Becoming a better tomato detective!

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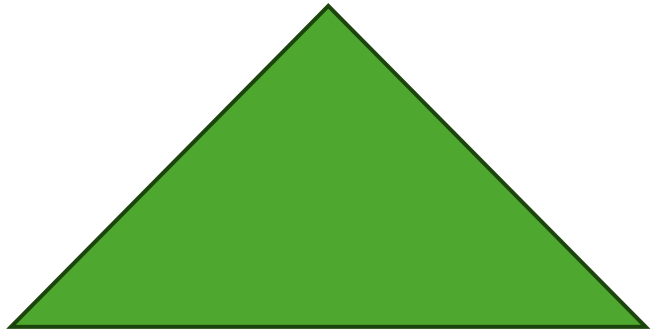
“What’s wrong with my tomatoes?”

Start by:

Looking for patterns



Asking the right questions

Getting information from a reliable source

Identifying the suspects

Think about the plant, as a living creature in a habitat–What does it need?

- Water
- Nutrients, pH
- Preferred temperature range
- Sunlight
- Consistency (e.g. no abrupt environmental changes)

What can hurt it?

- Animals (vertebrate & invertebrate)
- Fungi/ oomycetes
- Bacteria
- Viruses (& vectors!), phytoplasmas
- Herbicides/chemicals


Photo by Maggie Mason

Looking for patterns/ asking questions

- *What* happened? (signs and symptoms)
- *Where* is the issue located (e.g. older or younger leaves? Leaf margins? Is there damage on the petiole or fruit? Is the whole plant affected?) Where in the garden? Landscape?
- *When* did it happen? (e.g. suddenly or gradually? Associated with any weather event? Young or mature plants?)
- *Who* did it happen to? (Different species? All the plant of one species? Random plants? Just one plant?)

What happened?

- **Symptoms:** the way the plant looks—e.g. yellow leaves, necrotic (dead) spots, fruit rot, etc
- **Signs:** Evidence of who might have done it– e.g. fungal mycelium, presence of insects or frass, bacterial streaming, etc.

Where in the garden? On the plant? On the leaves/fruit?

On the plant

- Consistently worse on older / newer growth– consider nutritional issues!
- Tomato viral diseases usually show first on new growth
- Soil-borne fungal diseases often (not always!) on older growth
- Affecting the whole plant about the same

On the leaves/fruit/etc

- Damage mostly on the margins—often abiotic!
- Vein-limited– often bacterial
- On the roots/crown– often fungal

In the garden

- Associated with any particular environment?

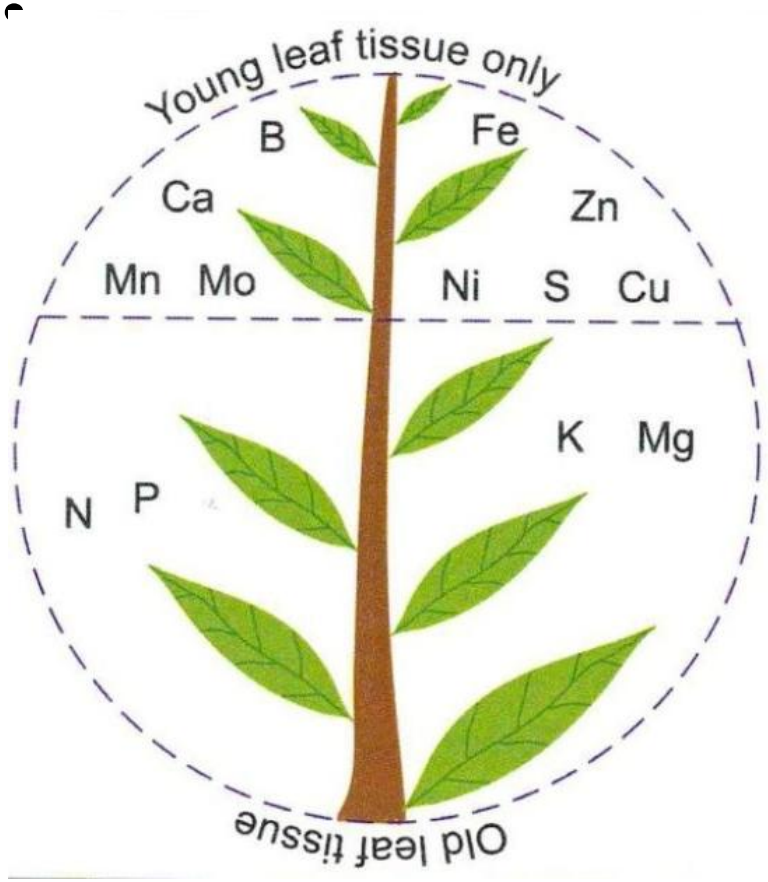


Image from IPNI

When did it happen?

- **Suddenly vs gradually**
  - Nutritional issues, some diseases usually progress slowly
  - Feeding damage, herbicides, some diseases tend to be rapid
  - Sudden problem = sudden change (sometimes!)

- **What's the weather?**
  - Cold, heat, sunlight (especially sudden changes) can cause damage
  - Many diseases have preferred environmental conditions—*this is why it's good to get disease info from local sources!*

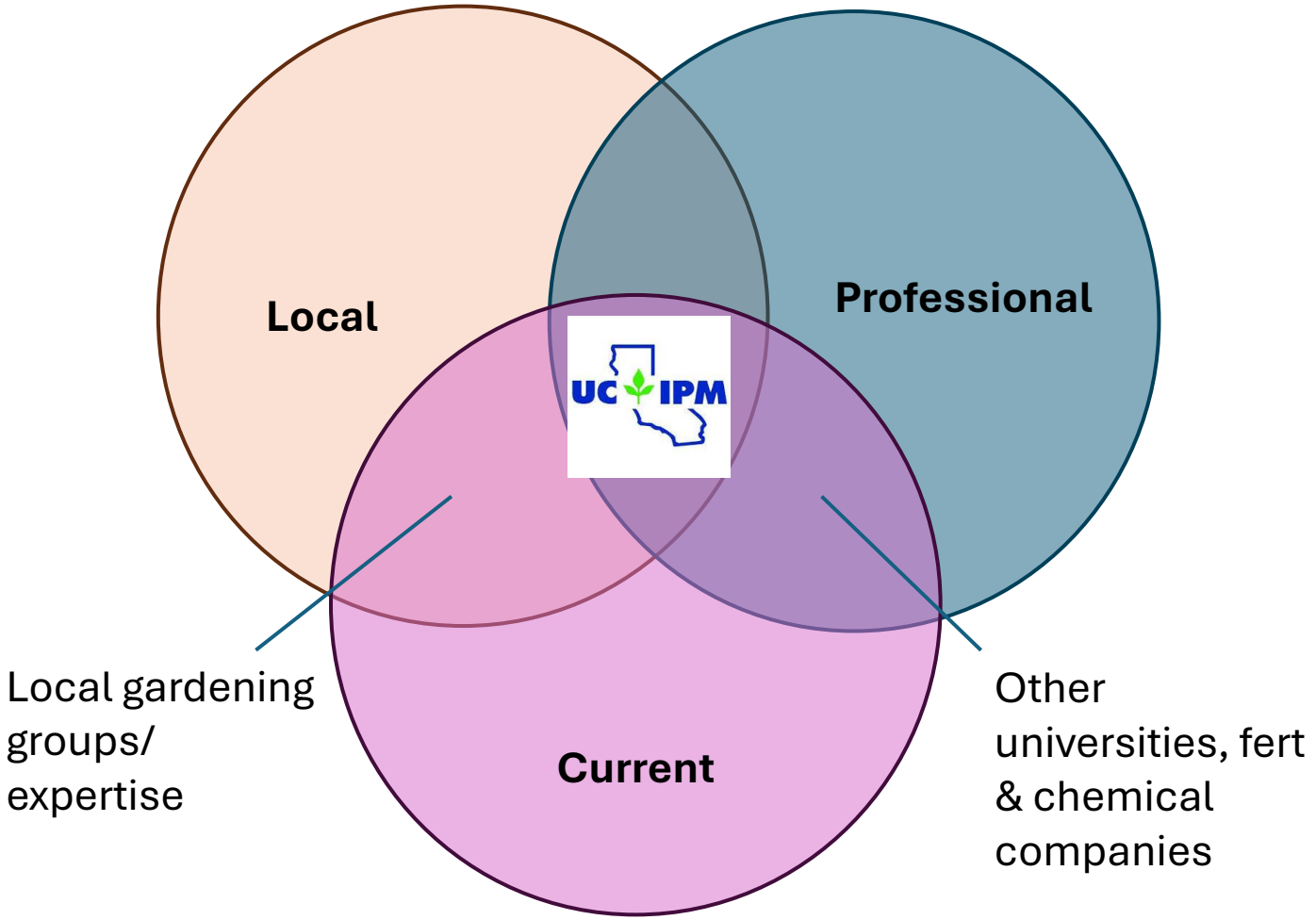
- **Plant growth stage**
  - Many issues associated with a particular stage (e.g. disease, nutritional, insects, environmental)

Who did it happen to?

- **Multiple species? Varieties?**
  - Some issues are specialists, some are generalists
  - If you see a similar issue on multiple type of plant, it can tell you lot
  - Check the weeds!
  - Check the resistance status of different varieties

- **Co-located plants? Random plants across the garden?**
  - Think about how the issue spreads
    - Soil? Water?
    - Insect lifestyle/habitat
- **Every plant? Every plant in a particular area? Plants associated with some kind of stress?**

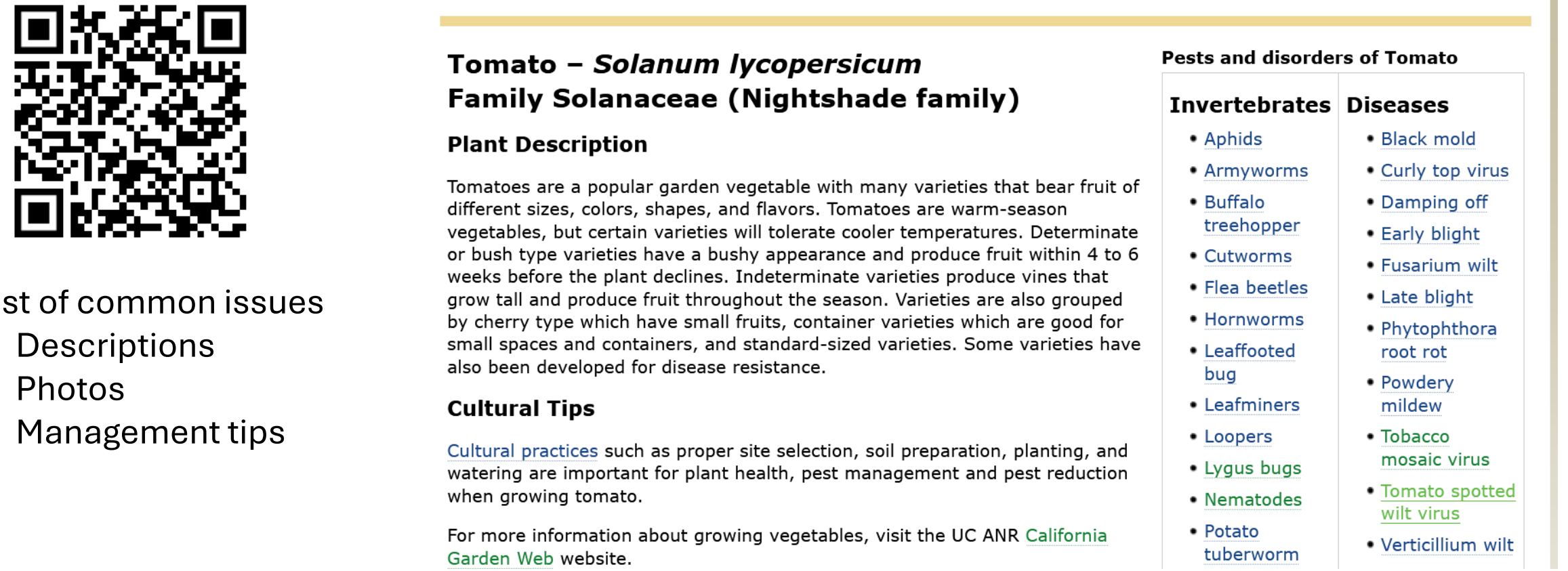
Info from reliable sources



UC IPM: For gardeners

List of common issues

- Descriptions
- Photos
- Management tips



UC IPM Home >Homes, Gardens, Landscapes, and Turf >

How to Manage Pests

Pests in Gardens and Landscapes

Tomato – *Solanum lycopersicum*
Family Solanaceae (Nightshade family)

Plant Description

Tomatoes are a popular garden vegetable with many varieties that bear fruit of different sizes, colors, shapes, and flavors. Tomatoes are warm-season vegetables, but certain varieties will tolerate cooler temperatures. Determinate or bush type varieties have a bushy appearance and produce fruit within 4 to 6 weeks before the plant declines. Indeterminate varieties produce vines that grow tall and produce fruit throughout the season. Varieties are also grouped by cherry type which have small fruits, container varieties which are good for small spaces and containers, and standard-sized varieties. Some varieties have also been developed for disease resistance.

Cultural Tips

Cultural practices such as proper site selection, soil preparation, planting, and watering are important for plant health, pest management and pest reduction when growing tomato.

For more information about growing vegetables, visit the UC ANR California Garden Web website.

Pests and disorders of Tomato

Invertebrates

- Aphids
- Armyworms
- Buffalo treehopper
- Cutworms
- Flea beetles
- Hornworms
- Leaffooted bug
- Leafminers
- Loopers
- Lygus bugs
- Nematodes
- Potato tuberworm

Diseases

- Black mold
- Curly top virus
- Damping off
- Early blight
- Fusarium wilt
- Late blight
- Phytophthora root rot
- Powdery mildew
- Tobacco mosaic virus
- Tomato spotted wilt virus
- Verticillium wilt

https://ipm.ucanr.edu/home-and-landscape/tomato/index.html

Tomato spotted wilt virus

Infected plants exhibit bronzing of the upper sides of young leaves, which later develop distinct, necrotic spots. Leaves may be cupped downward. Some tip dieback may occur. On ripe fruit, chlorotic spots and blotches appear, often with concentric rings. Green fruit show slightly raised areas with faint, concentric zones.

Solutions

The tomato spotted wilt virus is transmitted by thrips. Control thrips with applications of insecticidal soap. Removing and destroying infected plants can help control the spread of virus.

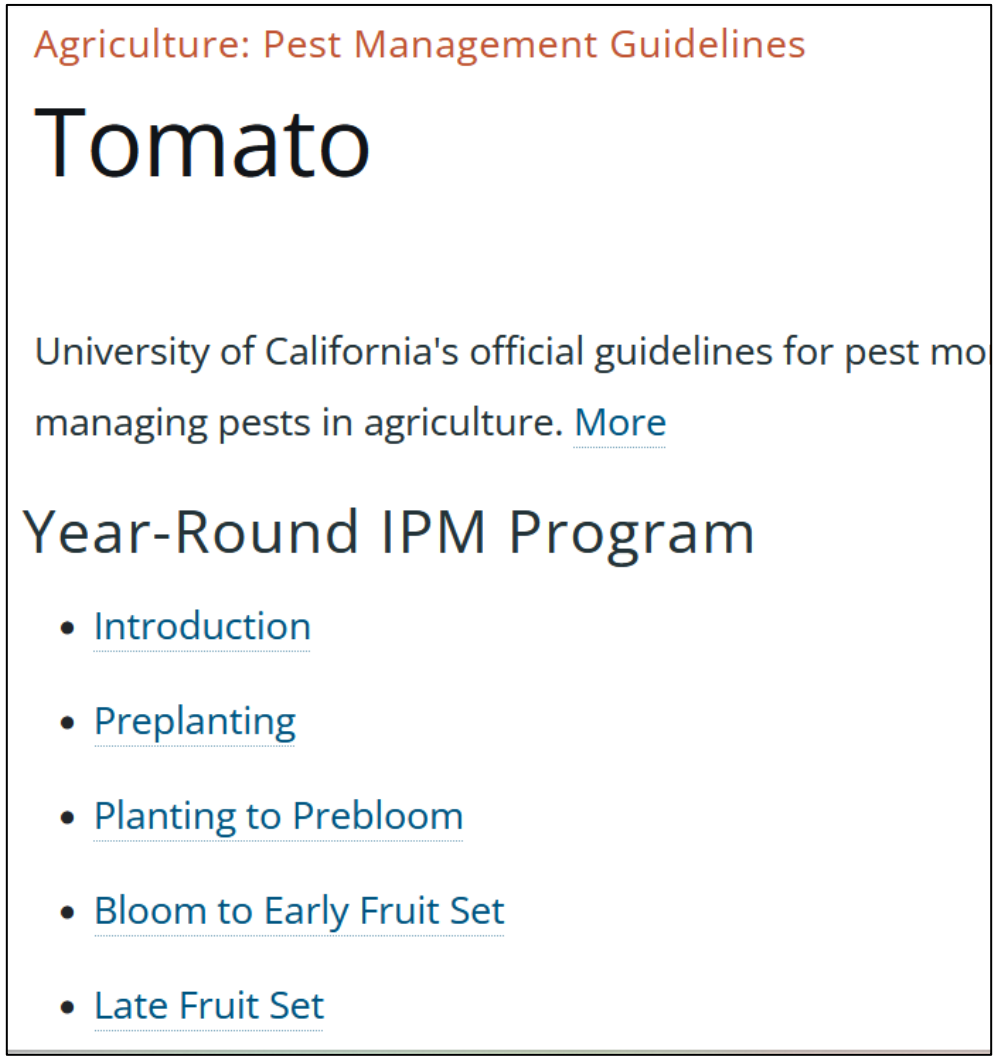
Tomato spotted wilt symptoms on fruit

Tomato spotted wilt symptoms on leaves

UC IPM: for agriculture

For agriculture:

- Lists potential issues by growth stage
- Includes additional photos, information
- Management advice geared more towards agriculture



https://ipm.ucanr.edu/agriculture/tomato/#gsc.tab=0

On This Page

Symptoms and Signs

Comments on the Disease

Management

Important Links

Symptoms and Signs

Plants infected with *Tomato spotted wilt virus* exhibit bronzing of the upper sides of young leaves, which later develop distinct, necrotic spots. Leaves may be cupped downward. Some tip dieback may occur. On ripe fruit chlorotic spots and blotches appear, often with concentric rings. Green fruit show slightly raised areas with faint, concentric zones.

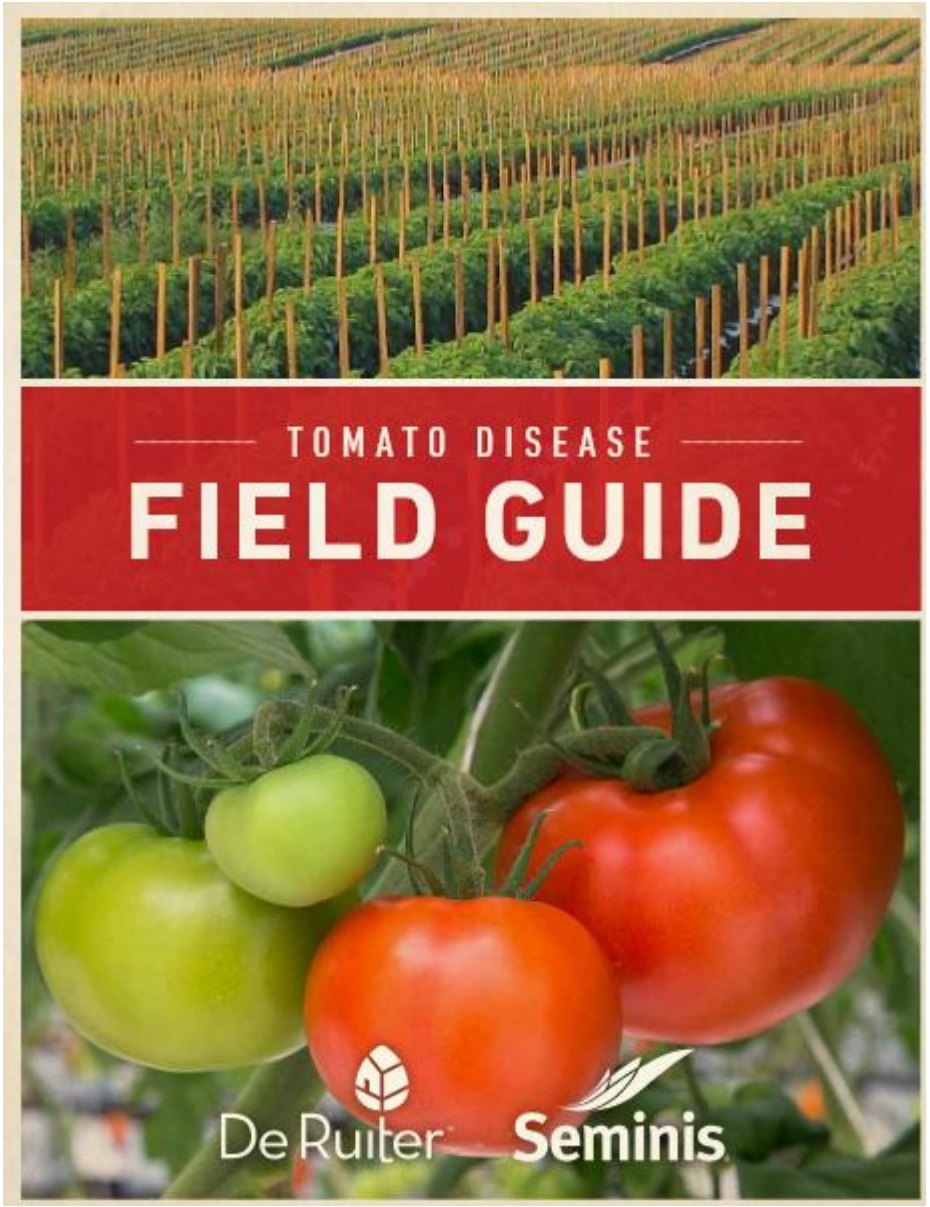
Comments on the Disease

Tomato spotted wilt virus is transmitted by various species of thrips, including the western flower thrips, *Frankliniella occidentalis,* the onion thrips, *Thrips tabaci,* and the chili thrips, *Scirtothrips dorsalis. Tomato spotted wilt virus* also infects the thrips vector. Nymphs that acquire the virus by feeding on infected plants will retain the ability to transmit it for the remainder of their lives. *Tomato spotted wilt virus* cannot be passed from infected females through the eggs.

The virus has an extremely wide host range, including many weeds and ornamentals as well as crop

Seminis disease guides: free, good pictures (not local)

Google “seminis vegetable disease pdf” – they have ones for many other vegetables too



VIRAL

TOSPOVIRUS DISEASES

GBNV: necrotic ringspots on leaflets and petioles. (Courtesy of Rakesh Kumar, Indian Agricultural Research Institute)

CAUSAL AGENTS

		DISTRIBUTION
Capsicum chlorosis virus	CaCV	Asia, Australia
Groundnut bud necrosis virus (synonym = *Peanut bud necrosis virus*)	GBNV (PBNV)	Asia
Groundnut ringspot virus	GRSV	Asia, USA (Florida)
Impatiens necrotic spot virus	INSV	Worldwide
Tomato chlorotic spot virus	ToCSV	Asia, USA (Florida)
Tomato necrotic ringspot virus	TNRV	Asia
Tomato spotted wilt virus	TSWV	Worldwide

VECTORS

Frankliniella occidentalis (western flower thrips)

Thrips tabaci (onion thrips)

Several additional thrips species

SYMPTOMS

Symptoms tend to be more severe on plants infected when young. Symptom expression can also vary with variety. Plants infected when young may exhibit stunting and inward cupping of leaves that develop a bronze cast followed by dark spots. Other characteristic tospovirus symptoms include mottling, chlorotic and necrotic leaf spots, which often lead to chlorosis and necrosis of entire leaves. Concentric ring spots are also a characteristic tospovirus symptom. Tospovirus symptoms can manifest as necrosis of growing tips, leading to bud necrosis. On fruit, symptoms can manifest as concentric rings that become necrotic.

CONDITIONS FOR DISEASE DEVELOPMENT

TSWV has a wide host range, whereas the host range of most other tospovirus species is more limited. Tospoviruses are transmitted in a persistent manner by several thrips species. Larvae acquire the virus after short feeding periods, and adult thrips transmit these viruses for the duration of their lives. The presence of infected weeds or mature plants in adjacent fields can pose a threat to newly planted crops. Temperatures above 22°C accelerate the hatching of eggs, resulting in explosive spread of these vectors and viruses. Tospoviruses are not seed-transmitted.

Other good resources

- Nutrient deficiency photos: https://www.yara.us/crop-nutrition/tomato/nutrient-deficiencies/potassium-deficiency-tomato/
- California fertilizer guidelines (NPK) https://www.cdfa.ca.gov/is/ffldrs/frep/FertilizationGuidelines/Tomato.html
- UC IPM herbicide injury symptoms: https://herbicide-symptoms.ipm.ucanr.edu/#gsc.tab=0

Herbicide Symptoms Tool

tomato ×

Filters

- squash
- strawberry
- sunflower
- sweet potato
- tomato
- toyon
- tulip
- verbena

Select Plants

Results (44)

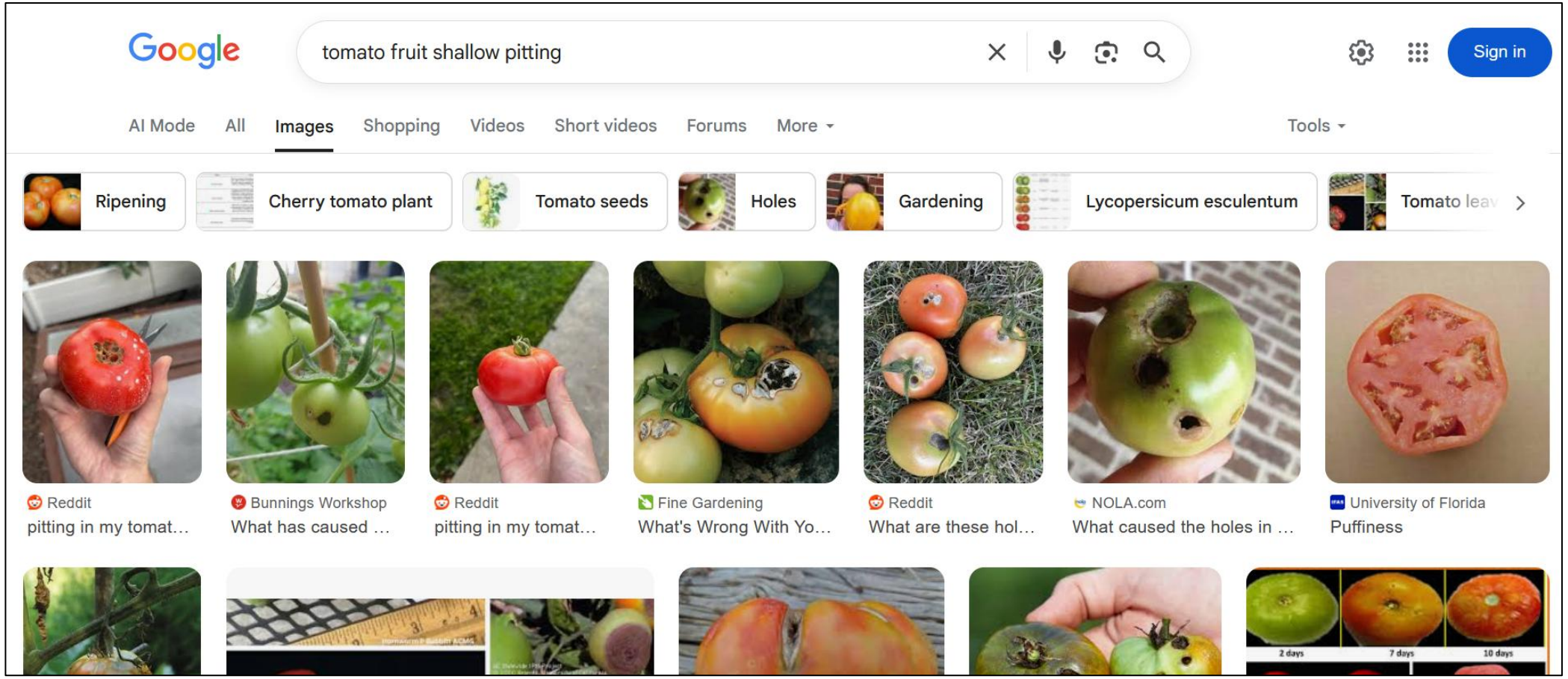
Plant: tomato
MoA: inhibition of epsp synthase
Chemistry: glycine
Herbicide: glyphosate
Symptoms: chlorosis, leaf distortion, stunting

Plant: tomato
MoA: inhibition of epsp synthase
Chemistry: glycine
Herbicide: glyphosate
Symptoms: chlorosis, interveinal chlorosis, leaf crinkling, stunting

Plant: tomato
MoA: inhibition of epsp synthase
Chemistry: glycine
Herbicide: glyphosate
Symptoms: bleaching, chlorosis, leaf crinkling, leaf distortion, necrosis, stunting

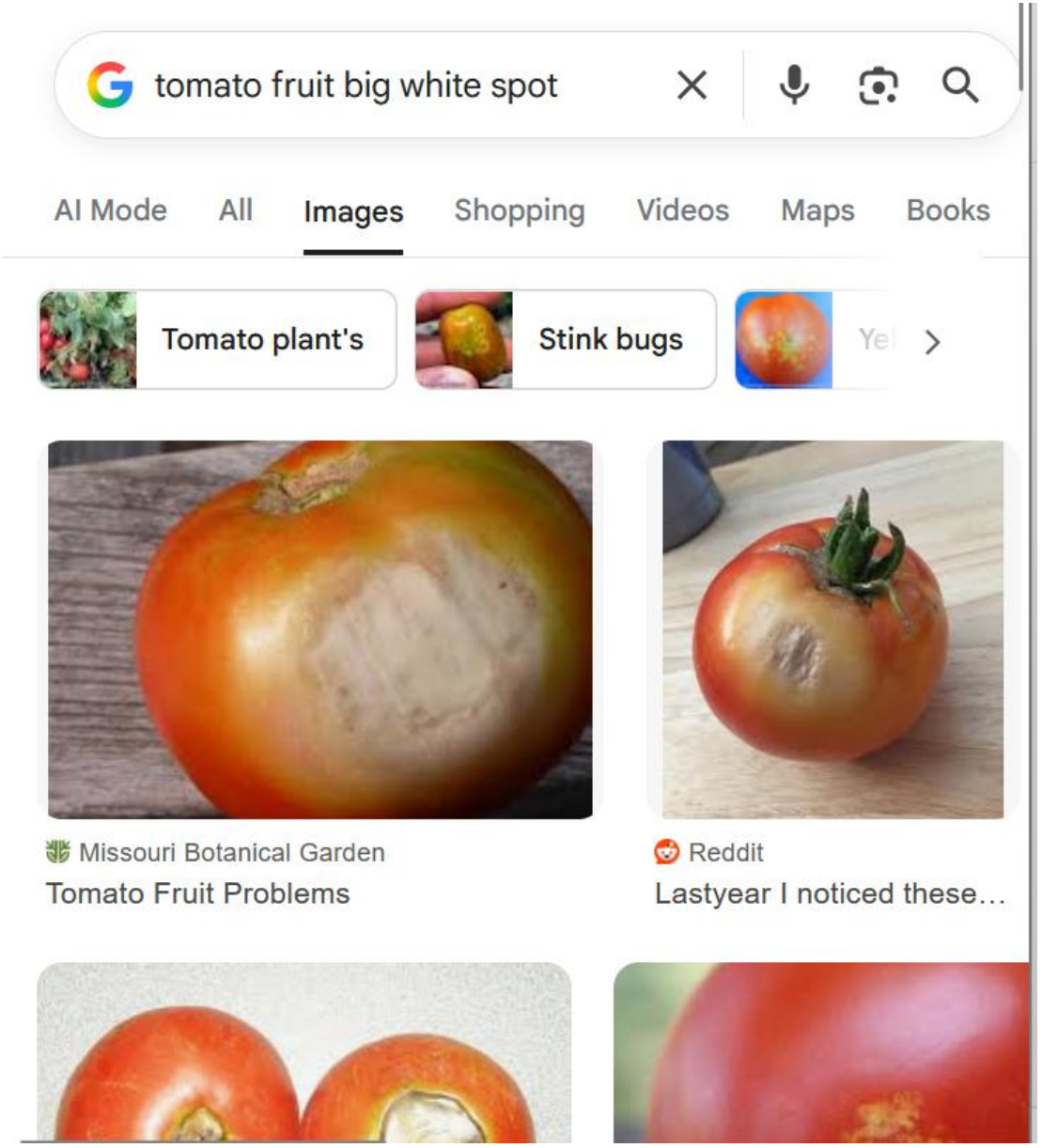
Google image search

A good place to start, but be careful!



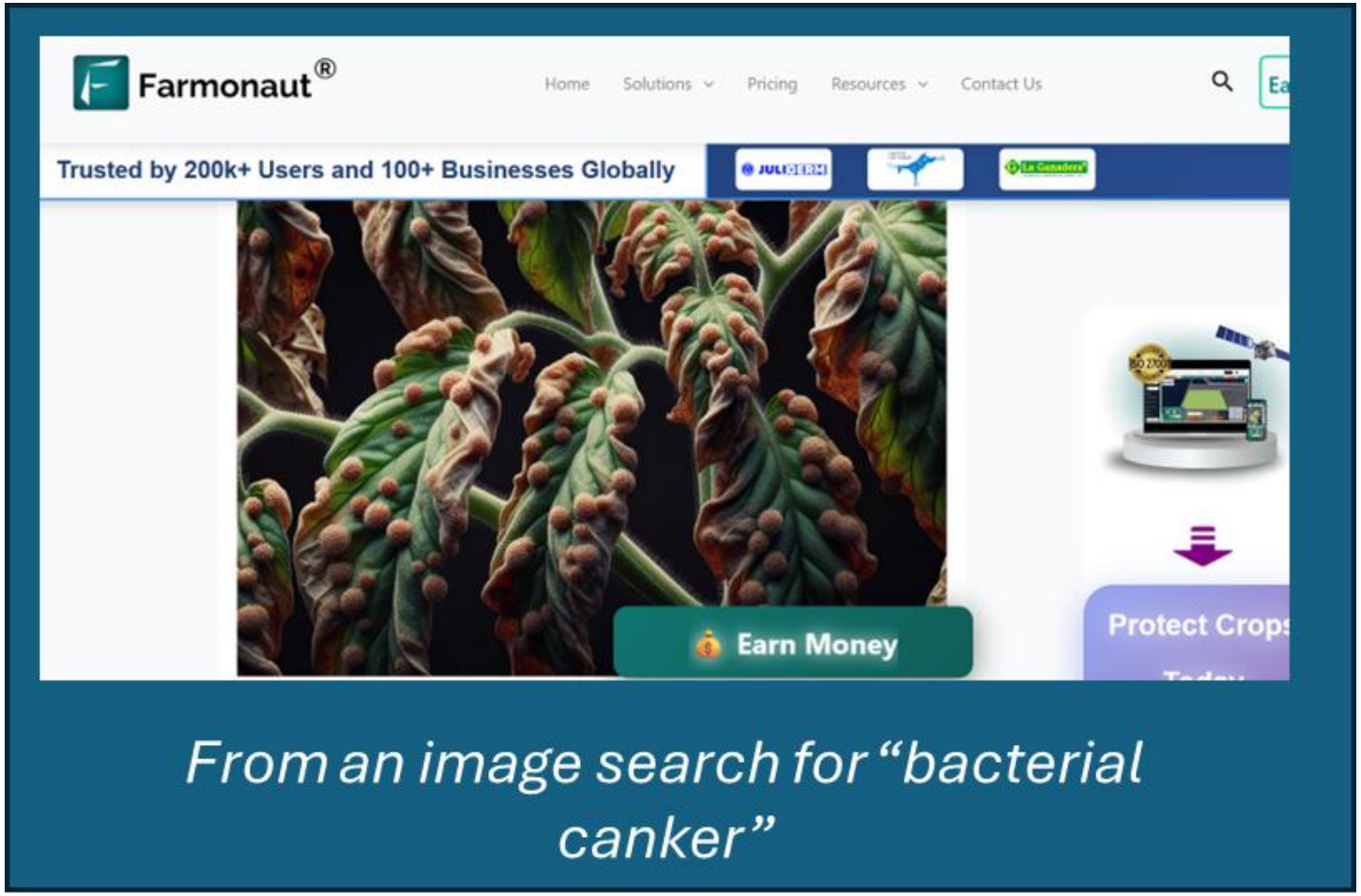
Safe & effective googling!

1. Image search specific symptoms
2. Click on a photo that matches, visit the site
   - Look at the source!
     - Is it from a university? Is it a verified diagnosis?
     - Does the location have similar environmental conditions?
   - Check UC IPM
     - Is the issue common in California?
     - Does it make sense with your conditions?



Ways to do it wrong

1. Search vague symptoms
2. Don’t read the source article
3. Don’t look for details around location/ environment
4. Don’t verify with a professional, local source



Ways to do it wrong

This site is an AI aggregator. Difficult to verify where it's getting info from

AI Mode | All | Images | Videos | Short videos | More | Sign in

Vague search

tomato leaves brown spots

Why do my tomato leaves have brown spots?

Brown spots on tomato leaves can be caused by various factors, including fungal

15 sites

Understanding Brown Spots on Your Spoon Tomato Leaves 🍅 - Greg

Nov 25, 2024 — Understanding Brown Spots on Your Spoon Tomato Leaves 🍅 * 🌱 Brown spots on...

Greg App

Brown Spots on Tomato Leaves? Leaves Turning Yellow? It ...

Early blight is a common problem for tomato plants and other plants in th...

YouTube · Growing The Home Gard...

Black Spots on Tomato Leaves: Treating Septoria Leaf Spot

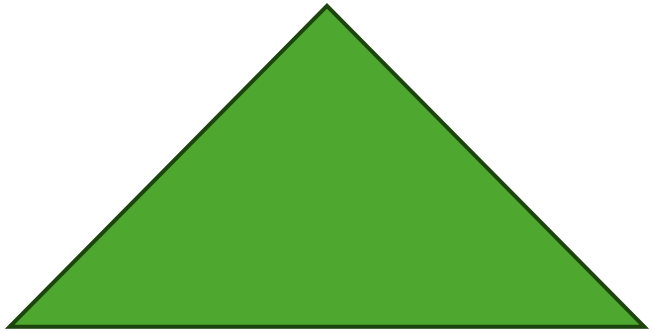
Aug 2, 2024 — She's also an author of three gardening books, a plant...

Summary does not give geographic info, or sources its getting the information from

AI does not seem to be good at giving geographical/ environmental context

Putting it all together!

Looking for patterns



Asking the right questions

Getting information from a reliable source

Case study: Yolo County farm call

- **WHAT:**
  - Leaf curling, browning
  - Necrotic margins, burned tips
  - Tomato plants aren’t stunted, fruit look pretty good

WHERE:

- Field is in a settling basin for Cache creek
- Whole field has a brownish look
- Necrosis worse on older leaves
- Necrosis starts from the margins

Case study: Yolo County farm call

WHEN:

- Grower says it developed gradually, became most noticeable when the plants started growing quickly

- **WHO?**
  - Every plant in the field was symptomatic
  - Similar symptoms (to a different degree) on nearby peppers, melons, some weeds

Case study: Yolo County farm call

- **VERY LIKELY CHEMICAL OR NUTRITIONAL!**
  - Took leaf, water, soil samples
  - Looked up “fertilization” in the UC IPM tomato guideline; found this table

Commonly used laboratory procedures for soil analysis and interpretation of results

	Element and soil test procedure				
Soil test interpretation	**Phosphorus**[1] (Olsen, bicarbonate extraction)	**Potassium** (ammonium acetate extraction)	**Zinc** (DPTA extraction)	**Soluble salts; EC** (saturated paste)	**Boron** (saturated paste)
Low	< 15 ppm	< 130 ppm	< 0.5 ppm	< 2 dS/m	< 1 ppm
Medium	15-25 ppm	130-250 ppm	0.5-1.0 ppm	2-4 dS/m	1-5 ppm
High	> 25 ppm	> 250 ppm	> 1.0 ppm	> 4 dS/m	> 5 ppm

Key: < = less than; > = greater than; dS/m = mmho/cm; ppm = parts per million; EC = electrical conductivity

Field EC=5.86 dS/m

Field Boron =3.9 ppm

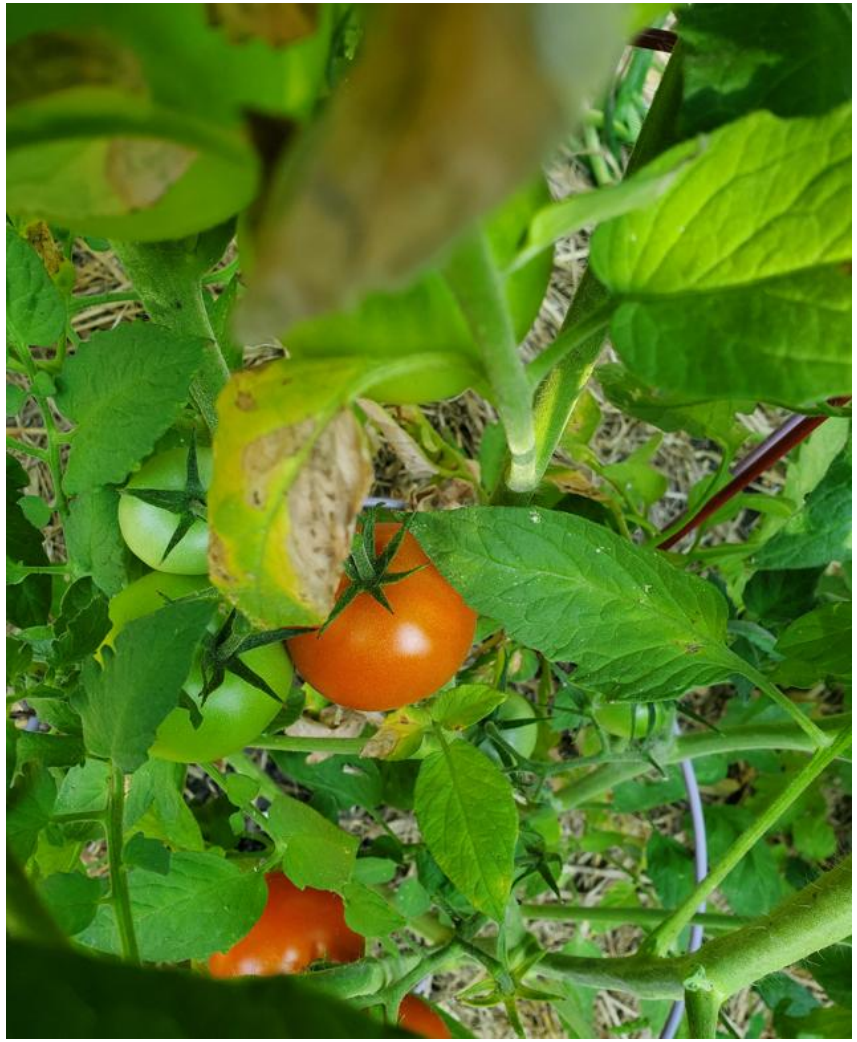
- **Leaf and water samples both had pretty high boron too– but was it too high?**
  - Symptoms (marginal necrosis, leaf cupping) similar to symptoms I found from a reputable source (MSU)
  - Harder to find salt damage symptoms; they can be similar

Figure 4. Severe boron toxicity symptoms observed in tomato plants resulting from an accidental over-application of boron. The tissue sample showed a concentration of 980 ppm, which is significantly higher than the tolerance threshold for tomatoes. Photo by Saltanat Mambetova, MSU Extension.

Conclusion

- Leaf damage likely from boron, but levels may not be really hurting yields
- Salinity may also be limiting
- Area has poor-quality water

- Improving drainage can help both issues!



- What?
- Where?
- When?
- Who?

QUESTIONS?

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