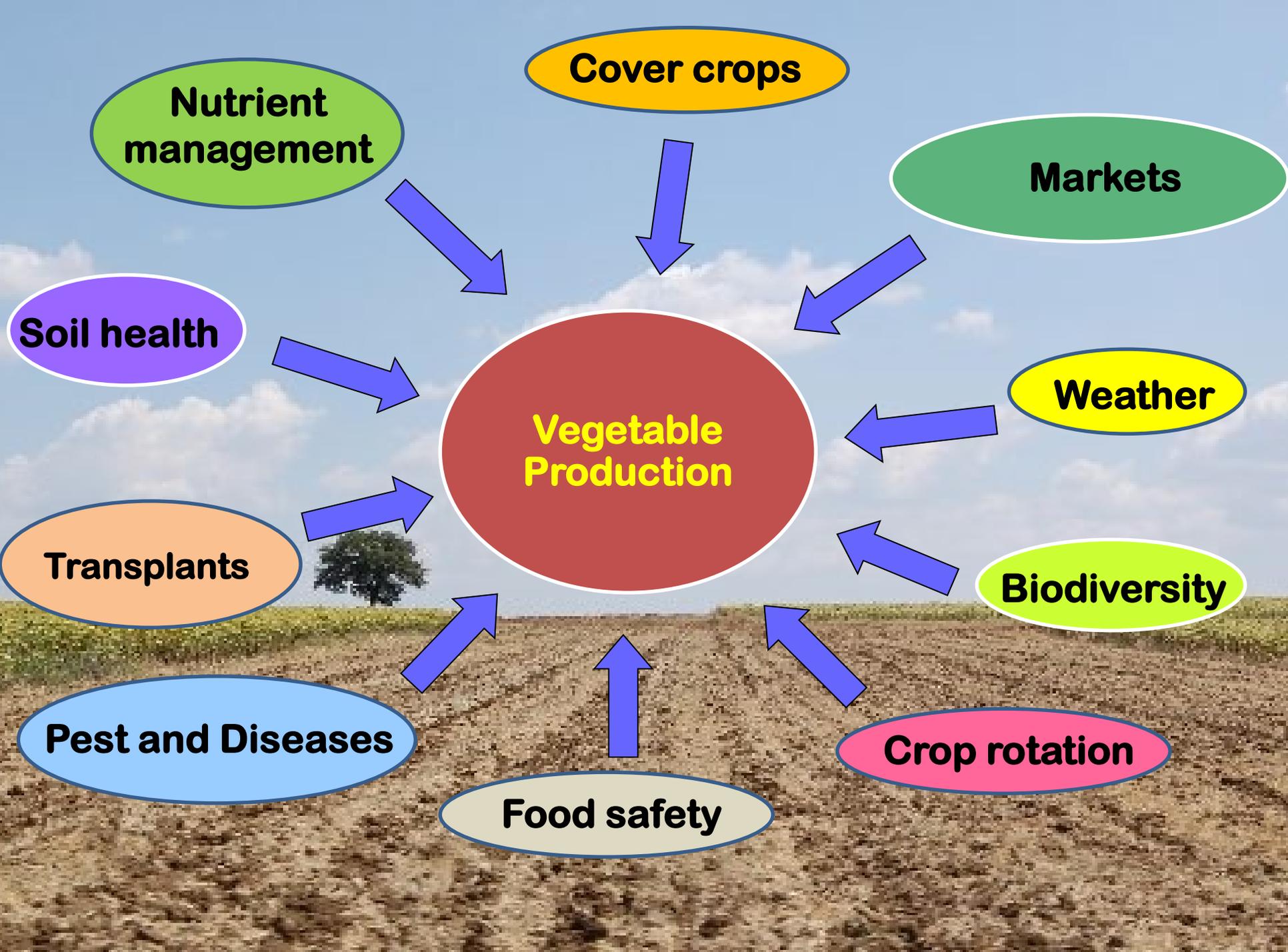


**Disease, Insect,  
Herbicide, Nutrition:  
What is going on?**

**Ajay Nair  
Department of Horticulture  
Practical Farmers of Iowa 1-18-2020**



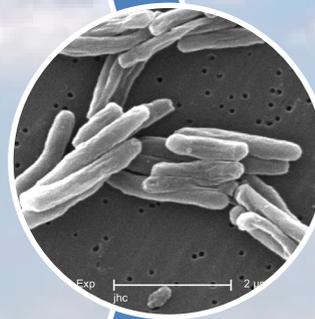
# Proper identification is the key

- Make the best use of your smartphone
- Keep a tab on daily activities carried in and around your crop
- Are the symptoms localized in the field?
- Is there a pattern?

Identification is critical  
for a timely and  
effective response



**Insect**



**Disease**



**Nutrition**

**Anything noticeable in this picture?**



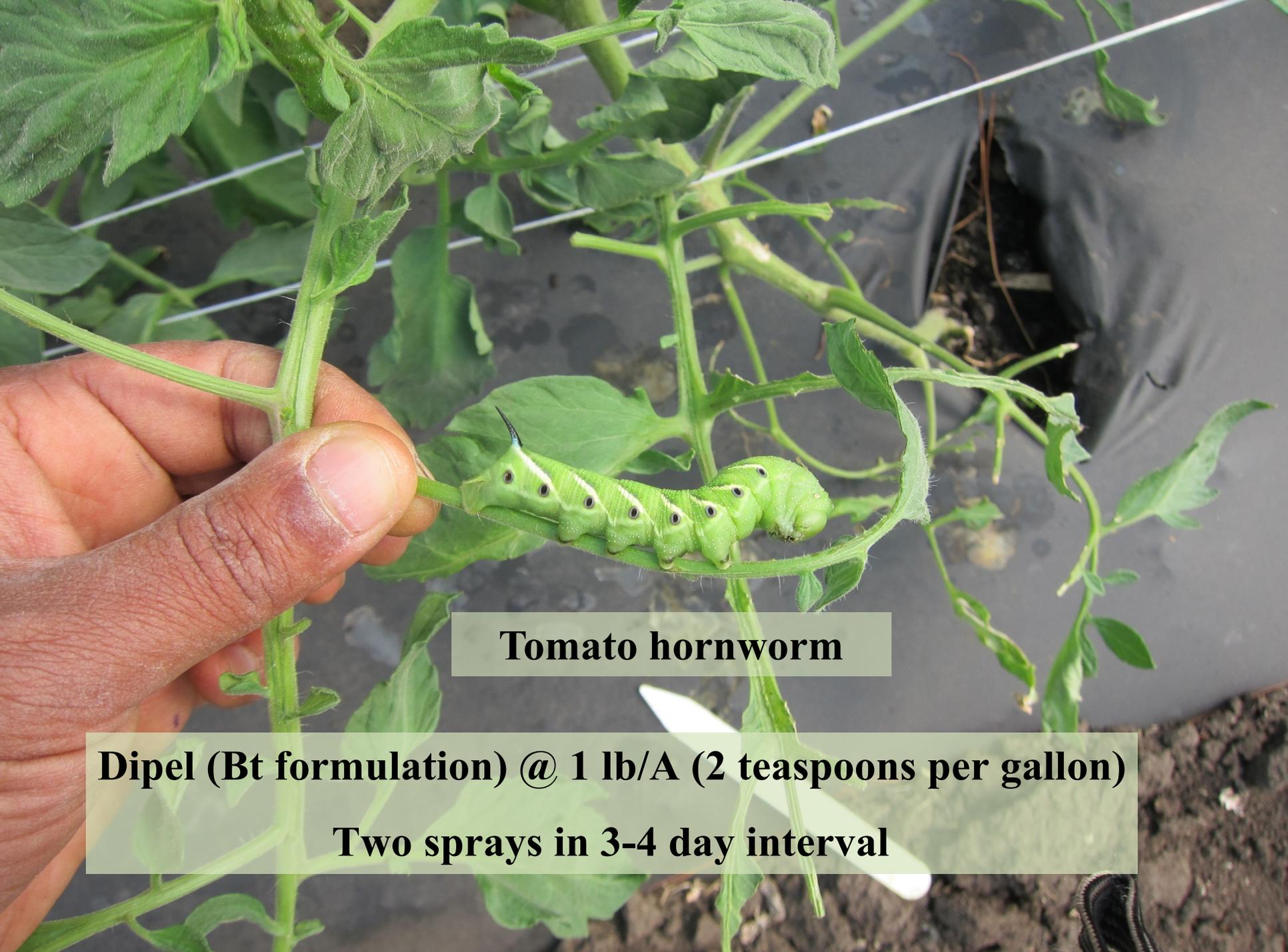
An adult hornworm moth is shown resting on dark, granular soil. The moth has a brown and white striped pattern on its wings and a prominent red patch on its hindwing. Its long, thin antennae are visible. The background includes some dried plant matter and a dark, curved object, possibly a container rim.

**Adult moth : hornworm**

# Hornworm Damage



Joe Boggs, OSU Extension©



**Tomato hornworm**

**Dipel (Bt formulation) @ 1 lb/A (2 teaspoons per gallon)**

**Two sprays in 3-4 day interval**







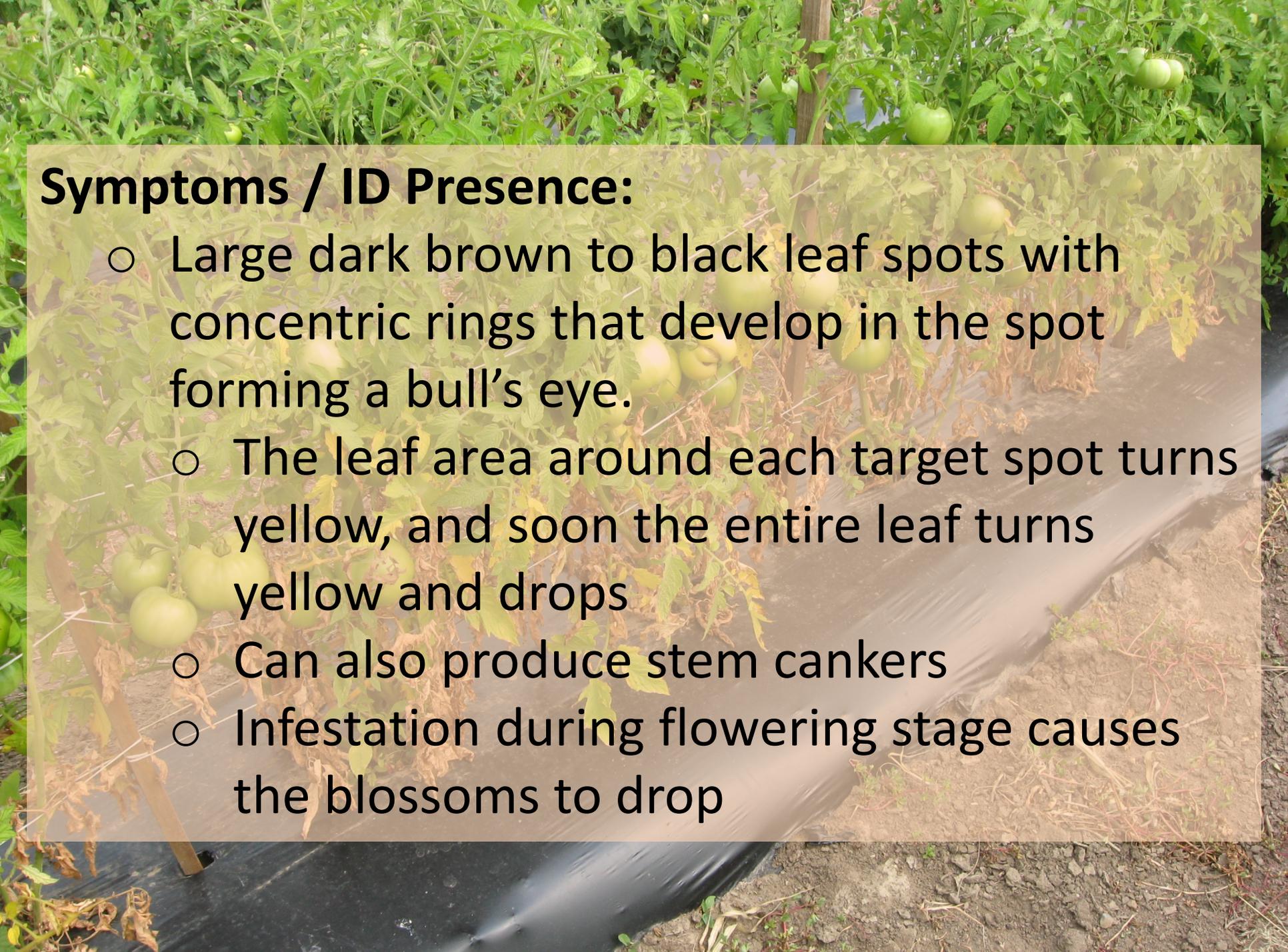
**Septoria Leaf Spot:  
Spots are circular, about  
1/16 to 1/4 inch in diameter  
with dark brown margins  
and tan to gray centers with  
small black fruiting  
structures**

## Possible causes

- Long periods of high relative humidity, temps of 60–80 degrees F, leaf wetness
- Pathways
  - The fungus overwinters on infected tomato debris or on weeds in nightshade family
  - The fungus can also survive on equipment such as plant stakes and cages
  - Spores may be spread by windblown water, splashing rain, hands and clothing of pickers, insects such as beetles, and cultivation equipment

# Prevention / What to do

- Remove infected leaves
- Improve air circulation
- Do not work around plants when they are wet
- Mulch around the base of the plant, control weeds
- Do not use overhead watering
- Rotate nightshade family
- Last resort: Use a fungicidal spray  
Apply [chlorothalonil](#), maneb, macozeb, or a [copper](#)-based fungicide, such as copper hydroxide

A photograph of a tomato garden. The plants are supported by wooden stakes and are growing over black plastic mulch. Several green tomatoes are visible on the vines. Some leaves show signs of stress, including yellowing and dark spots, which are characteristic of black spot disease.

## Symptoms / ID Presence:

- Large dark brown to black leaf spots with concentric rings that develop in the spot forming a bull's eye.
- The leaf area around each target spot turns yellow, and soon the entire leaf turns yellow and drops
- Can also produce stem cankers
- Infestation during flowering stage causes the blossoms to drop



## Possible causes

- Develop quite rapidly in mid to late season and is more severe when plants are stressed by poor nutrition, drought, warm humid weather with heavy dews or rain
- Overcrowded plants
- Too much moisture during cool and warm weather



Serenade Max™ (*Bacillus subtilis*), Garlic, neem oils and seaweed extract have shown some effectiveness

- **Late blight**
- **spreads quickly in fields and can result in total crop failure**
- <https://usablight.org/>
- **TomCast from Cornell**



- 
- **Leaf mold**
  - **Can be managed by improving air movement**



**Sunburn in pepper**

Salt burn symptoms - pepper



# Electrical conductivity (EC)

- **Measure of the ability of the solution to conduct electricity**
- **Based on saturated paste extract method**

< 2 mmhos/cm = optimum

2.1-4 = sensitive crops restricted; plants show initial symptoms

4.1-8 = Growth affected; many crops restricted

> 8.1 = detrimental; most crops restricted

# Relative salt tolerance of fruit and vegetable crops

**0-2 mmhos/cm<sup>+</sup>**  
**Nontolerant**

blueberries  
carrots  
green beans  
onions  
radishes  
raspberries  
strawberries

**3-4 mmhos/cm<sup>+</sup>**  
**Slightly**  
**Tolerant**

apples  
cabbage  
celery  
grapes  
lettuce  
peppers  
potatoes  
sweet corn

**5-7 mmhos/cm<sup>+</sup>**  
**Moderately**  
**Tolerant**

broccoli  
beets, table  
cucumbers  
muskmelons  
squash  
tomatoes  
spinach

**8-16 mmhos/cm<sup>+</sup>**  
**Tolerant**

asparagus  
Swiss chard



Salt burn syn

**Robust and healthy plants can withstand many abiotic and biotic stresses. That leads to importance of maintaining soil quality and health**



# Characteristics of healthy soil

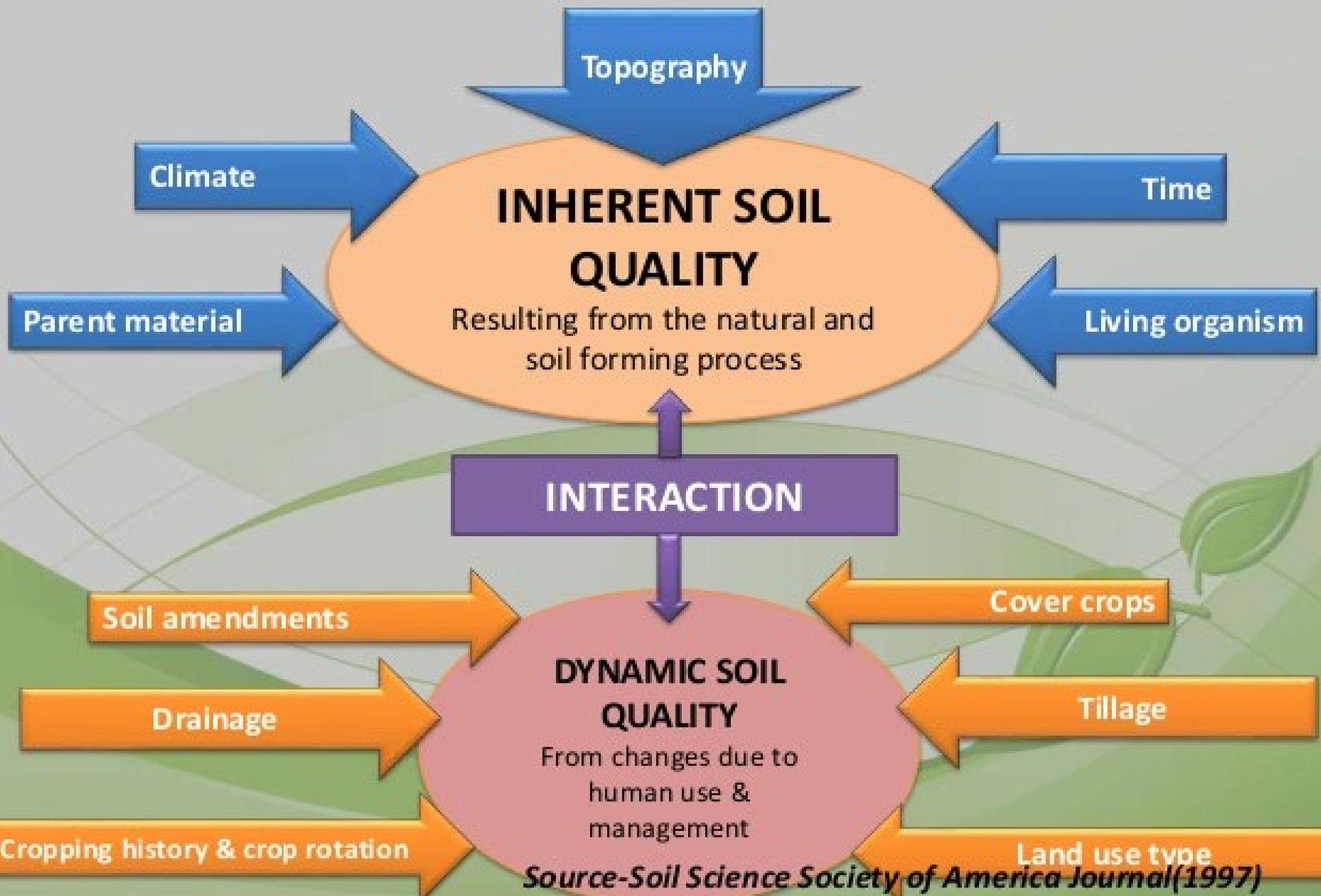
- Good tilth
- Sufficient depth
- Good water storage and drainage
- Less compaction



- Sufficient supply, but not excess of nutrients
- Proper balance of nutrients
- Optimum pH, EC
- Low weed pressure

- Organic matter
- Biologically active soil
- Diversity of soil microorganisms

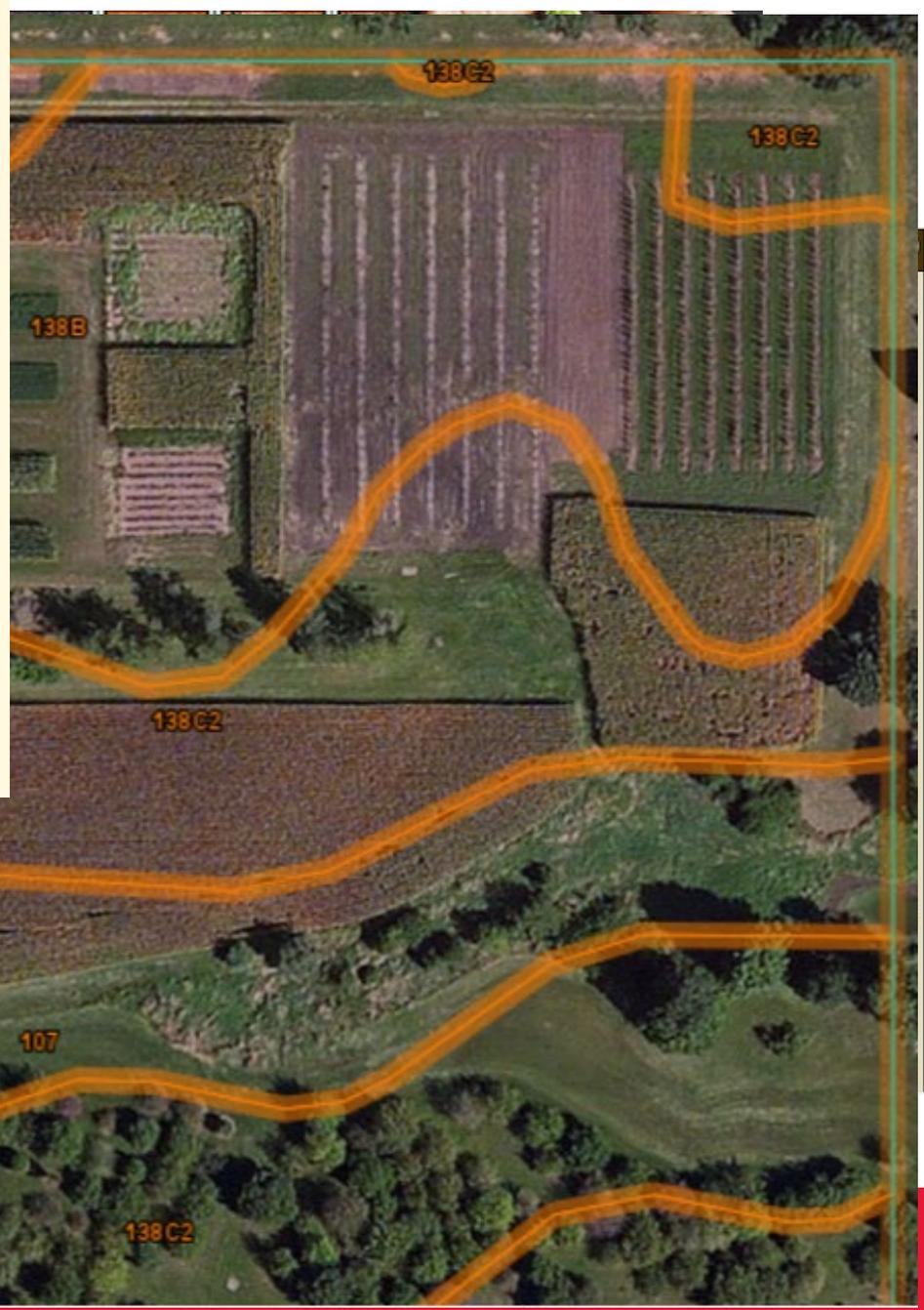
# Factors effecting soil quality



# Map Unit Legend

## Story County, Iowa (IA169)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
55	Nicollet clay loam, 1 to 3 percent slopes	1.0	5.6%
107	Webster clay loam, 0 to 2 percent slopes	2.9	16.8%
138B	Clarion loam, 2 to 6 percent slopes	6.3	36.5%
138C2	Clarion loam, 6 to 10 percent slopes, moderately eroded	7.1	41.1%
<b>Totals for Area of Interest</b>		<b>17.3</b>	<b>100.0%</b>





HEALTHY leaves shine with a rich dark green color when adequately fed

PHOSPHATE shortage marks leaves with reddish-purple, particularly on young plants.

POTASH deficiency appears as a fring or drying along the tips and edges of lower leaves.

NITROGEN hunger sign is yellowing that starts at tip and moves along middle of leaf.

MAGNESIUM deficiency causes whitish stripes along the veins and often a purplish color on the underside of the lower leaves.

DROUGHT causes the corn to have a greyish-green color and the leaves roll up nearly to the size of a pencil.

DISEASE, *Helminthosporium blight*, starts in small spots, gradually spreads across leaf.

CHEMICALS may sometimes burn tips.

Drought: Margaret Price

Healthy

P

K

N

Mg

Drought

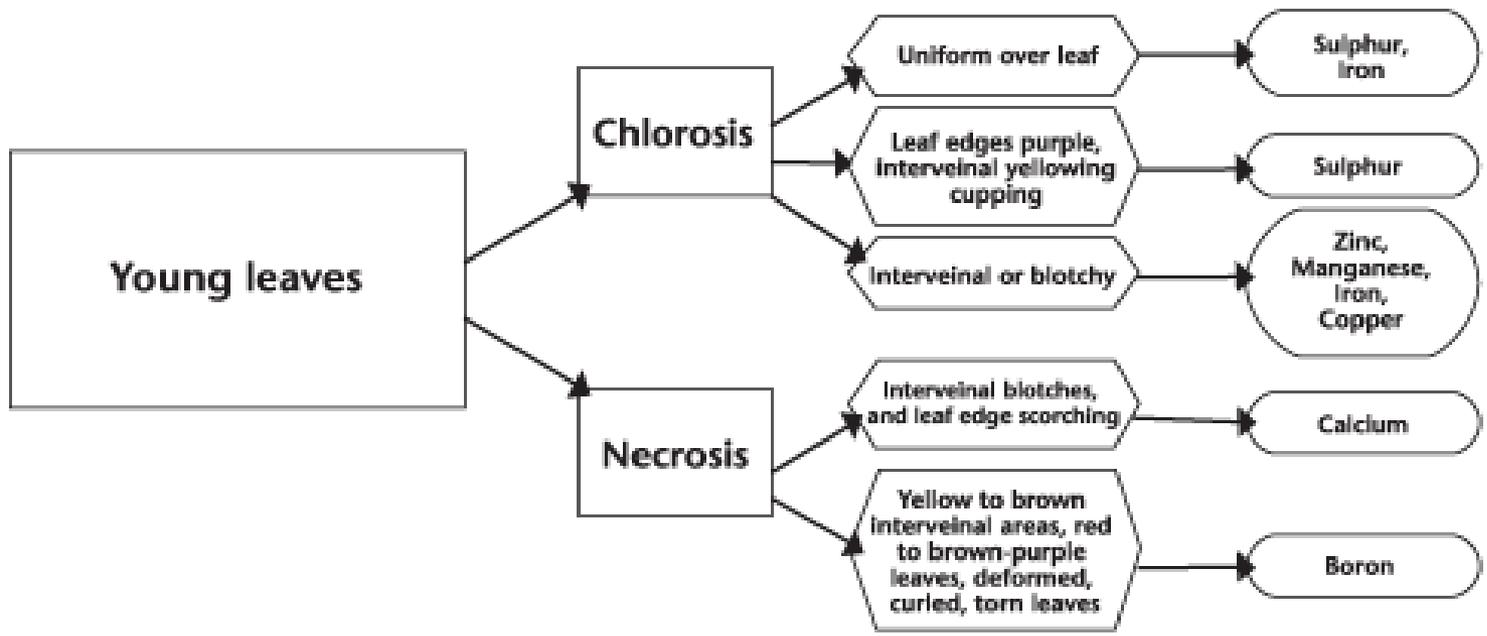
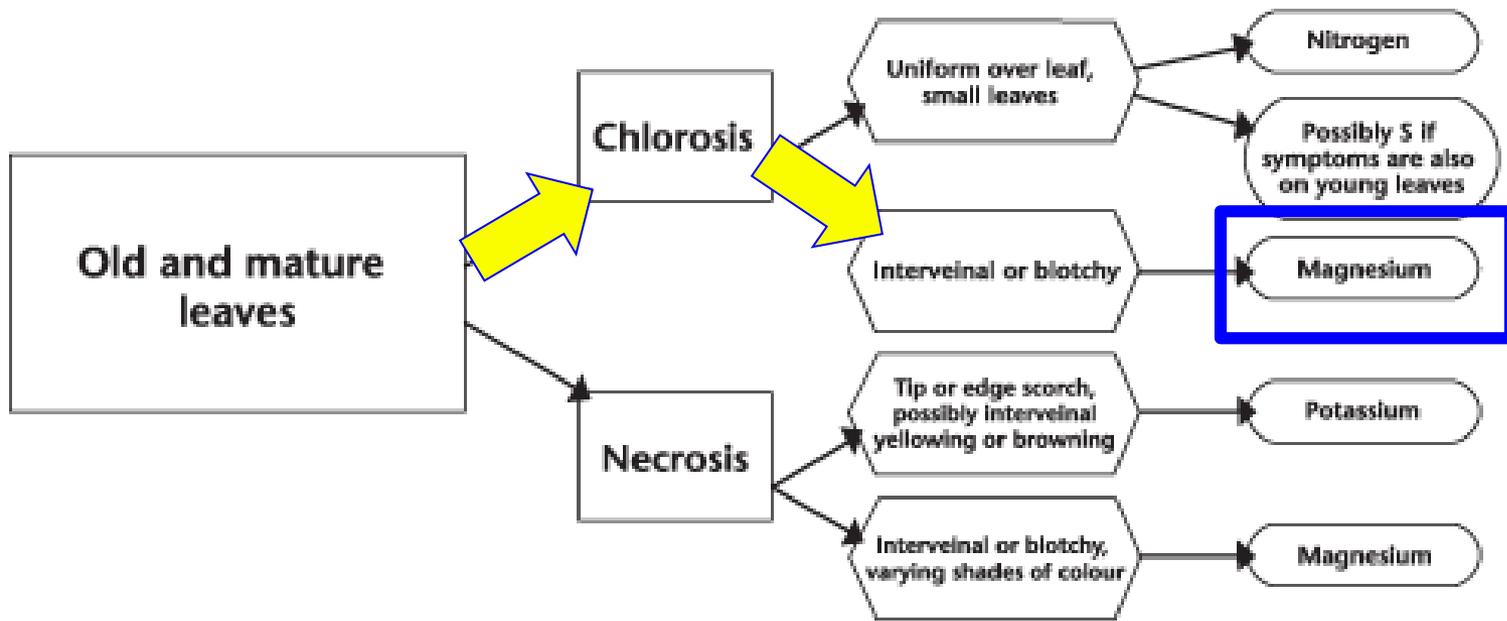
Disease

Chemicals

**Fertigation with Cal-Mag and Epsom salt along with foliar sprays of Epsom**

**Interveinal chlorosis:  
Magnesium deficiency**





# Leaf symptom on cucumber

Scorching of lower leaf edges



Nutrient deficiency: Potassium

**Green/Yellow shoulder**



**Green/Yellow shoulder**



5368974

# **Green/yellow shoulder**

- **Physiological disorder**
- **Heat (high temperature; 95F and above)**
- **Uniform color development requires more K<sup>+</sup>, than the amount required to sustain yield**

# Fields at a lower risk of producing fruit with YSD have the following soil properties

- pH between 6.0 and 6.8;
- organic matter above 1.5 %;
- exchangeable potassium above 400 lbs/ac (or 200 ppm) and,
- ratio of  $K/\sqrt{Mg}$  above 0.35.

# "Hartz" Ratio

- [Project Objectives](#)
- [Color Disorders](#)
- [Presentations](#)
- [Color Disorders vs. Soil](#)
- [Preliminary Results](#)
- ["Hartz" Ratio Calculator](#)
- [Related Links](#)
- [Participants](#)

To know if your soil is at low risk of YSD, enter the information below based on the standard test results of your soil.

Please enter the values for Phosphorus (P), Potassium (K), Magnesium (Mg), Calcium (Ca), Cation Exchange Capacity (CEC), and the units used by the laboratory.

P	35	Units <input checked="" type="radio"/> ppm <input type="radio"/> lb/acre <input type="radio"/> Kg/ha	<input type="button" value="Calculate"/>
K	100		
Mg	2000		
Ca	2900		
CEC			

The results are presented below. You can compare your results with the most desirable values for soils at low risk of YSD (values on right side in green).

Your results		Course Textured Soil at low risk of YSD (Midwest, USA)	Fine Textured Soil at low risk of YSD (Midwest, USA)	Soil at low risk of YSD (California, USA)
Extractable K	0.256 Kmol/kg	>0.45	>0.5	>0.7
Hartz ratio	0.063	>0.6	>0.35	>0.25
K of the CEC	Infinity %	> 4%	> 4%	>2%
Ca/Mg Ratio	0.879	> 3.0	> 3.0	> 2.0



- **Purpling of lower leaves**
- **Might see soon after transplanting; this is due to colder soils**

**Blossom end rot**



**Nutrient deficiency: Calcium**  
**Irregular watering**

## **Progression of blossom end rot**

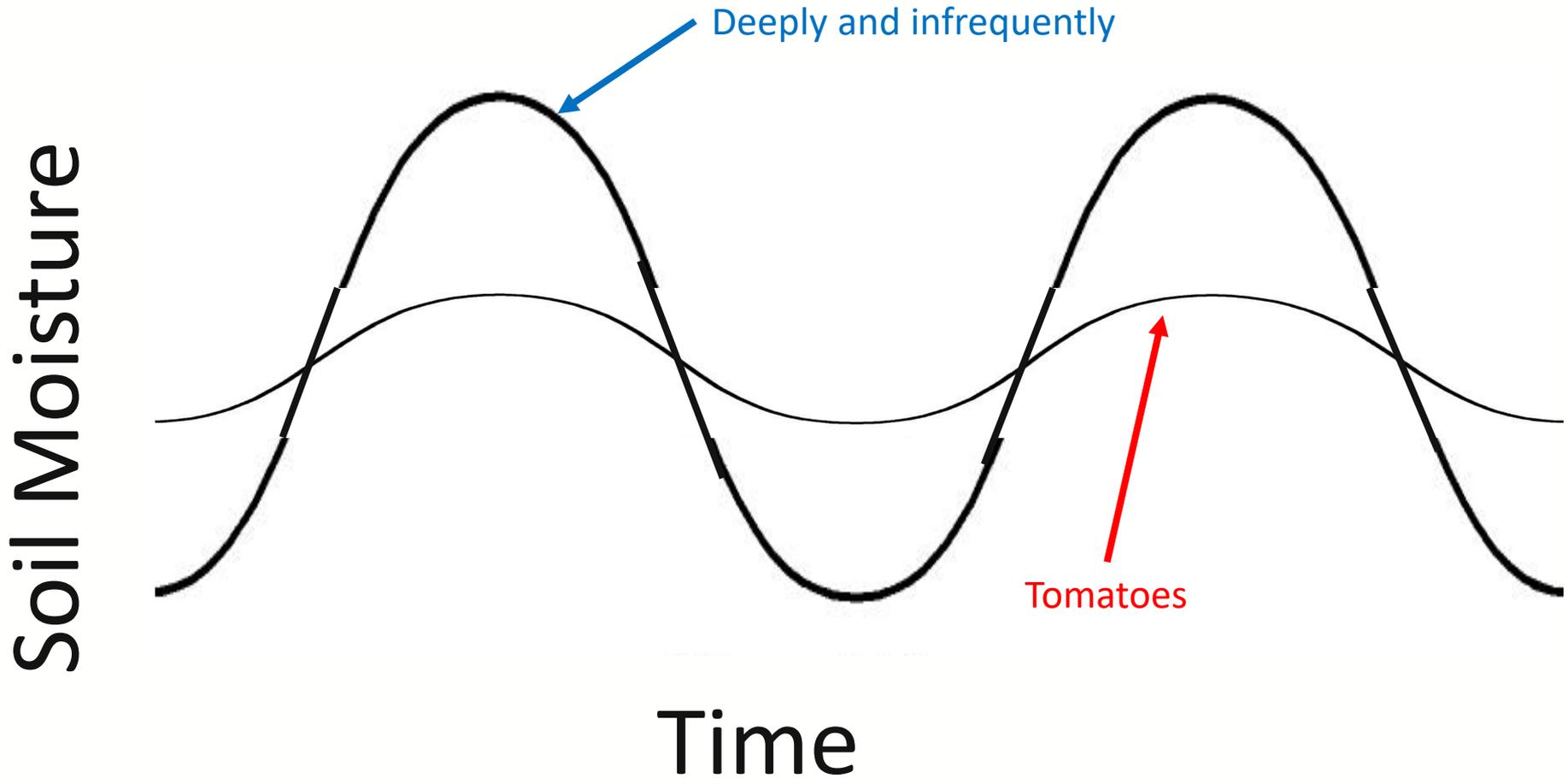


**Nutrient deficiency: Calcium**  
**Irregular watering**



**Blossom end rot  
in pepper**

# Water management



# Effect of emitter spacing

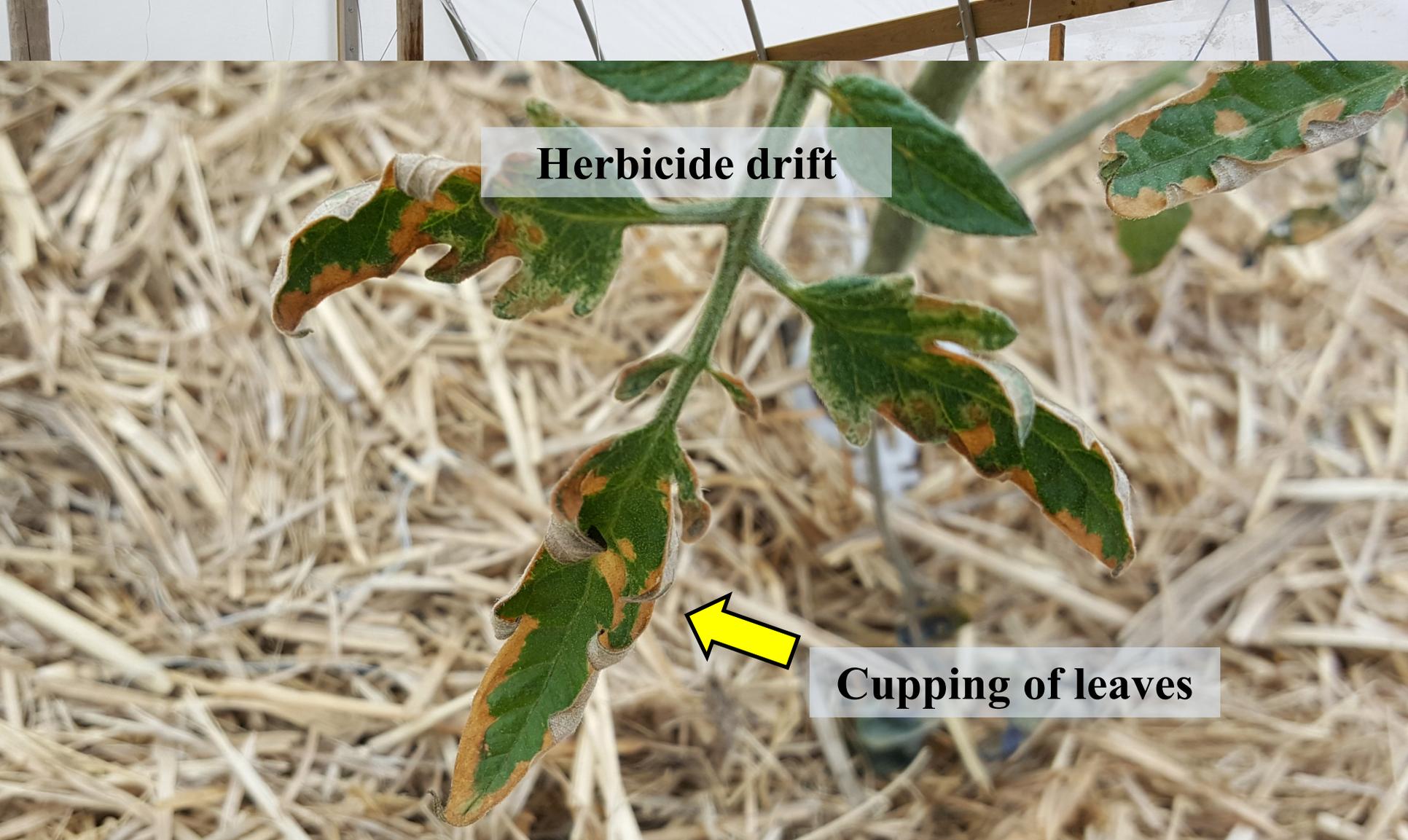
12" emitter  
spacing

8" emitter  
spacing



## Herbicide damage could look like disease but..

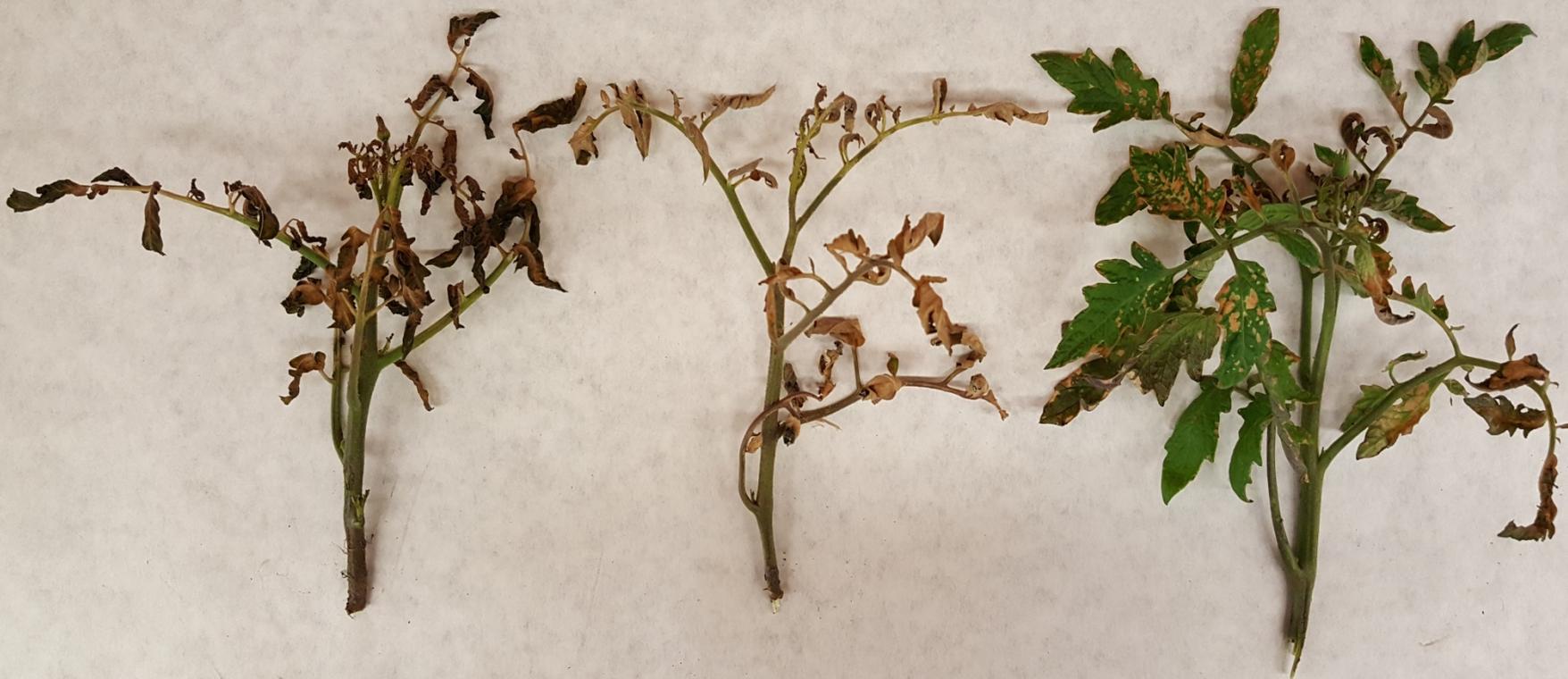
Clues to chemical injury include uniformly distributed symptoms that appear suddenly in the entire field or within areas in the field and absence of plant pathogen signs (e.g. fungal mycelium, fruiting structures, or spores; or bacterial ooze)



**Herbicide drift**

**Cupping of leaves**

## Paraquat damage



# 2,4-D damage on tomatoes



**Tomato leaves cupping**

# Response could be cultivar specific

Scarlet Red

Jet Star





**This is not herbicide drift. This is physiological leaf rolling**

# Physiological leaf roll

Indeterminate cultivars of tomato are reported to be more sensitive to this disorder than determinate cultivars.

My recommendation would be to:

1. reduce stress on plants as much possible, 2. Don't overfertilize and overwater, 3. Avoid severe pruning



**Presumably 2,4-D drift on melons**



**Bleaching at the base of  
leaflets: Glyphosate damage**



**Sulfentrazone damage**

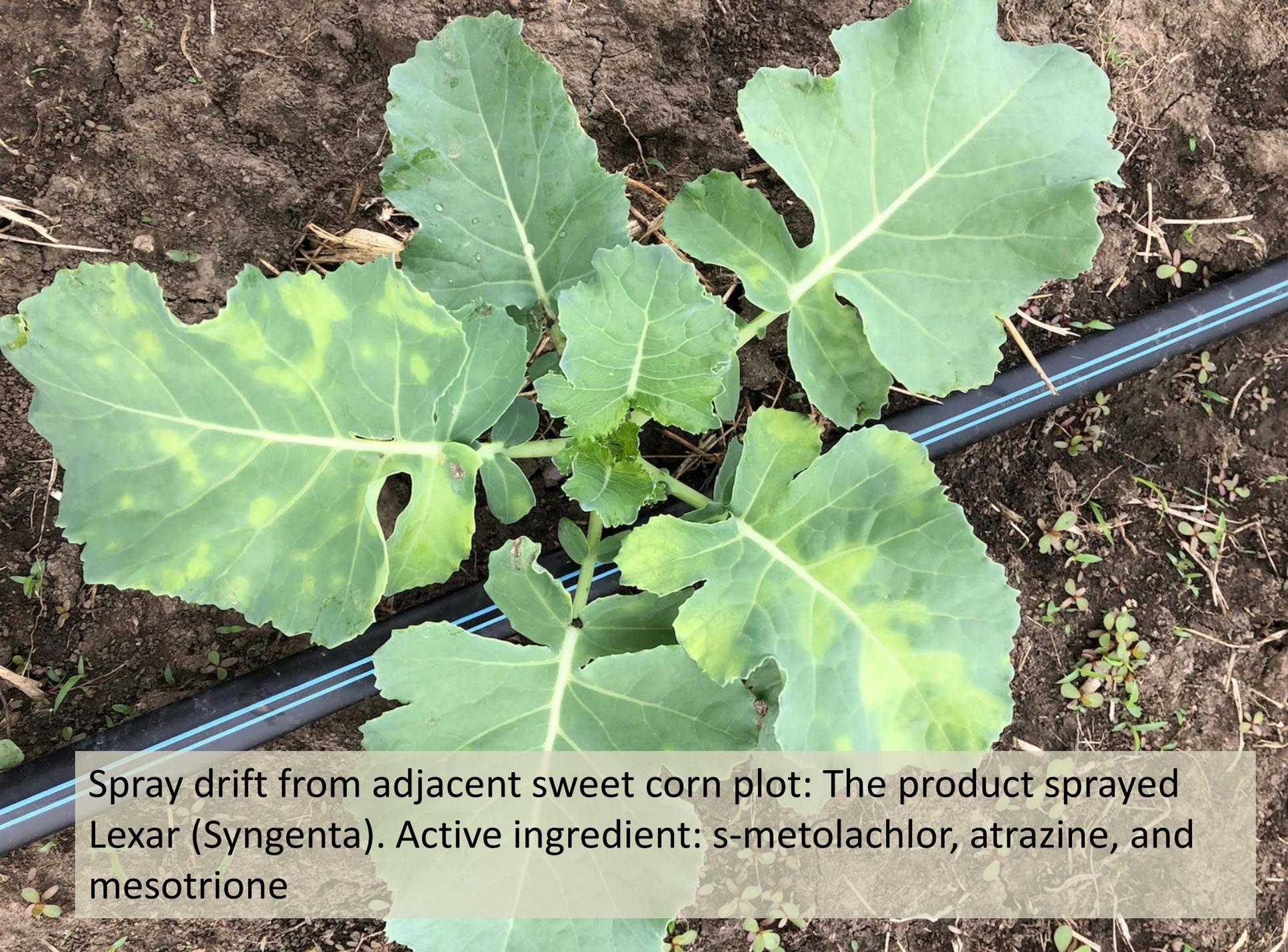




**Prodiamine damage**



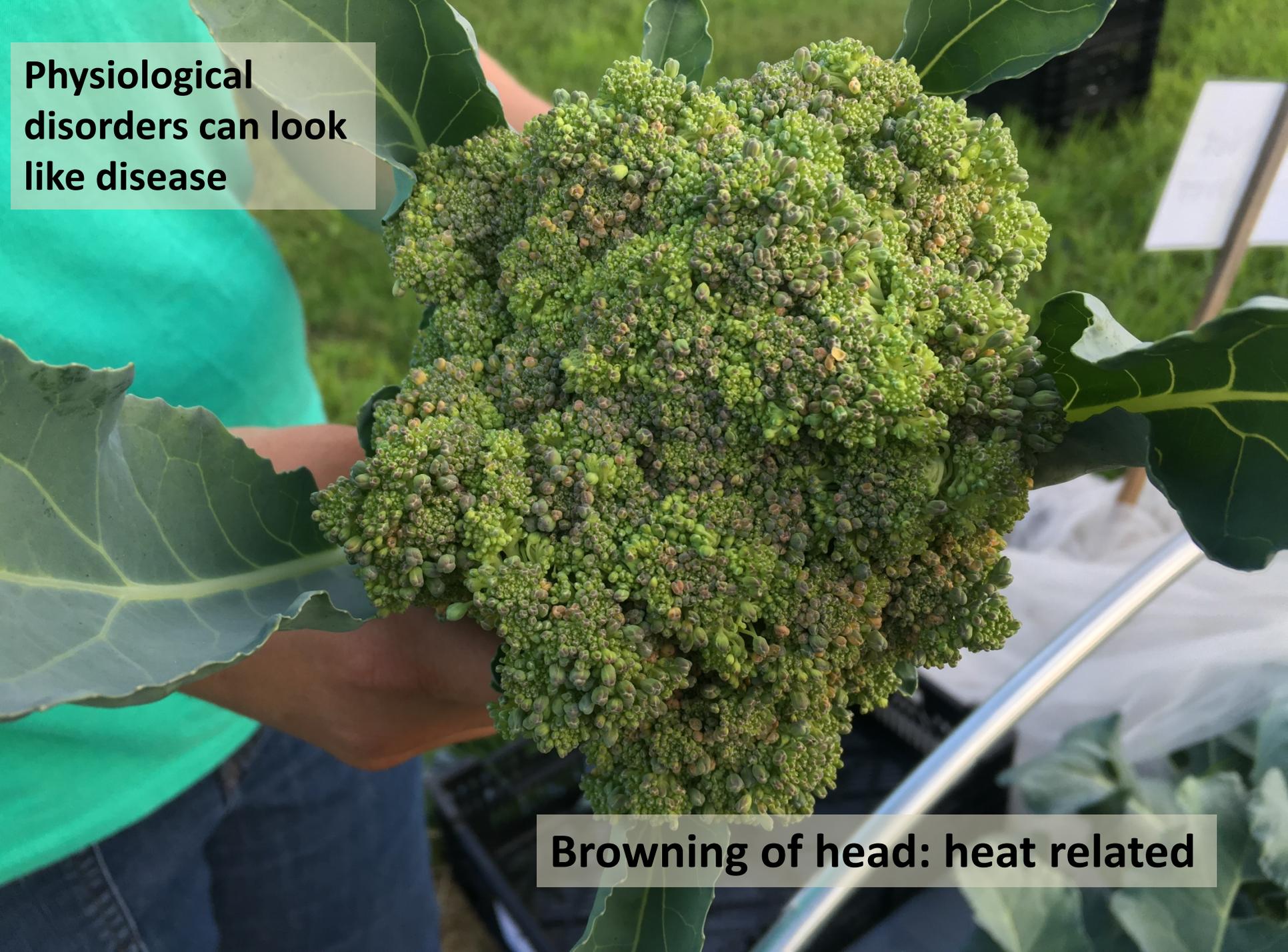
**Dicamba damage**



Spray drift from adjacent sweet corn plot: The product sprayed Lexar (Syngenta). Active ingredient: s-metolachlor, atrazine, and mesotrione

# Clomazone injury (Command® herbicide)



A close-up photograph of a person's hands holding a head of broccoli. The person is wearing a bright green t-shirt. The broccoli head is densely packed with small florets, many of which show small, brown, necrotic spots, particularly towards the base and in the crevices. The background is slightly blurred, showing other green plants and a white sign on a wooden post. The lighting is bright, suggesting an outdoor setting.

**Physiological disorders can look like disease**

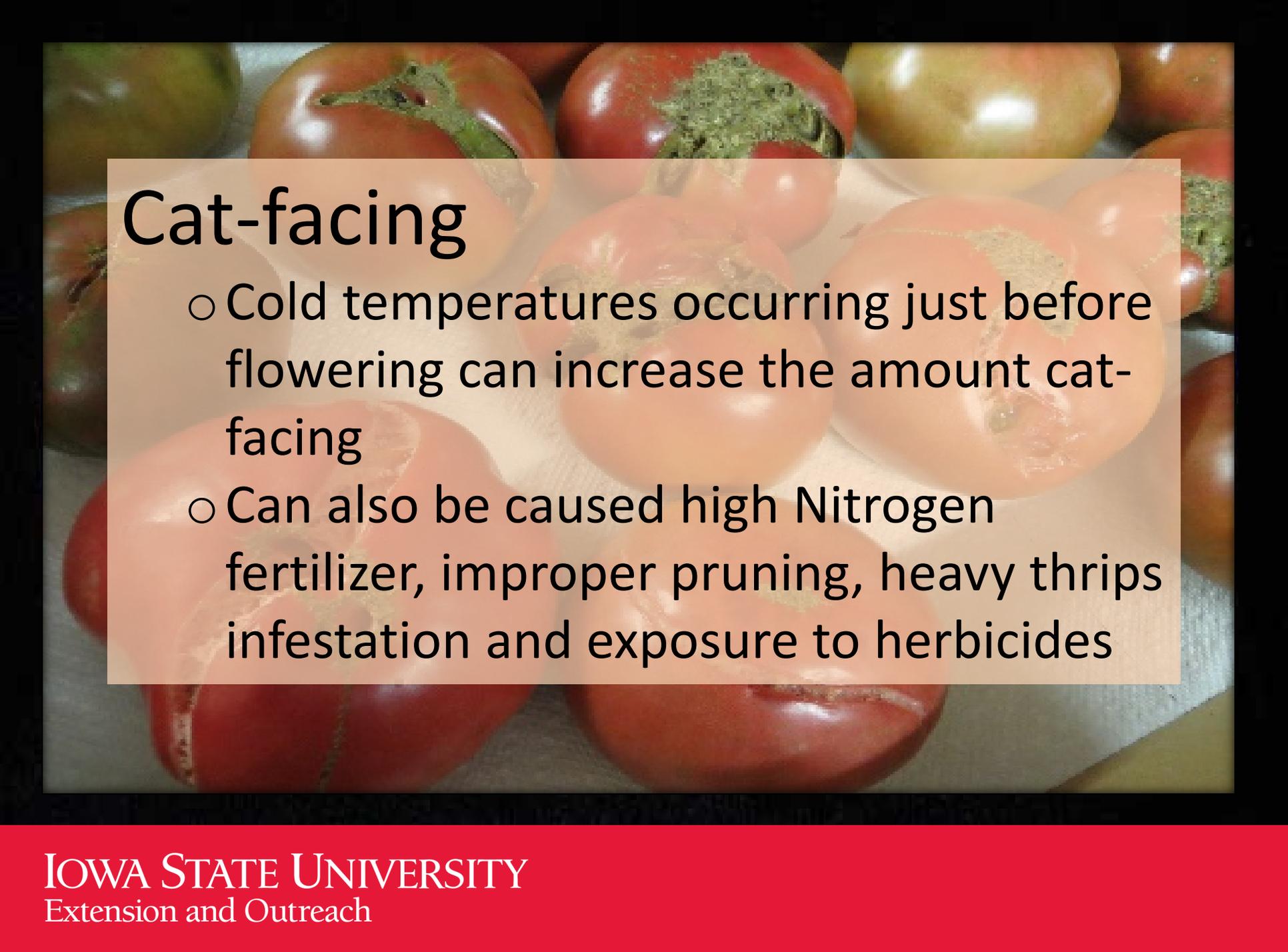
**Browning of head: heat related**

# Tomato transplants in the high tunnel: Sudden death





**Heat stress on tomato inside high tunnels: sides fail to open; 140°F; kill**



# Cat-facing

- Cold temperatures occurring just before flowering can increase the amount cat-facing
- Can also be caused high Nitrogen fertilizer, improper pruning, heavy thrips infestation and exposure to herbicides



## Viruses:

- After ripening, yellow rings or blotches may show,
- Discoloration is only on the surface and center of fruit will ripen normally
- Thrips usually transfer viruses

# Take home message

- Proper identification is the key
- Do some investigative work
- Weather data: [mesonet.agron.iastate.edu](http://mesonet.agron.iastate.edu)
- Pictures of individual plants and the entire field
- Communicate with neighbors

**Ajay Nair**

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**[www.extension.iastate.edu/vegetablelab](http://www.extension.iastate.edu/vegetablelab)**



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**SUSTAINABLE  
VEGETABLE  
PRODUCTION**

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**Here we go !**