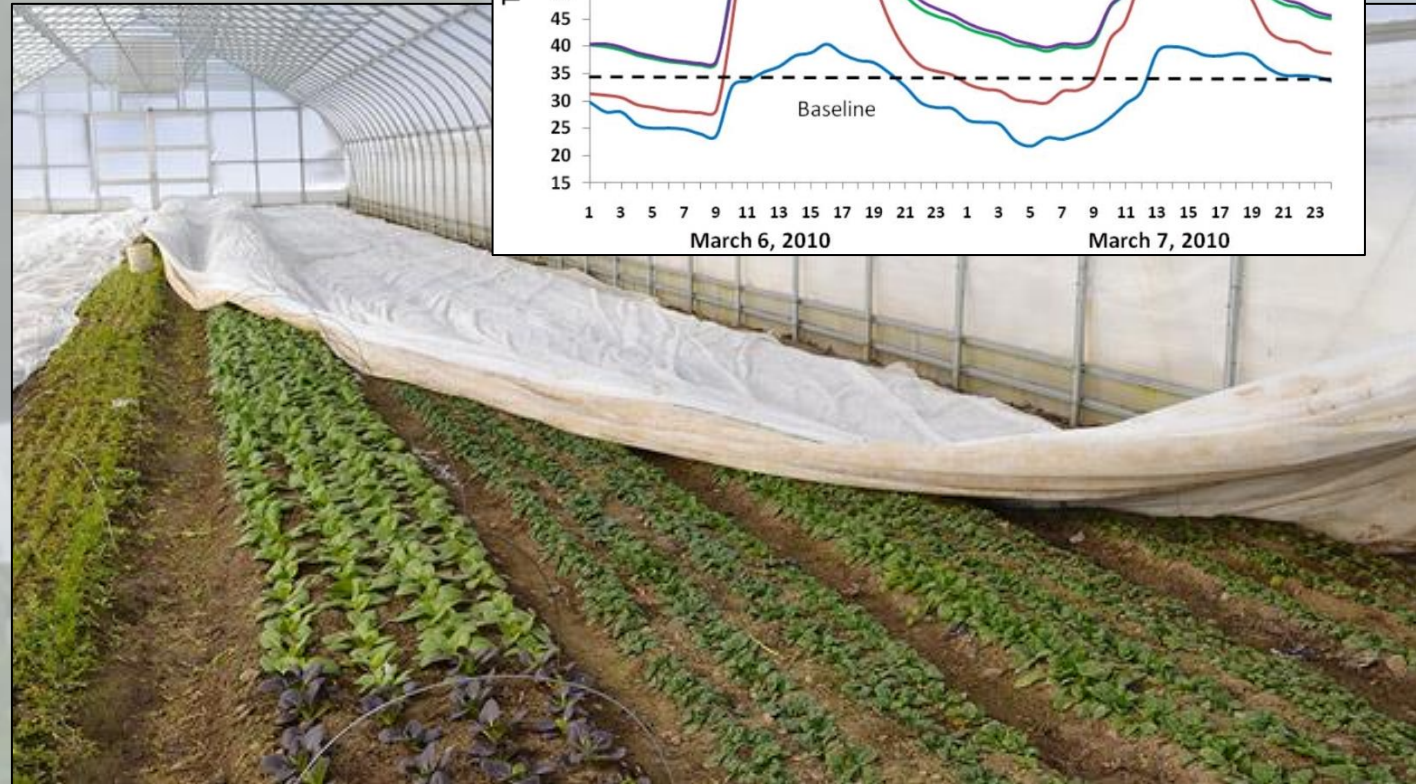
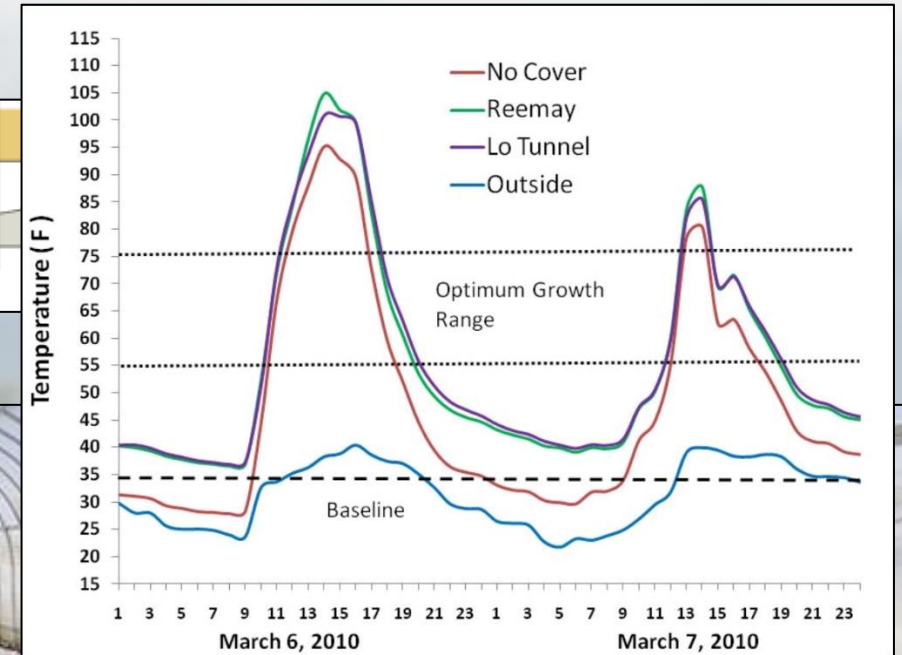
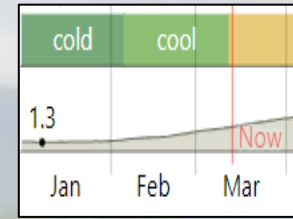


Standard Daily Climate Management Practices

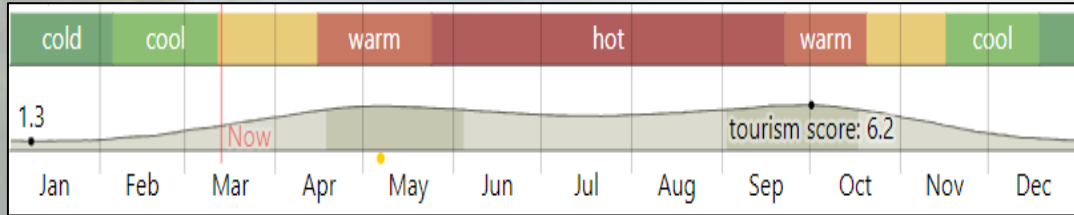
Winter:

1. Prevent or protect from damaging cold temperatures
2. Avoid excessively high temperatures (70-75°F)

- Secondary covers – night
 - 2 - 5° temperature protection
- Ventilate on warm or sunny days
- Additional heating
- Monitor humidity
 - Remove secondary covers during the day

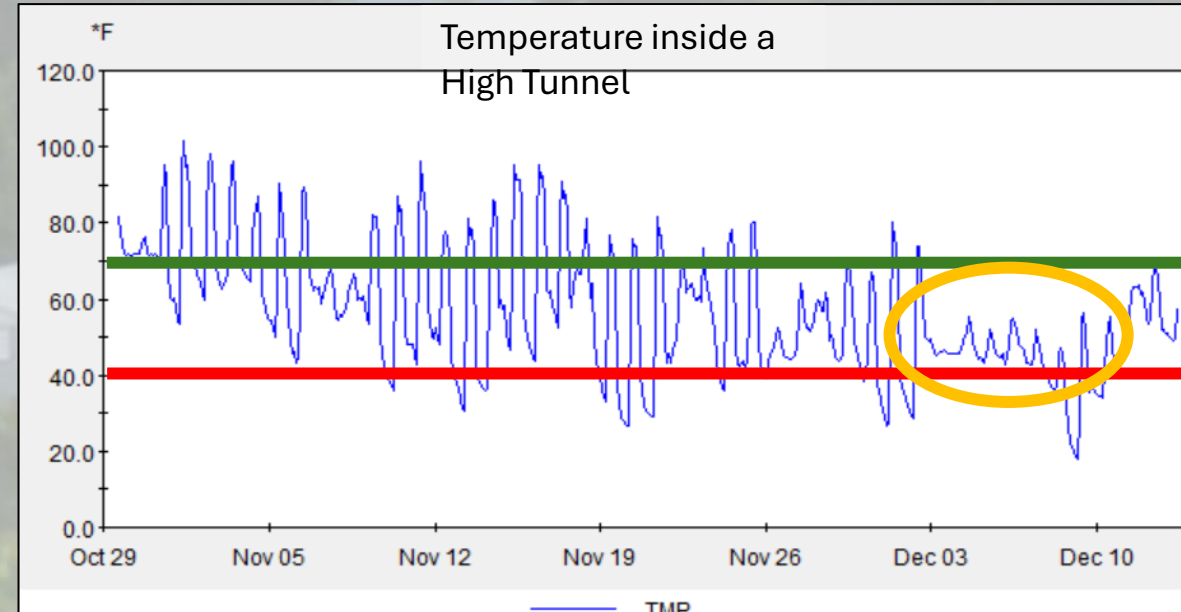


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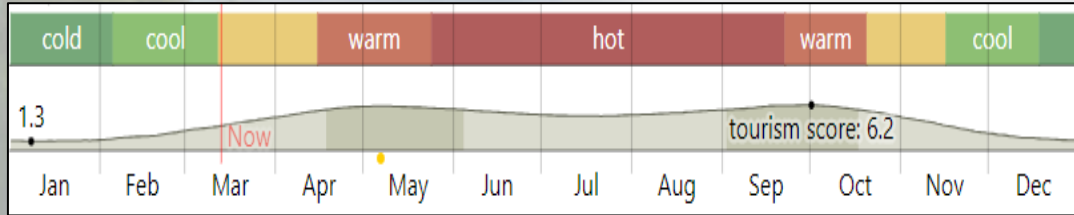


Spring and Fall:

1. Preventing high temperatures
 2. Protect plants from excessively cold temperatures
- Highest labor need (usually)



Standard Daily Climate Management Practices



Spring and Fall:

1. Preventing high temperatures
2. Protect plants from excessively cold temperatures

- Highest labor need (usually)

- Daily Management:

- Monitor forecasts daily

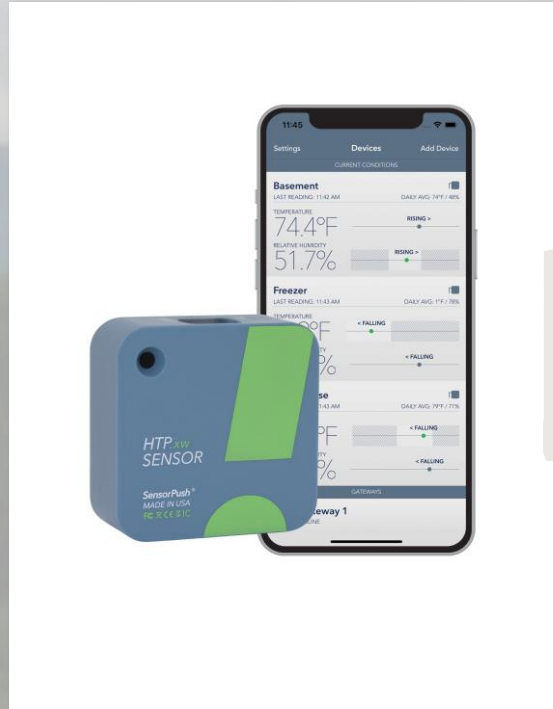
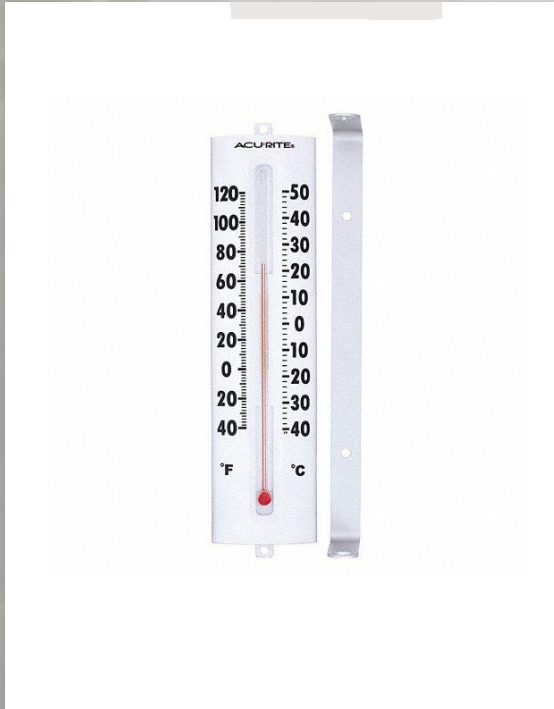
Indicate venting and/or secondary cover needs

Extremely cold and overcast = no venting

- Monitor the internal temperature of the high tunnel

Partly sunny cold days, or warm overcast days

- Monitor humidity

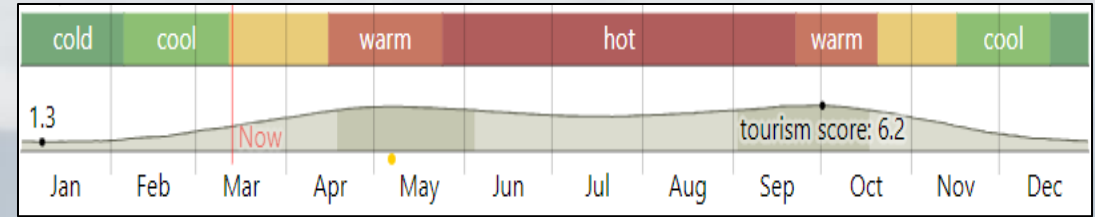


Standard Daily Climate Management Practices

Standard Daily Climate Management Practices

Summer:

1. Prevent excessively high temperatures
- Maximize ventilation and air movement
 - Shade cloth is absolutely necessary!
 - Varying degrees of shade 10-80%
 - Apply when day temperatures are consistently 80-85°F
 - Fans



A close-up photograph of a plant stem, possibly a citrus fruit, showing a significant white, fuzzy growth. The growth is dense and covers a large portion of the stem, indicating a fungal infection. The background is blurred, showing green foliage.

Diseases Management Practices

1. ~~Rainfall or Splashing Water~~

Bacterial spot of tomato and pepper
Many *Colletotrichum* species (cause anthracnose)

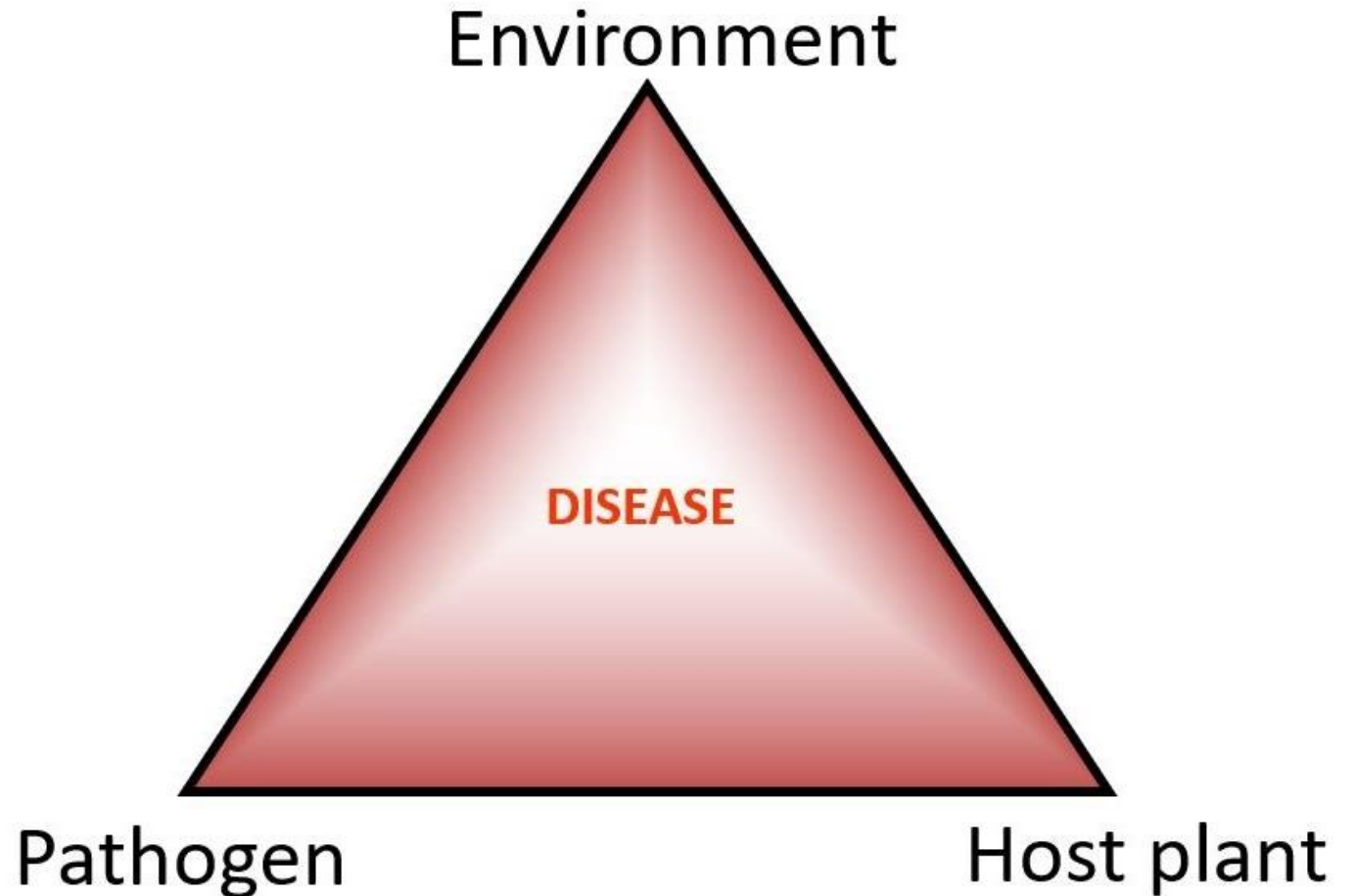
2. Extended periods of high humidity and leaf wetness

- Leaf mold
- Botrytis grey mold
- Powdery mildew

3. Wind

- Wind/air movement is **necessary** in high tunnels to manage temperature and humidity

Disease Triangle

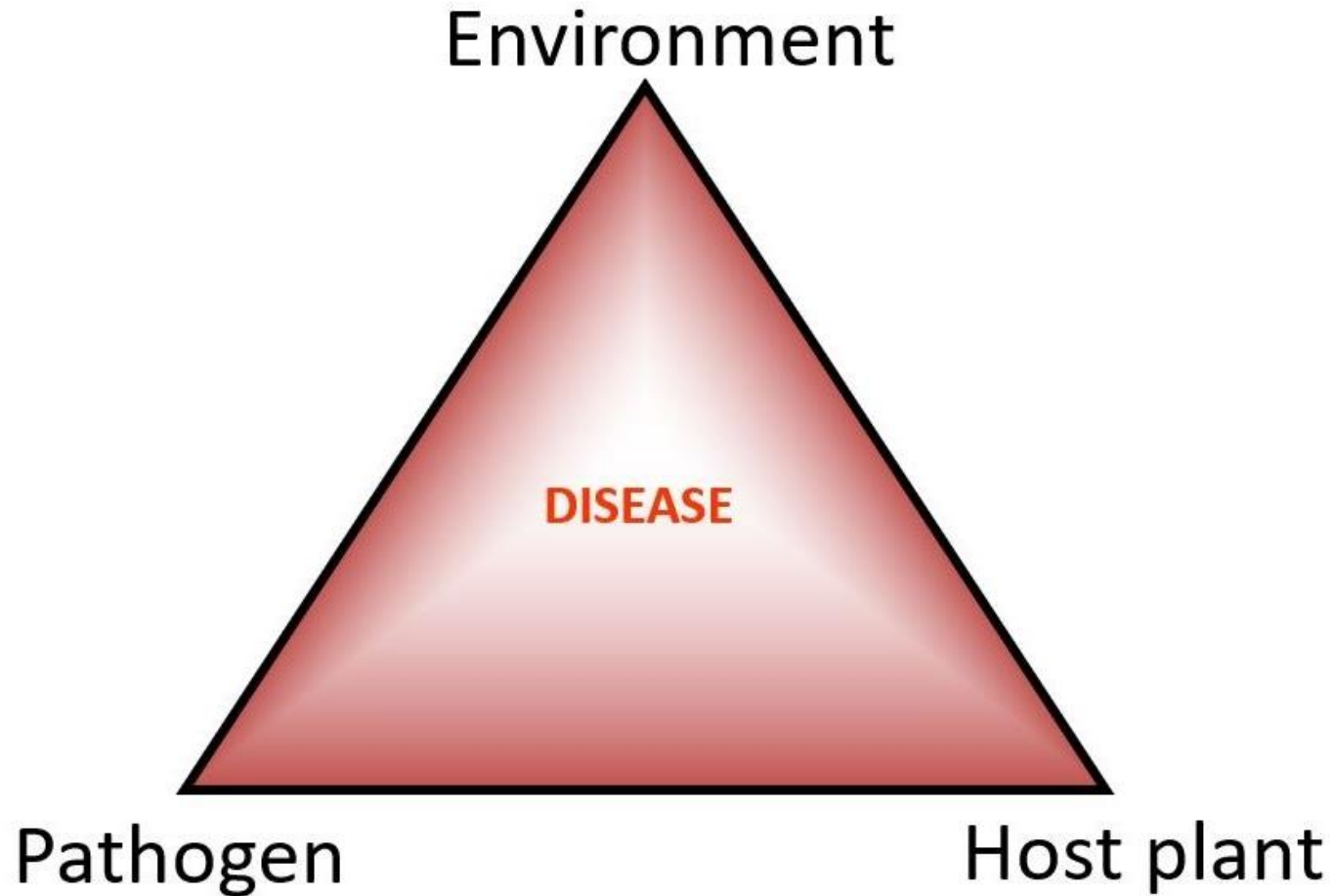


Climate Management Practices for Disease Control:

- Proper site selection!
 - Maximize potential sunlight
 - Maximize airflow
 - Avoid standing watering inside the tunnel
- Proper tunnel design
 - Maximize airflow
- Proper management of secondary covers
 - Minimize time spend under high humidity
 - Minimize large temperature fluctuations and extremes



Disease Triangle



Integrated Pest Management (IPM)

Uses a combination of management tactics to achieve long term solutions that are both economically and ecologically sustainable.

- Pest Prevention
- Cultural Control
- Biological Control
- Mechanical Control
- Chemical Control

Disease Management Practices

- Host Plant:
 - Select disease-resistant varieties when possible
- Pathogen:
 - Crop Rotation – “Cornerstone of pest management”
 - Break disease and insect cycles
 - Minimize disease inoculum present
 - Sanitation
 - Avoid bringing in diseased inoculum
 - Remove as much disease inoculum as possible
 - Do not store tools, equipment etc. inside the tunnel
 - Deep till if there are known soilborne pathogens
 - Preventive fungicides



Plant Family	Common Crops
Composite family (Asteraceae)	Endive, Lettuce, Sunflower
Goosefoot family (Chenopodiaceae)	Beet, Spinach, Swiss Chard
Gourd Family (Cucurbitaceae)	Cantaloupe, Cucumber, Pumpkin, Squash, Watermelon
Grass family (Poaceae)	Ornamental corn, popcorn, sweetcorn
Lily Family (Alliaceae)	Chives, Garlic, Leek, Onion
Legume Family (Fabaceae)	Bush bean, Lima bean, Pea, Pole bean
Mallow Family (Mavaceae)	Okra
Mustard Family (Brassicaceae)	Broccoli, Brussels sprouts, Cabbage, Cauliflower, Collard, Kale, Mustard greens, Radish, Rutabaga, Turnip
Nightshade Family (Solanaceae)	Eggplant, Pepper, Potato, Tomato
Parsley Family (Apiaceae)	Carrot, Celery, Parsley, Parsnip

A close-up photograph of a plant stem, possibly a citrus branch, heavily infested with a dense layer of small, light-colored insects, likely aphids. The insects are clustered on the stem and the underside of the leaves, which are visible in the background. The text "Pest Management Practices" is overlaid in the center of the image.

Pest Management Practices

Pest Management Practices:

Increase in pest issues inside a high tunnel

Mites (spider, broad, and russet mites)
Aphids
Whiteflies
Thrips
Scale insects
Hoppers
etc



1. Have an action plan ready go
2. Scout often
 - Two times a week when possible
 - 10x lens
3. Respond quickly!
 - Have supplies on hand



Pest Management Practices:

Combination of tactics is necessary

****Sanitation****

Avoid the Green Bridge!

Weeds/plant residue provides alternate host and shelter for many tunnel pests

- Weed control - Reduces risk from mites and other pests
- Avoid pools of standing water
 - Big issue with fungus gnats, shore flies, and potentially slugs
- React with appropriate insecticides, miticides, or biological control quickly



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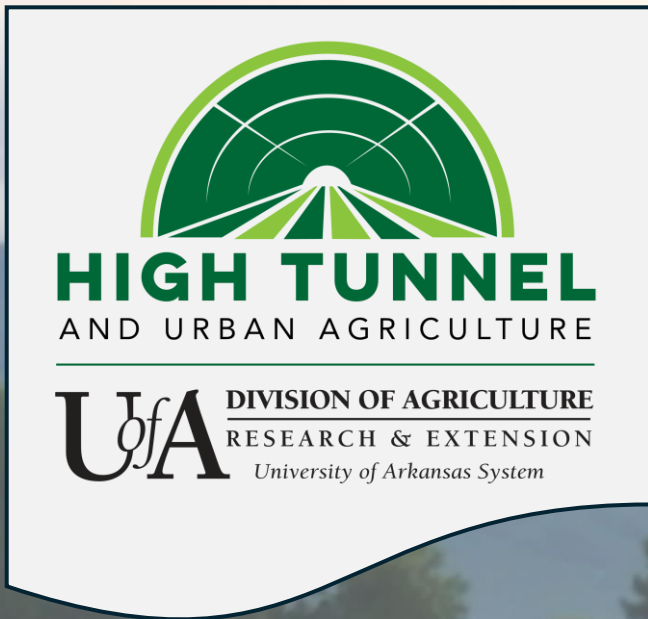
2024

VEGETABLE CROP
HANDBOOK

"Everything you need
on the dashboard of your truck."



<https://content.ces.ncsu.edu/southeastern-us-vegetable-crop-handbook>



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More information can be
found at:

uaex.uada.edu/hightunnel



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