Physiological Disorders and Environmental Stresses

Kimberly Williams
Kansas State University
The Fred C. Gloeckner Foundation, Inc.

Topics

- Overview and terminology
- Caused by chemicals or air pollution
- Caused by moisture management
- Caused by temperature and/or light

Physiological Disorders

- NOT caused by 'biotic' factors
  - Insects and mites
  - Diseases
- Nutritional disorders

Physiological Disorders

- Caused by:
  - Chemicals, air pollution
  - Moisture management
  - Temperature
  - Light (intensity, photoperiod)
- Very often, a combination of the above

Plants can only respond to distress in so many ways

During vegetative growth…

- Cell malfunction = *chlorosis [loss of green chlorophyll]*


Plants can only respond to distress in so many ways

During vegetative growth…

- Cell damage, impediment to growth = *distortion*


Plants can only respond to distress in so many ways

During vegetative growth…

- Cell death = *necrosis*

Photo courtesy of APS

Plants can only respond to distress in so many ways

During reproductive growth…

- Delay of normal flowering response
- Flower malformation
- Flower bud abortion


Photo courtesy of Brian Whipker


Photo courtesy of Gus DeHertogh

Chemicals and Air Pollution

- Foliage epinasty
- Foliage distortion
- Phytotoxicity

Epinasty

- Wilted, distorted appearance of plants in response to *ethylene*
  - Heater not combusting fuel completely


Photos courtesy of Paul Nelson

Plants can only respond to distress in so many ways


2,4-D spray drift damage

Distortion

Treflan (pre-emergent herbicide) damage

Phytotoxicity

Non-reversible ethephon phytoxicity

Reversible chlormequat phytoxicity

Moisture Management

Combines…

- Water availability
  - Water retention by substrate
  - Frequency of irrigation
- Humidity
  - Ventilation for air exchange
  - Air movement with HAF fans, fan-jet tube

Paul Nelson

Moisture Management

Photo courtesy of Doug Bailey

Edema = Oedema

- *Pelargonium* spp. notoriously susceptible

Edema

- If plant absorbs water faster than it can be assimilated or transpired, cell turgor will increase and cells will burst
- More prevalent with
  - Over-watering
  - High humidity
  - Cool temperatures, low light
- i.e. Water abundant, transpiration low

- Plants grown consistently over-watered produced maximum growth
- Edema was LESS on susceptible cultivar when over-watered (left) compared to underwatered (far right)

Photo courtesy of Valerie Jonas

Plants can only respond to distress in so many ways

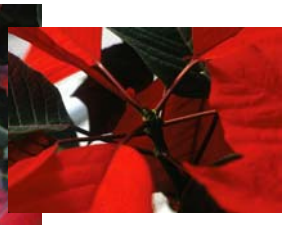
Related to thrips feeding

Related to moisture status

Latex Eruption = "Crud"

- High cell turgor causes cells to burst
- Latex spills over tissue
- Upon drying, latex hardens, creating a growth-restricting layer

Photos courtesy of Brian Whipker



Latex Eruption – A Scenario

Application of pesticide

- Waters plants in well before early evening application
- Applies pesticide
- Keeps greenhouse vents closed down through night to accommodate REI, minimize heat loss
- Heating system malfunctions, temperature drops

Intumescences

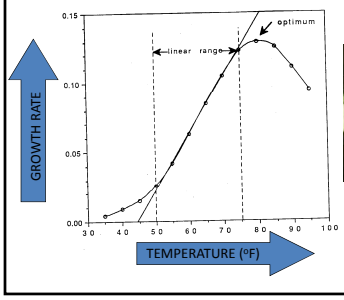
- Ultra-violet light helps abate occurrence
- Tomato, pepper, ornamental sweet potato, cuphea

Photo courtesy of Nicole Rud

Photo courtesy of Joshua Craver

Temperature

- Rate of growth is dependent upon temperature
- Outside linear range, growth is affected



High Temperature Stress

- Reversible foliage "whiting"
  - Ivy geranium

Physiological wilt

- Plant-water-deficit occurs due to high evaporative demand
  - E.g. ***Physiological wilt***
    - Early, bright morning
    - Root medium moist, cool
    - Snapdragons wilt because root system cannot absorb water as fast as it's transpired

Heat Delay

- Delay or failure of flower buds to develop
- **Interaction between photoperiod & high temperatures**
- Symptoms:
  - Deformity of bracts & florets
  - Irregular floret arrangement (mums)
  - Faded flower color
  - Petal streaking
  - Formation of ***crown buds***

Crown Buds

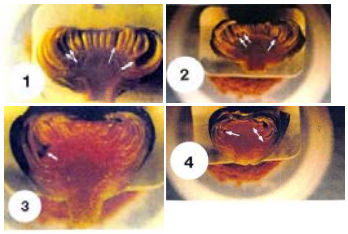
Crown bud vs. Terminal bud

Crown Buds

- Will form under LD after a certain number of leaves have developed on a SD plant, like mum
- May occur when FBI under SD is followed by LD or high temperature
- Will cause branching

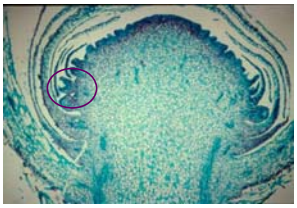
Heat Delay

- Voids on receptacle and deformed florets under heat stress during FBI



Heat Delay

Plants subjected to heat stress **during first 2 wks of SD** showed greatest effects, in both sensitive and tolerant cultivars



Splitting

- Single flower initiated in terminal of shoot, but flower fails to develop
- 3 lateral shoots develop below the terminal flower

Genetics Rule!

- Occurrence of most disorders influenced by cultivar

Ivy geranium 

Edema susceptibility

'Amethyst' tolerant

'Sybil Holmes' susceptible

Florist Mums 

Heat delay susceptibility

'Yellow Favor', 'Iridon' tolerant

'Orange Bowl', 'Coral Charm' susceptible

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