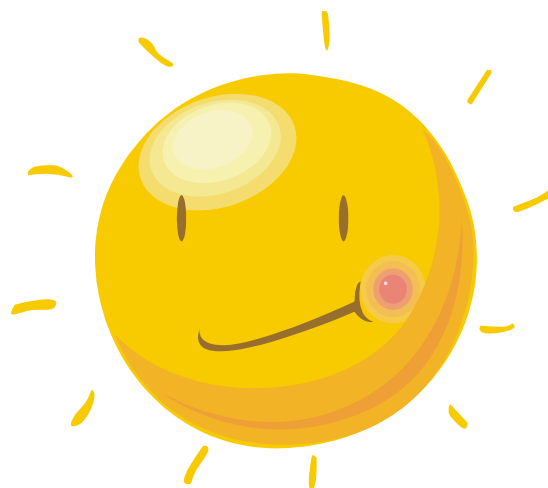


# Keeping It Cool: Shading your Veggies

Dr. Stephanie Walker  
Extension Vegetable  
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# Introduction

- Maintaining a productive garden during the intense heat and sunlight of New Mexico summers is challenging
- Methods to protect our vegetable gardens from these conditions will be discussed in this session



# Introduction

- Sunlight provides energy for growing plants; critical for life to exist on earth
- While many areas of the country strive to maximize sunlight, NM can have overabundance during the summer months
- Ultraviolet (UV) radiation is most damaging to plants; higher levels at high elevations



# Sunlight

- Plants intercept short- and long-wave radiation
- Damage occurs if plants receive or accumulate excessive light radiation
- High light intensity can result in plant stress and fruit disorders
  - Sunburn** results when leaves or fruit cells are damaged by excessive light radiation



Photo credit: <http://calag.ucanr.edu/Archive/?article=ca.v053n06p40>

# Sunburn Types

- **Photo-oxidative**: Fruit that have been shaded are suddenly exposed to sunlight due to broken branches or loss of leaf cover  
-Occurs at temp range 90-100°F
- **Browning**: Brownish discoloration from damaged pigments in fruit  
-Occurs at temp range 100-115°F
- **Sunburn necrosis**: Plant tissue dies; turns white or brown  
-Occurs at temps 110-125°F

# Sunburn

- Plants prevent sunburn damage by cooling themselves; water is taken up and dissipated through stomates
  - heat, wind, drought stress limit plant's ability to reverse damage
- Mature tomato and chile pepper fruit have few stomata
  - tend to be highly susceptible to sunburned fruit

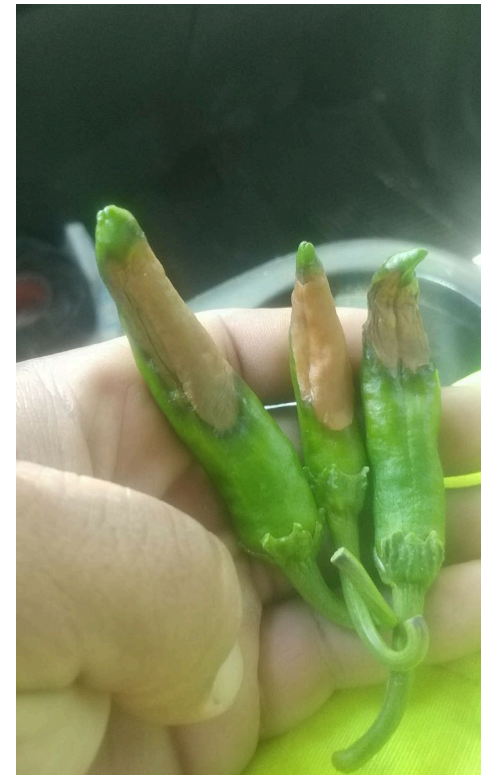


Photo courtesy of Leigh Ann Marez

# Other Common Abiotic Disorders

- **Greenback**, can be caused by:
  - Potassium deficiency
  - Excess sunlight during ripening



<http://gardener.wikia.com/wiki/Greenback>

- **Blotchy Ripening**, can be caused by:
  - Viral disease
  - Potassium deficiency
  - Excess heat during ripening

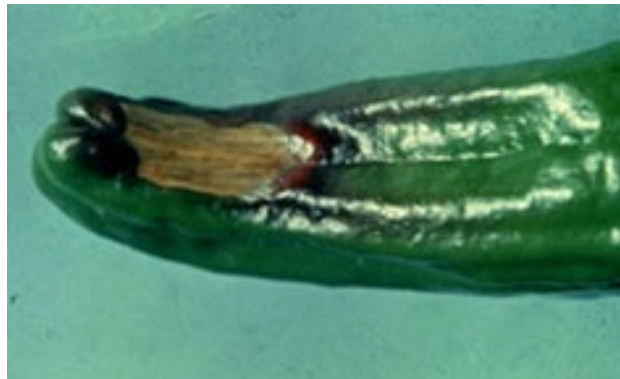


Photo by [Timothy Coolong, University of Kentucky](#)



# Other Common Abiotic Disorders

- **Blossom End Rot**, Caused by stressful conditions (heat, drought) during fruit set





# Keys to Hot Weather Gardening

- Build healthy soil
- Apply consistent & deep irrigation
- Apply organic mulch
- Grow heat-loving crops
- Plan for protective infrastructure for wind & sunlight
  - Protective companion plants
  - Wind barriers
  - Shade cloth



Photo credit: Gardeners Supply, [gardeners.com](http://gardeners.com)

# Build Healthy Soil

- Best soil is deep, well drained, fertile soil that contains plenty of organic matter
- Soil texture: Clay, sandy and loam
- Soil can be improved with compost and manure, crop rotation, cover cropping
- Healthy soil, high in organic matter, provides better buffer for high temperatures



**Determining soil moisture using the wet ball method**  
Courtesy NRCS

# Irrigation

- Essential input for growing vegetable in NM
- Quality, quantity and timing are critical
- Heat-loving crops tend to be deep rooted
- Important to apply consistent, deep watering



# Mulch

- Material placed on soil surface around plants
- Plastic vs. Organic
- May increase or decrease soil temperature depending on type of mulch



# Soil Solarization with Clear Plastic

- Non-chemical method to manage soilborne diseases, pests, and weeds
- Perform during summer months, 4-6 weeks duration
- Moisten, cultivate, remove weeds in area to be solarized
- Cover area with solid, clear plastic and seal edges with soil
- ***Greatly increases*** soil temperature under plastic





# Black Plastic Mulch

- Popular in commercial vegetable production
- Useful for season extension
- Reduces water evaporation
- Reduces weed pressure
- ***Increases*** soil temperature
- Creates disposal issue





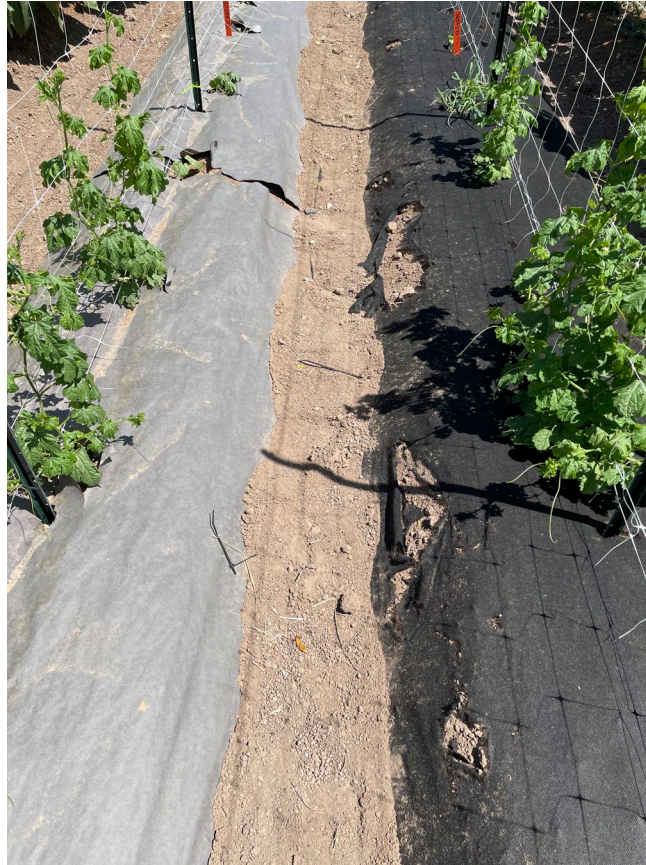
# Paper Mulch

- Biodegradable
- Effective for weed management
- Maintains soil moisture
- Keeps soil cooler compared to bare ground during hot, summer days



# Paper Mulch

- Challenges
  - More expensive
  - Heavier
  - ‘Critter’ damage...?



# Organic Mulch

- Organic mulch helps increase soil organic matter, conserve soil moisture, & assist with weed management
- Tends to buffer soil temperature against temperature spikes
- **Types:** Straw, shredded leaves, wood chips, newspaper, pecan shells, compost
- How to apply
  - Once plants are established, cover ground 2 – 4 inches
  - Don't cover vegetable plants



# Organic Mulch

- Improves soil quality as it decomposes
- Be careful to not introduce weed seed
- Be aware of possible harborage of insect & vertebrate pests



# Heat-loving Vegetable Options

- Cucumber
- Melons
- Pumpkins
- Squash



- Sweet potatoes
- Okra
- Eggplant
- Chile
- Tomatillos



***Different varieties of a vegetable may exhibit different tolerance to heat***

# Shading

- Reduces short- and long-wave radiation reaching plants
- Reduces moisture loss in soil
- Reduces heat stress on plants
- Cools the area around the plants by 4-5°F
- Shading materials vary in their light transmission
  - Best choice is 30% shade rating for vegetables
- Best to install later in the season after plants are established and remove when no longer needed



# Shading Options

- Planting next to or under structures
- Planting next to taller plants
- Use plant 'sunscreens'- Kaolin clay application
- Planting under or adjacent to shade cloths

# Windbreaks

- Hot winds quickly damage plants and dry out soil
- Place or plant perpendicular to the wind direction
- Can be used as both wind and sunlight protection



# Shade from Structures

- Build trellis to support vining plants
- Exploit sheltered spots that provide shade during hottest part of the day
  - Against a house
  - Beside a wall



Photo credit: [www.winnscape.com.au/original%20pictures/PROJECTS%20016.jpg](http://www.winnscape.com.au/original%20pictures/PROJECTS%20016.jpg)

# Shade from Neighboring Plants

- Establish tall, sturdy plants at west or south side of garden (Corn, okra, sunflowers)
- Use of vining plants on trellis west or south of garden
- Make sure that the shading neighbor is not overly competitive for irrigation, nutrients and space





# Shade from Plant 'Sunscreen'

- Kaolin Clay (Surround)
- Provides protection from solar radiation
- Also provides some protection from insect pests
- Must be reappplied frequently as plants grow or when washed off



# Shade from Shade Cloth

- Material strategically placed to protect plants from full sunlight
- Reduces the amount of solar radiation reaching the plants
- Results in lower daytime air temperature & slightly higher nighttime temps under shade





# Shade Cloth Impacts

- ***Yield of high-quality fruit can be greatly increased under optimum shade due to:***
  - Reduction in sunburned fruit
  - Less fruit cracking, blossom end rot and other abiotic disorders
  - Plants tend to grow taller and produce larger leaves
  - Reduction of wind damage
  - Increase in humidity around plants

# Commercial Shade Houses

- Expensive infrastructure, but critical for production of delicate crops like colored bell peppers



# Shade Cloth

- Range of thicknesses
  - Ideally, shade cloth should be made from durable material for multi-year use
- Comes in different shade ratings (i.e. % of sunlight blocked) from 10-90%
  - Optimum range for vegetables is 20-40%
- Comes in different colors



Photo credit: Gardeners Supply, [gardeners.com](http://gardeners.com)

# Shade Cloth Colors

- ***Color of cloth affects the light spectra reaching the plants***
- White: Reduces the amount of light, but provide a balanced spectrum; reflects heat
- Black and green: Absorbs heat; filters light reaching the plants
- Red: Reported to increase tomato yield
- Reflective: Strands of reflective strips incorporated into the cloth increase reflection of UV light up to 95%



# Options in Shading Material

- Commercial shade cloth with preferred rating & color
  - Usually treated for UV protection
- Double or triple thick mesh fabric
  - Red tulle (increases red and far-red light to optimize growth of tomatoes)
- Floating row cover material
- White sheets
  - When you can see light through cloth held to bright light, the material will likely work



Photo credit: [www.onlinefabricstore.com/red-tulle-fabric-.htm](http://www.onlinefabricstore.com/red-tulle-fabric-.htm)



# How to Use Shade Cloth

- Hang on posts or over structures (like pergolas)
- Replace plastic covering on hoop houses with shade cloth during the summer months
- Drape over arches in raised bed gardens
- Use your own design
- ***Remove and store when not in use for long-term viability***



# Additional Shading Considerations

- Shade should be placed to provide relief during periods of peak sunlight intensity
  - However, watch for exposure issues on plants
- Preferably, shade cloth should not touch plants; allow room for air circulation
- Shade cloth must be well-secured in place to prevent damage and loss by wind
- Fall and winter gardens benefit from more sunlight; ideally shade should be removable

# Manage Challenges for Gardening Success in Hot Weather

- Create excellent soil
- Provide consistent irrigation
- Plant heat-loving vegetables
- Use organic mulch
- Plan for shade and wind break companion plants and infrastructure



# Thank You Questions?

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