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4 Common problems

Juan C. Cabrera

Field Specialist in Horticulture

Email: jcabrera-garcia@missouri.edu

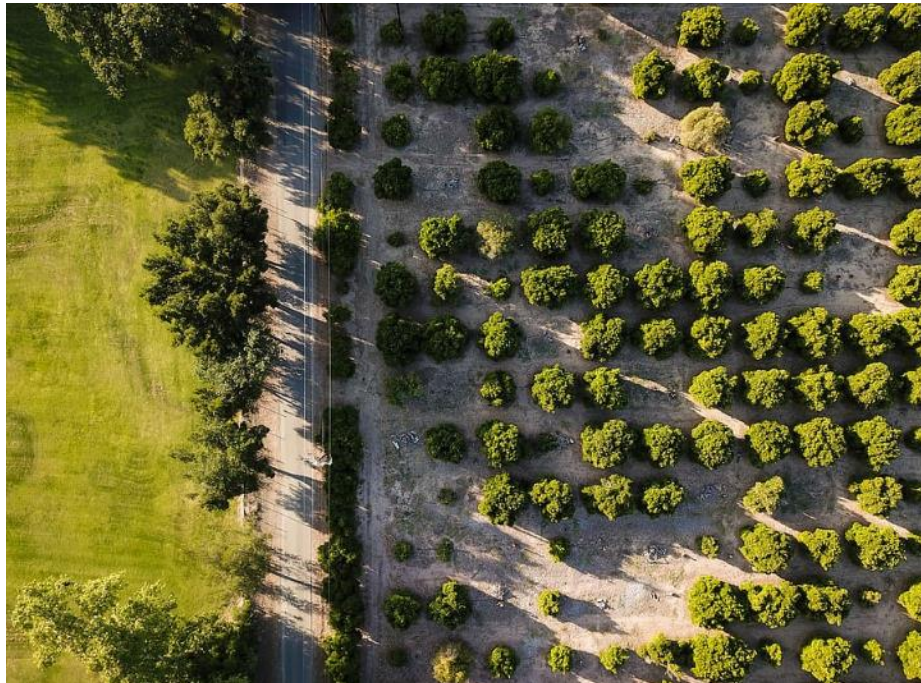
Phone: (573)-686-8064

Topics

1. Environmental problems
2. Plant diseases
3. Insect pests
4. Algae
5. Organic production

Abiotic vs biotic

- Biotic problems: caused by a living organism (develops over time with sporadic occurrence)
- Abiotic problems: caused by the environment (instant and general occurrence)



Abiotic vs biotic

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What is wrong with these lettuce plants?

BOTH CAUSED BY HIGH TEMPERATURE!



Temperature

- Lettuce: root 75°F; air → Day 68°F-75°F (never over 77°F) → Night 60°F-65°F
- Tomatoes 77°F
- Spinach: root 72°F; air 61°F - 91°F



Temperature and diseases

20-30% of losses happen during summer



Dissolved oxygen in nutrient solution

- O₂: Root growth and nutrient uptake depend on respiration.
- Low O₂: stunts growth, increases production of ethylene (stress).
- Optimum level no less than 6 ppm



Temperature and dissolved oxygen

↑ Temperature = ↓ solubility of oxygen

Temperature-Oxygen Solubility Relationship	
Temperature (°C)	Oxygen Solubility (mg/L)
0	14.6
5	12.8
10	11.3
15	10.2
20	9.2
25	8.6
100	0

Temperature affect plant health directly and indirectly.

Abiotic disorders

- Leggy plants with pale green/yellow foliage and long internodes: Poor lighting or overcrowding.
- Burned tips: high salinity (high EC), excessive fertilizers (improper mixing and preparation)
- Yellow foliage: lack of nutrients

Not a disease!



Blossom end rot

Caused by environmental conditions that limit the absorption of calcium. Even when calcium levels are adequate in the soil!

Calcium enters the roots with water!

Factors that will limit water uptake include days with high relative humidity and inconsistent watering.



Extension

University of Missouri

Not a disease!



How to prevent blossom end rot?

- If growing indoors make sure you have a fan exchanging air around the plants to avoid stagnant humid air.
- Open the greenhouse/high tunnel vents to allow for air exchange and lower air humidity.
- Remember to keep the soil moist but not saturated when watering.
- Avoid prolonged periods of drought, specially when the fruits are growing.



Extension

University of Missouri

Not a disease!



Caused by high temperatures and intense sunlight exposure can affect fruit development and ripening.

Solutions

- Increase airflow to lower air temperature
- Use of shade cloth rated between 20 to 50% shade.
- Shade cloth will lower air temperature between 6 to 9 °F and should be installed when temperatures are going to be over 85°F.



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BIOTIC ISSUES

Caused by living organisms

Insects

Plant pathogens (diseases)

Plant pathogen dispersal

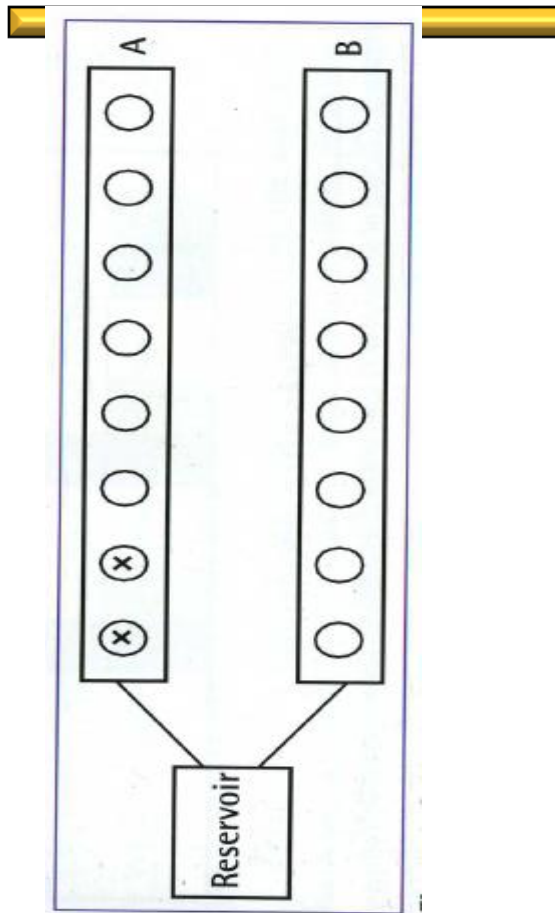


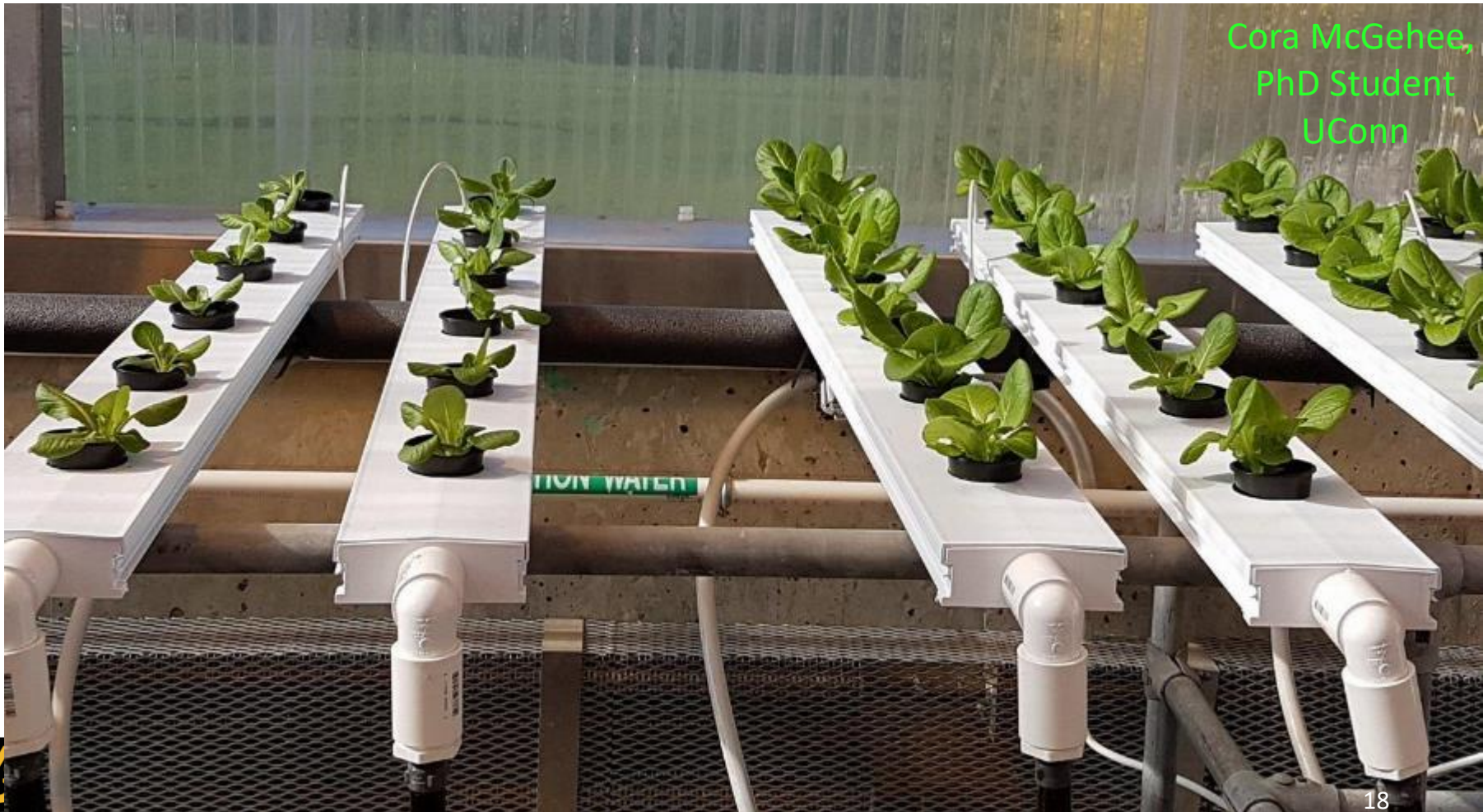
Fig. 4. Mortality of pepper plants on the inoculated and noninoculated side of a two-sided ebb-and-flow cultural system in the (A) absence or (B) presence of a surfactant in the recirculating nutrient solution. X = the inoculated plants that served as the source of secondary inoculum.

Common pathogens in hydroponics

- *Pythium* spp.
- *Phytophthora* spp.
- *Thielaviopsis basicola*
- *Xanthomonas*
- *Sclerotinia*
- *Botrytis*
- Powdery and downy mildew



Biocontrol of waterborne diseases: Still not compatible with hydroponic production



Cora McGehee,
PhD Student
UConn

Get to the Root of the Problem: Diagnosis and Biocontrol of Root Rot in Leafy Greens



Cora McGehee, MSc.
cora.mcgehee@uconn.edu
PhD Student

Webinar Series
December 3, 2019

- <https://youtu.be/ODCVqnjou58>

Diseases

- Damping-off and root rots: Use high quality water or consider treating the water. Use a *Trichoderma* drench as preventive biocontrol.
- Mildews and white mold (*Sclerotinia*): Increase air circulation especially horizontal flow. Increase plant spacing. If growing indoors, consider a dehumidifier.
- Botrytis (gray mold): likes cool and wet weather. Avoid watering at night. Remove affected plants and improve air circulation.
- Leggy plants with yellow foliage: Lack of light, overcrowding or lack of nutrients.

Preventing diseases: Environment

- Keep plants in their comfort zones: pH, dissolved oxygen, temperature, and proper fertility
- Use good quality water
 - Municipal water (\$\$) or well water (\$)
- Consider water treatment if you don't have access to good quality water
 - Solid separation → Filtration → Sanitation
- Use certified disease-free seeds and resistant varieties
- Ensure good air circulation: spacing and pruning



Preventing diseases: Equipment

- Keep the outside perimeter free of weeds
- Avoid reusing potting mixes
- Start with clean surfaces
 - Wash off debris, scrub with soap, and rinse
 - Sanitize (follow label instructions): quaternary ammonium (Green-Shield[®], Physan 20[®], and Triathlon[®]), hydrogen dioxide (ZeroTol[®], Oxidate[®]) and chlorine dioxide (Selectocide[™])
- Keep floors clean

Preventing diseases: Control

- When in doubt contact your Extension Specialist
- Use chemical pesticides as last resort
 - Read the pesticide label: This is a binding contract
 - Do you have a pesticide applicator license?
 - Is it labeled for the crop?
 - Is it labeled for use indoors or in greenhouse?
 - Is it labeled to control the intended pest?
 - Do you have the required protective and application equipment?
- Consider biocontrol options:
<http://greenhouseipm.org/ipm-basics/> <http://anbp.org>

Insect pests

- Use sticky traps to scout for insects
 - At plant height
 - Yellow: fungus gnats, aphids, thrips, whiteflies, and leaf miners
 - Blue: whiteflies
 - One trap per 1,000 square feet
 - Additional traps as needed near vents and doors
 - Always inspect the plants
- Identify the pests and the damage they cause (some transmit plant diseases)
- LIMITED REGISTERED PESTICIDES
- HIGH RISK OF DEVELOPING RESISTANCE
- SHORT CROP CYCLE (PREHARVEST INTERVALS)
- Biocontrol options
- CHEMICAL ROTATION



Monitoring for insect pests

- Use sticky traps to scout for insects
 - At plant height
 - Yellow: fungus gnats, aphids, thrips, whiteflies, and leaf miners
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 - One trap per 1,000 square feet
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 - Always inspect the plants
- Identify the pests and the damage they cause (some transmit plant diseases)
 - Identity will help you identify proper control

Sticky traps



Insect pests

- Indoor/greenhouse: thrips, aphids, whiteflies, fungus gnat, and shoreflies
- Cultural control: resistant varieties, prevention measures, insecticidal soaps, horticultural oils, neem oil.
- Chemical control: Read the label! The label is the law! Rotate products (IRAC code)
- Biological control: predatory insects and beneficial fungi



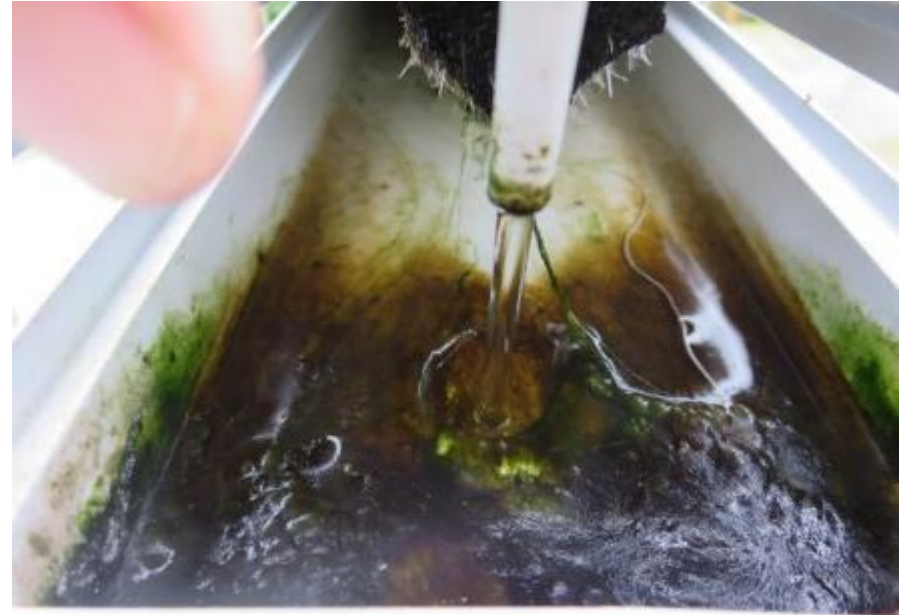
Chemical control

- You need training to get a private pesticide applicator training
- Always rotate pesticides with different FRAC or IRAC codes to prevent resistance development
- Read the label: this is a legal binding contract
 - Intended pest, for the specific crop, and adequate personal protective equipment
 - Ensures the responsible use of chemical pesticides
- Re entry and pre harvest intervals

Tripping hazard
Foul smell
Host insect pests
Toxic to humans
Compete for nutrients



Algae accumulation



Algae in indoor farming facility



Ex

University of Exeter



Algae control



Factors that affect algae growth:

- Nutrients
- Water
- Light

Algicides will
also kill
plants

Sanitation: Lower initial inoculum



Sanitation: Lower initial inoculum



Organic production: Clogging



Organic fertilizer

3-1-1

GUARANTEED ANALYSIS

Total Nitrogen (N)3%

2.55% Water Soluble Nitrogen

0.45% Water Insoluble Nitrogen

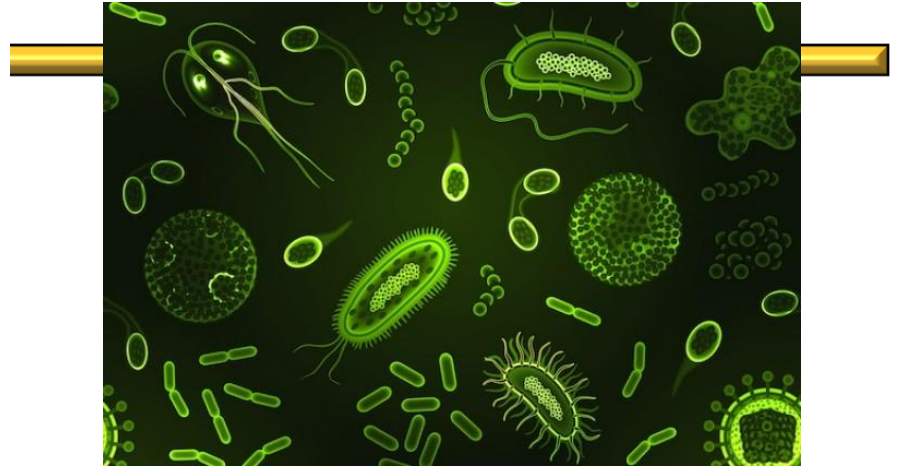
Available Phosphate (P₂O₅).....1%

Soluble Potash (K₂O)1%

Derived From: Fermented Oilseed Extract

10 lbs. per gallon at 68°F

F2358



Food safety considerations

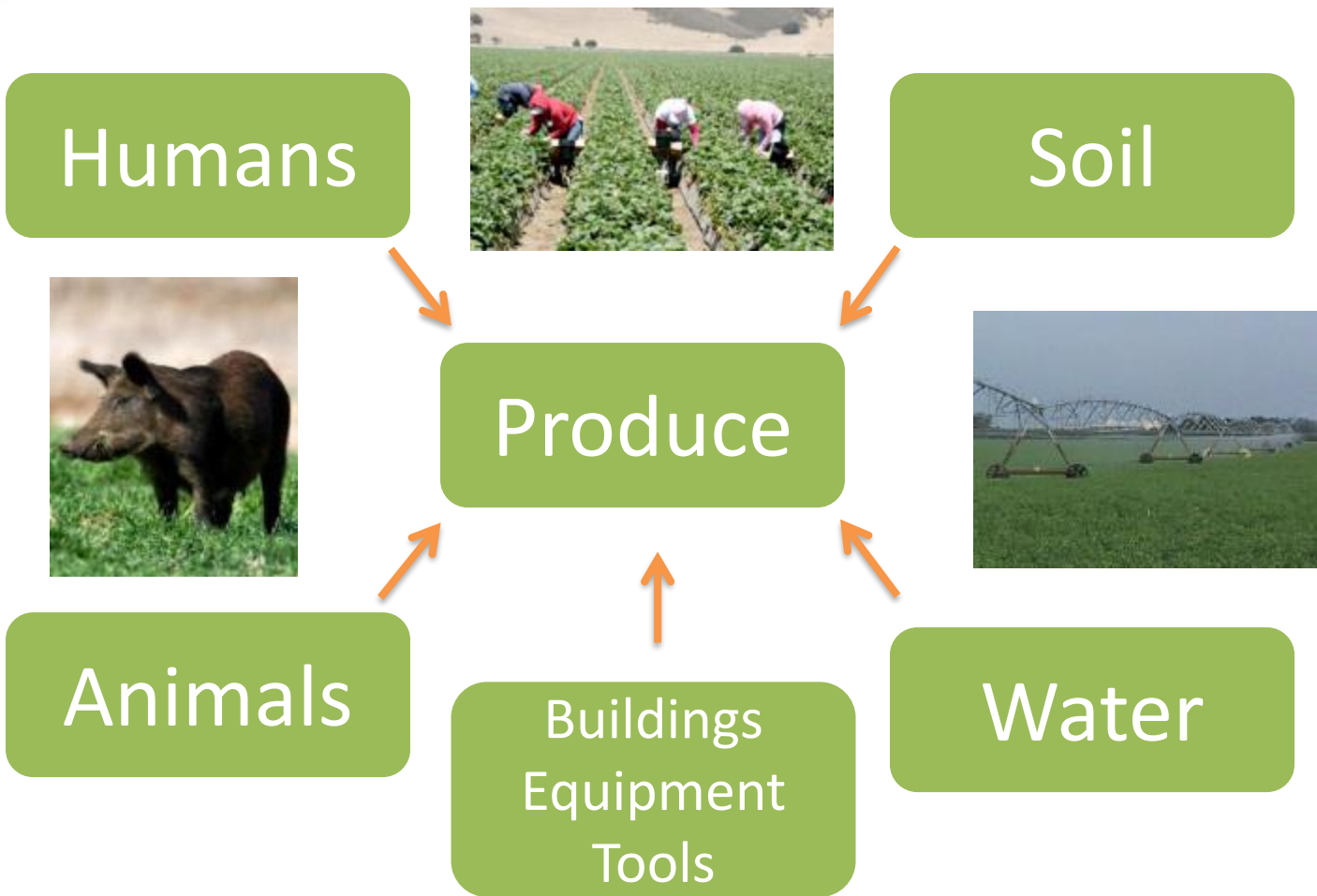
- Learn how to identify risk of contamination and how to minimize them
- Rodent control
- Worker training
- Quality of the production and postharvest water
- Packing house cleanliness
- Pets
- Visitors

Food safety considerations

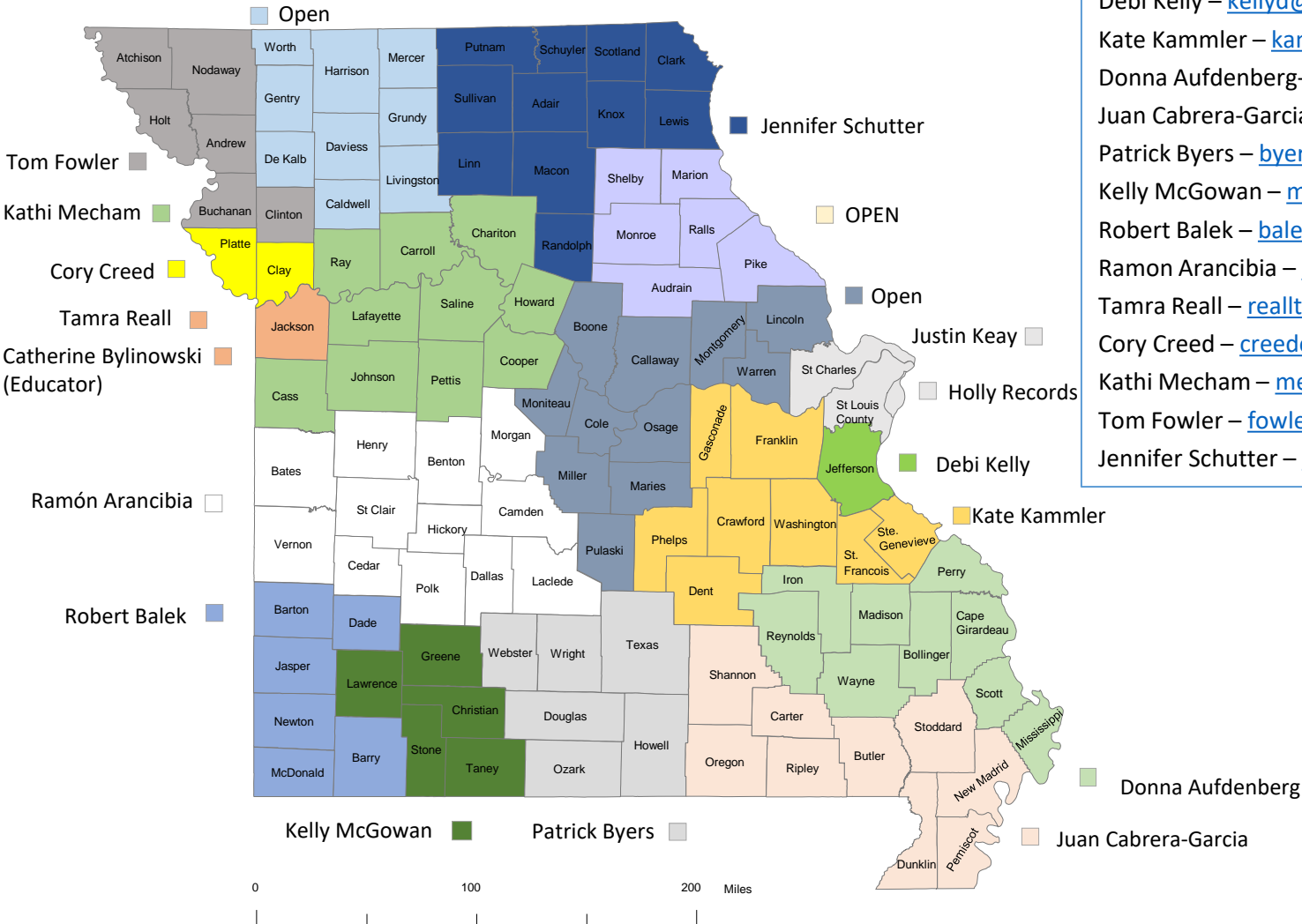
- Learn how to identify risk of contamination and how to minimize them
- Rodent control
- Worker training (hygiene, health, illness, or injury)
- Quality of the production and postharvest water
- Cleanliness of buildings, equipment, tools, and surfaces
- Pets
- Visitors
- Fertilizers (organic source)
- Provide equipment, training, policies, practices and facilities to minimize risks



Contamination Sources



Horticulture Specialists



- Justin Keay – Justin.keay@missouri.edu
- Debi Kelly – kellyd@missouri.edu
- Kate Kammler – kammlerk@missouri.edu
- Donna Aufdenberg- aufdenbergd@missouri.edu
- Juan Cabrera-Garcia – jcabrera-garcia@missouri.edu
- Patrick Byers – byerspl@Missouri.edu
- Kelly McGowan – mcgowank@Missouri.edu
- Robert Balek – balekr@Missouri.edu
- Ramon Arancibia – ramon.arancibia@Missouri.edu
- Tamra Reall – reallt@Missouri.edu
- Cory Creed – creedca@Missouri.edu
- Kathi Mecham – mechamk@Missouri.edu
- Tom Fowler – fowlert@Missouri.edu
- Jennifer Schutter – schutterjl@Missouri.edu