1 **Nursery IPM: A focus on scales**

Juang-Horng “JC” Chong

Clemson University
juanghc@clemson.edu
843-519-0479 (Office); 843-409-0544 (Cell)

2

3

4 **A few quick tips about setting up an IPM program**

IPM starts at planting.

5 **A few quick tips about setting up an IPM program**

“What should I do to avoid infestation?”
(What I heard: “What can I do to kill these trees?”)

Good establishment + Good growth

= less stress

= healthier trees

= more tolerance for bugs

= less damage from bugs

6 **A few quick tips about setting up an IPM program**

Tips # 1: Right plant, right place

7 **A few quick tips about setting up an IPM program**

Tips # 2: Watch your planting depth

8 **A few quick tips about setting up an IPM program**

Tips # 3: Proper pruning

There are good reasons to do it right:
1. Make for a high quality/grade tree;
2. Open up canopy to allow airflow, leads to less diseases;

3. Reduce shelter for insect pests;
4. Open up canopy to allow better penetration of pesticides;
5. Allow better scouting; and
6. Allow removal of infested or infected tissues.

9 **A few quick tips about setting up an IPM program**
Tips # 4: Scout, scout and scout

10 **A few quick tips about setting up an IPM program**
Tips # 5: Know what you (or your client) will tolerate

11 **A few quick tips about setting up an IPM program**
Tips # 5: Know what you (or your client) will tolerate

12 **A few quick tips about setting up an IPM program**
Tips # 5: Know what you (or your client) will tolerate

13 **A few quick tips about setting up an IPM program**
Tips # 6: Know when to quit

14 **A few quick tips about setting up an IPM program**
If you can't sell it, throw it away.

15

16 **What I wish to cover today…**
Scales, scales and more scales!!

17

18

19 **Gloomy scale**

20 **False oleander scale**
(aka magnolia white scale)

21

22

23 **Oak lecanium scale**

24 **Cottony cushion scale**

25 **Cultural Control**

- Inspect all plant materials received from suppliers and reject infested materials.
- If infestation is not extensive, prune out the infested branches and isolate and keep monitoring these plants for reinfestation.
- In infestation is extensive, thrown away the infested plants.
- Discarded materials should be removed and destroyed immediately. Infested materials left in the ground can let the insect move back onto the plants.
- Remove weeds that may serve as alternative hosts of insects.
- KEEP PLANTS HEALTHY.

26 **Biological control of scales (for releases)**

27 **Scale insects are attacked by a large number of existing natural enemies**

- Oak lecanium scale (SC)
  - 33 parasitoid species; 8-59% parasitism rate
  - 5 predator species

28 **Scale insect control for commercial applicators:**

- acephate (Orthene)
- carbaryl (Sevin)
- chlorpyrifos (Dursban)
- dimethoate (Cygon)
- disulfoton (Di-Syston)
- Pyrethroids (various)
- abamectin (Avid, etc.)
- s-kinoprene (Enstar)
- buprofezin (Talus)
- pyriproxyfen (Distance)
- horticultural oil
- dormant oil
- azadirachtin

29 **JC's typical recommendations for scale insects:**

- If the scale insect feeds on the leaf, or spend at least part of its life on the leaf:
  neonicotinoids (drench, granule, injection, trunk)
  or, spray of below

- If the scale insect feed on the twig or branch its entire life, spray of:
  horticultural oil
  IGRs (pyriproxyfen, buprofezin)
  neonicotinoids
  spirotetramat
  diamides (soft scales)
  flupyradifurone (soft and armored scales)

30 **JC's typical recommendations:**

Application timing:

- If using systemic insecticides:
  Anytime, but realistically depends on the mobility of the chemical.

- If using contact insecticides:
  At crawler emergence; repeated application biweekly until all crawlers have emerged (armored scales).
  Wait until all crawlers have emerged (armored and soft).
  Wait until natural enemy activities have died down, but when nymphs are still vulnerable (soft scales).

31 **Four pieces of information you'll need to design a scale insect management program**

1. What are you dealing with?
   Armored or "soft" scales

2. What life stage is (the majority of) the population?
   Adult or nymph

3. Where are they feeding?
   Leaf or woody tissues

4. What is the size of the host plant?
   Tree, shrub or other

32 **Four pieces of information you need to design a scale insect management program:**

1. What are you dealing with?
   Armored scales or “soft scales”

33 **Four pieces of information you need to design a scale insect management program:**

1. What are you dealing with?
   Armored scales or “soft scales”

Why do we need to identify at least to armored scale or “soft scale”?

Because:

1. Proper identification helps with selection of management tools.
2. Armored scales are a lot more difficult to control.
3. Armored scales have more generations per year, that means more intense management if using contact insecticides.

34 **The most common scale insects**

35 **The most common scale insects**

36 **Number of generations**

37 **Number of generations**

38 **Four pieces of information you need to design a scale insect management program:**

2. What life stage is (the majority of) the population in?
   Adult or nymph

39 **Four pieces of information you need to design a scale insect management program:**

2. What life stage is (the majority of) the population in?
   Adult or nymph

Why do I need to care whether they are mostly adults or nymphs?

Because:

1. Adults are just about impossible to kill.
2. Crawlers and nymphs should be the target of (contact and systemic) applications. Therefore, timing is important.
3. If it is a mixed population, or crawlers emerge over a long time, repeated applications may have to be applied to cover the majority of crawlers.

40

41 **Scouting methods for scale insects**

1. Visual inspection
   - Scale insects
   - Wilting, diebacks
   - Honeydew and sooty mold
   - Ants
2. Trap

42 **Scouting methods for scale insects**

1. Visual inspection
2. Trap
   - Double-side tape
   - pheromone trap

43 **Crawler emergence time**

44 **Crawler emergence time**

45 **Four pieces of information you need to design a scale insect management program:**

3. Where are they feeding?
   - Twig or leaf

   This factor will be more crucial for systemic insecticides.

46 **Four pieces of information you need to design a scale insect management program:**

4. What is the size of the host plant?
   - Tall trees, short ones, or shrubs

47 **Limitations of contact insecticides – Only small trees**

48

49 **JC's typical recommendations for scale insects:**

- If the scale insect feeds on the leaf, or spend at least part of its life on the leaf:
  - neonicotinoids (drench, granule, injection, trunk)
  - horticultural oil
  - Insect growth regulators (pyriproxyfen, buprofezin)

- If the scale insect feed on the twig or branch its entire life:
  - horticultural oil
    - and/or
  - IGRs (pyriproxyfen,buprofezin)

50