

# COMMON ISSUES FOR CHESTNUT GROWERS



HOW TO DEAL WITH COMMON  
FAILURES AND PROBLEMS  
IN THE GREENHOUSE AND  
IN THE FIELD

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# GREENHOUSE MANAGEMENT



## RECOMMENDATIONS FOR GROWING CHESTNUT IN THE GREENHOUSE



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# Greenhouse Management



- What makes a greenhouse?
  - Really just a building where plants are grown
  - Capture solar radiation to provide heat and light
- Traditional greenhouse or glasshouse
- Hoop house or cold frame
- Sun room, bright window or other more accessible home options

If it's not a good time for outside planting, a greenhouse can help you to get a jump on the season!





# Greenhouse Management

## Sanitation:

Plants aren't the only things that can thrive in the warm environment of a greenhouse

Good sanitation practices are important to prevent unexpected problems

Fungus gnats are a very common greenhouse pest. →

Algae build-up can be an issue, especially when ventilation is poor. ↓



<http://upload.wikimedia.org/wikipedia/commons/b/ba/Trauerfliege.JPG>





# Greenhouse Management

## Ventilation:

The sun is powerful and heat can build up quickly, even on a cold day

Moisture needs a way out

Ventilation methods are an important part of any greenhouse



↑  
A fan and side louvers (vents) help keep this glass greenhouse ventilated. ←

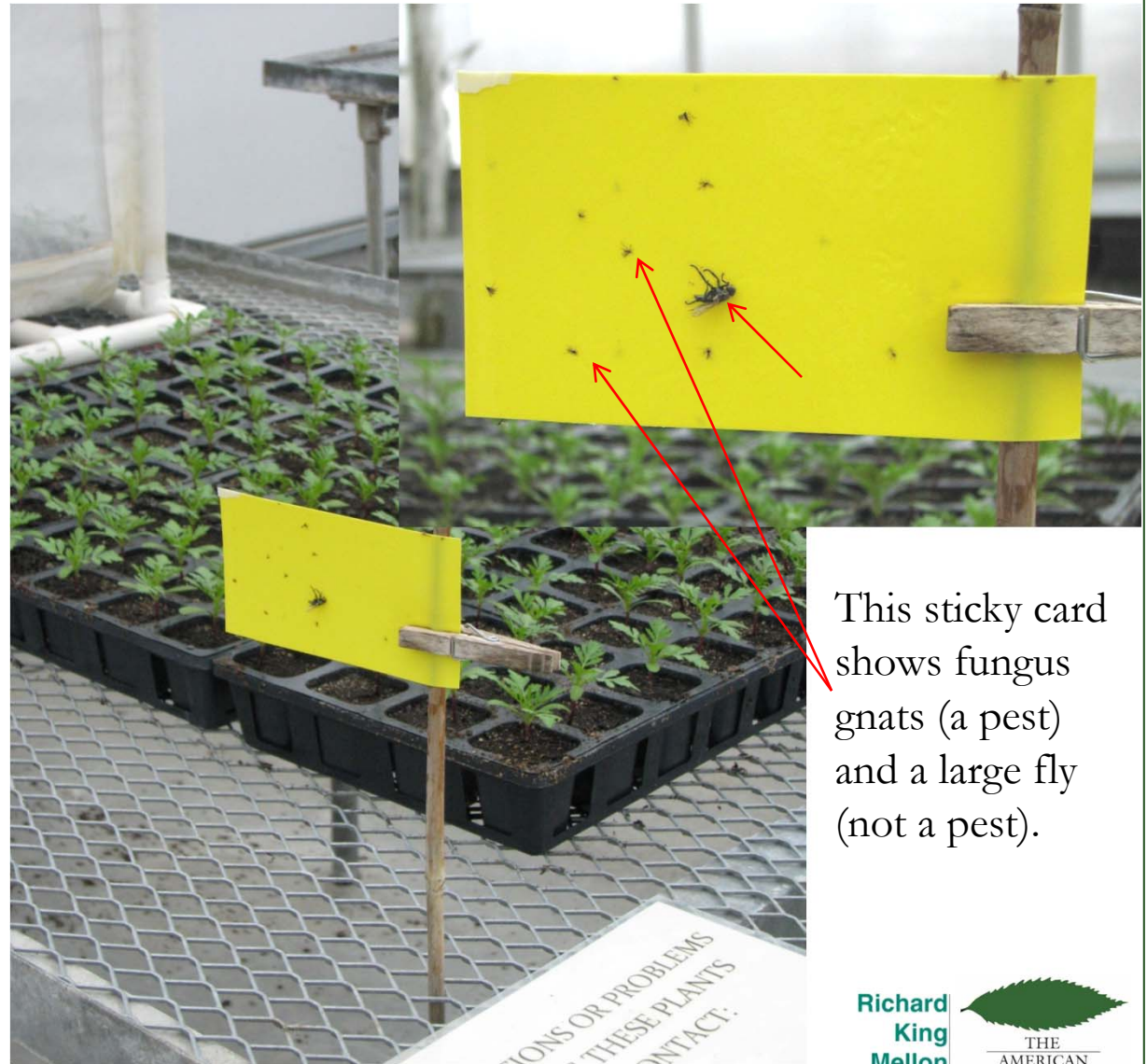


# Greenhouse Management

## Monitoring :

Vigilance is key to catching issues early

Monitoring should include scouting for pests or problems, monitoring with sticky cards and quick observation of signs/symptoms of damage



This sticky card shows fungus gnats (a pest) and a large fly (not a pest).

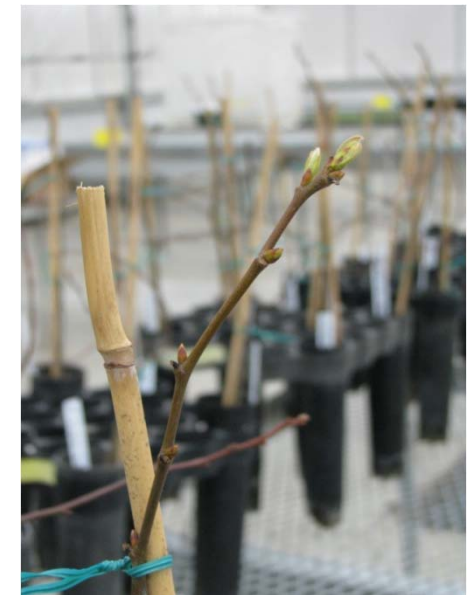
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# Starting Chestnut in Pots



- Starting chestnuts in pots can be a great way to get a jump on the season or produce nice-looking trees for ceremonial plantings
- Greenhouse planting can occur much earlier than field planting
  - As soon as the nuts are properly stratified (2-3 months) they could be potted
  - Timing varies somewhat by location – your local extension service should be able to advise on the proper timing for your area



# Starting Chestnut in Pots

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## Container Selection

- Pots
  - Tap-rooted tree needs a deep pot
  - Small “Cone-tainers” are appropriate for chestnuts that will be out-planted soon
  - Larger 1+ gallon tree pots are better for long-term support
- Homemade options
  - Milk cartons w/ drainage

## Media Selection

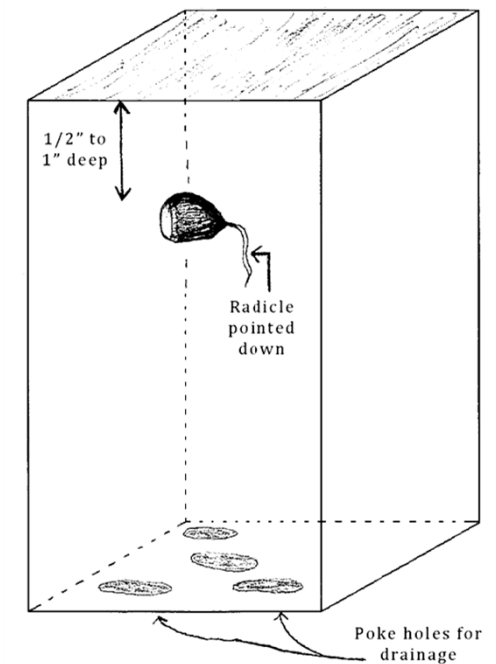
- Match your watering habits
- Mix your own
  - 1/3 each peat, perlite and vermiculite
- Commercially available
  - Scott’s Miracle-Gro<sup>®</sup> Moisture Control<sup>®</sup> Potting Mix
  - Sun Gro<sup>®</sup> Metro-Mix<sup>®</sup> 560 SUN-COIR



# Starting Chestnut in Pots



- Plant to 1/2 - 1" deep, no deeper
- Plant radicle down or sideways
- Water as needed – some mixes dry out faster than others
- In greenhouse, feed with Miracle-Gro® Miracid® or other commercially-available acid fertilizer



# Starting Chestnut in Pots



- Greenhouse-grown chestnuts, especially those in leaf, will need to “harden off” before being planted outside:
  - The greenhouse protects from wind, outside temperature fluctuations and direct light, all of which the seedling needs to adjust to once outdoors
  - Allow greenhouse-grown chestnuts to harden off in a protected area for a week or two before moving to a permanent planting location
  - The remnant nut shell at the base of the seedling can attract critters – remove the shell before moving chestnuts outside





Its time to put what you just learned about planting chestnuts in pots to use!



**Let's Plant a Chestnut!!**

# COMMON GREENHOUSE PESTS



## FUNGI, INSECTS AND VERTEBRATES



David Cappaert, Michigan State University, Bugwood.org:  
<http://www.ipmimages.org/browse/detail.cfm?imgnum=2131075>

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# Integrated Pest Management

Prevention

Observation

Intervention



- IPM is an integrated approach to crop management used in many greenhouse operations:
  - Define acceptable pest levels – when is there a problem?
  - Cultural practices – prevention is the first line of defense
  - Monitoring – catch problems early
  - Control – use the least risky option
    - ✦ Mechanical control
    - ✦ Biological control
    - ✦ “Soft” chemical control – soaps, oils, fungi
    - ✦ Chemical control

# Fungi: Signs and Symptoms



- Fungi can cause damage to roots, stems and foliage
- Fungi generally prefer damp environments
  - Careful watering can help keep soil from staying too wet
  - Good ventilation can help keep fungal growth at bay
- There are many different fungi that can be found in the greenhouse, but only a couple are regular offenders

Gray mold, caused by *Botrytis spp.*, is a relatively common greenhouse fungal pathogen, encouraged by damp conditions.

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<http://www.ipmimages.org/browse/detail.cfm?imgnum=1436162>



# Fungi: *Pythium* spp.



- *Pythium* root rot can be a problem for chestnut, especially when potting media is kept very damp
  - Root rot or damage
  - “Damping off” – death of newly-emerged seedlings
- Treatment:
  - Difficult to diagnose and treat
  - Proper sanitation
  - Manage moisture levels



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<http://www.ipmimages.org/browse/detail.cfm?imgnum=1233227>

# Fungi: Powdery Mildew



- Powdery mildew can be found on chestnut, especially in high-moisture environments
  - Caused by several species of fungi
  - Dusty white or gray coating on leaf surface
- Typically not a major concern
- Treatment:
  - Good sanitation – remove fallen leaves
  - Fungicides, if needed
    - ✦ Make sure host plant and intended use are appropriate
    - ✦ Follow all label instructions



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Extension Slide Series, Bugwood.org:  
<http://www.ipmimages.org/browse/detail.cfm?imgnum=1436138>



# Insects: Signs and Symptoms



- Insect damage may be:
  - Foliage feeding , chewing or tunneling
  - Sucking or piercing
  - Bark/stem boring
- Conditions that encourage insects vary, but the warm, controlled greenhouse environment can allow an infestation to get out of control quickly
- Regular monitoring is key to catching problems early
- When in doubt – ask extension!



# Insects: Fungus Gnats



- Fungus gnats are a common greenhouse pest, though typically harmless (especially on chestnut)
  - The larvae feed on plant roots or fungi
- Often an indicator of over-watering
  - Rotting roots
  - Fungus on top of damp media
- Treatment:
  - Parasitic wasps
  - BT (*Bacillus thuringiensis*)
  - Limit moisture



# Insects: Spider Mites



- Spider mites are tiny arachnids that suck nutrients from plant cells
  - Well-known pest on greenhouse-grown chestnut
  - Two-spotted spider mite is the most common
- Typically do best in hot, dry conditions
- Populations may also increase after general insecticide treatment, which can wipe out the mites' natural enemies
- Life-cycle takes about 2 weeks
  - Important for treatment, eggs are generally not killed by chemical controls



# Insects: Spider Mites



- Damage:
  - Yellow or white spotting, bronzing or scorching of leaves
    - ✦ Caused by cellular bruising from insect sucking
  - Premature leaf drop or plant death (bad infestation)
  - May also see fine webbing
- Treatment:
  - Biological controls – natural predators
  - Horticultural oil and insecticidal soaps
  - Miticides – follow instructions



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<http://www.ipmimages.org/browse/detail.cfm?imgnum=1435027>



David Gent, USDA Agricultural Research Service, Bugwood.org:  
<http://www.ipmimages.org/browse/detail.cfm?imgnum=5393987>

# Insects: Spider Mites



- Spider mites are one of the most problematic pests for growing chestnut in the greenhouse
- Monitor regularly to catch an infestation early!
- Treatment should follow life-cycle
  - Eggs are not killed so must be diligent with repeat applications to manage the population
- Rotate treatment/chemicals used
  - Resistance to chemicals can increase over time

Whitney Cranshaw, Colorado  
State University, Bugwood.org:  
[http://www.forestryimages.org/  
/browse/detail.cfm?imgnum=1  
325020](http://www.forestryimages.org/browse/detail.cfm?imgnum=1325020)



# Insects: Aphids



- Aphids are a common sucking insect found on many species, including chestnut
  - Often feed in large, dense groups; leave honeydew behind
  - Cause curling, distortion and yellowing of leaves, and/or stunting
  - Most active during warm weather
- Treatment:
  - Monitoring – short life cycles
  - Biological controls – natural predators
  - Chemical controls – “soft” chemicals (insecticidal soap or neem oil) or pesticides
    - ✦ Read labels and follow all instructions
    - ✦ Follow chemicals with miticide to prevent spider mite break-out



Whitney Cranshaw, Colorado State University, Bugwood.org:  
<http://www.ipmimages.org/browse/detail.cfm?pimnum=22000>

# Insects: Whiteflies



- Whiteflies are similar to aphids, found on the underside of leaves and damage plants by sucking out nutrients
  - Look for discolored, distorted or yellow leaves; honeydew
  - Premature leaf drop
  - Commonly introduced by infected plants
- Treatment:
  - Cultural methods – removal of infected plant tissues, traps
  - Biological control – natural predators
  - Chemical control – know life-cycle
    - ✦ Read labels and follow all instructions
    - ✦ Eggs not killed, requires repeat applications



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<http://www.ipmimages.org/browse/detail.cfm?imgnum=1236104>

# Insects: Thrips



- Thrips are tiny sucking insects that may show up in a greenhouse setting
  - Very small – damage is usually seen before thrips
  - Look for scabby, scarred, stippled or distorted plant tissue
  - Usually feed on rapidly growing tissues
- Treatment
  - Not usually a problem unless major infestation
  - Biological control – predators (mites, wasps)
  - Cultural control – pruning
  - Chemical control – know life cycle
    - ✦ Read labels and follow all instructions
    - ✦ Eggs not killed, requires repeat applications



GB Edwards, Florida Department of  
Agriculture and Consumer Services,  
Bugwood.org:  
<http://www.ipmimages.org/browse/detail.cfm?imgnum=5179074>





# Vertebrates: Signs and Symptoms

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- Signs of vertebrate damage are usually much more obvious than insect or fungal damage – at least we hope!
  - Chewed or missing nuts
  - Chewed, browsed or missing leaves and/or stems
  - Plants moved, tipped or removed all together
- Cold weather can drive many critters searching for food or shelter into a warm greenhouse
  - Rodents are the most common to find setting up shop
- Monitor regularly to identify problems early
- When in doubt – ask extension!



# Vertebrates: Rodents



- Squirrels, mice and other rodents can get into the greenhouse and cause big problems for chestnut growers
  - Eat potted nuts – even those that have sprouted
  - Can eat a lot of nuts quickly
    - ✦ Especially a problem with larger critters or populations
- Treatment:
  - Find and remove any nests
  - Block any possible entrances
  - Traps



David Cappaert, Michigan State University, Bugwood.org:  
<http://www.ipmimages.org/browse/detail.cfm?imgnum=2133024>



[http://en.wikipedia.org/wiki/File:Eastern\\_Gray\\_Squirrel\\_peanut.jpg](http://en.wikipedia.org/wiki/File:Eastern_Gray_Squirrel_peanut.jpg)

# Vertebrates: Humans



- Often a greenhouse space is shared by different people
  - People can do weird things!
  - If something moves or disappears completely, start asking questions
- Know who else is using the facility
- Practice good communication
- Be a good neighbor
  - Pick up after yourself
  - Be respectful of others' projects
- Most human-induced plant damage is mechanical, which is usually not a problem in a greenhouse



David J. Moorhead, University of Georgia, Bugwood.org:  
<http://www.ipmimages.org/browse/detail.cfm?imgnum=005091>



## Environment: Signs and Symptoms

Environmental conditions can cause damage as well

Environmental damage often looks very similar to pest or pathogen damage

- **Water**
  - Over-watering can cause yellow or wilted leaves and stems
    - ✦ Lead to root rot and other fungal problems, or even plant death
  - Under-watering can lead to drought-stress, wilted tissues and plant death
- **Nutrition**
  - Many nutrient deficiencies show up in the foliage
  - Knowing the expected discoloration patterns will help determine the cause
  - Foliar analysis can be helpful as well
- **Temperature**
  - High heat can also lead to drought stress
  - Low temperatures are less common in a greenhouse but can lead to injury