

# Ohio Pesticide Applicator Training

Ornamental  
Student Workbook



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# Ohio Pesticide Applicator Training

Ornamental

**Student Workbook**

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## Preface

This workbook was prepared by Ohio State University Extension for use as a self-study guide or in combination with an educational program. It has been developed to assist Pesticide applicators in better preparing themselves for taking the exams required for certification in the ornamental category. The

sample questions presented in this manual will help the reader obtain a general understanding of nursery pest problems, approaches to control, and general information needed to apply and use pesticides safely. Emphasis on the private exam for category 5 is ornamental plants. If a sod producer wants to take a turf exam, they must take the commercial turf exam. Bulletin 841-8 is the study guide recommended for turfgrass.

Your comments and suggestions to improve this study tool for future users would be appreciated. Comments should be directed to Pesticide Applicator Training, 249 Howlett Hall, 2001 Fyffe Ct., Columbus, OH 43210-1096.

## How to Use This Workbook

This workbook is designed to serve as a supplementary study guide to the following bulletins published by Ohio State University Extension. All references are available from any county office of Ohio State University Extension.

Bulletin 504	<i>Insect and Mite Control on Woody Ornamentals and Herbaceous Plants</i>
Bulletin 614	<i>Disease Control in the Landscape</i>
Bulletin 843	<i>Worker Protection Standard How to Comply</i>
HYG 3038-95	<i>Using Fungicide Sprays Effectively</i>
HYG 2016-95	<i>Black Vine Weevil and other root weevils</i>
HYG 3049-92	<i>Fireblight on Ornamentals</i>
HYG 3044-96	<i>Leaf Diseases on Ornamental Trees and Shrubs</i>
HYG 2012-92	<i>Spider Mites and Their Control</i>
HYG 2150-91	<i>Lace Bugs</i>
HYG 2018-95	<i>Bronze Birch Borer</i>
HYG 2003-94	<i>Magnolia Scale and its control</i>
HYG 2504-91	<i>Japanese Beetle</i>

Users of this workbook should read the bulletins before attempting to answer questions in the workbook. When completing this workbook, use the flap on the back cover to conceal the answers while answering the questions on the left-hand page. Once all the questions for a section are answered, the user should check to see if the responses are correct, mark those incorrect, and read the explanation for each question. If the explanation is the least bit confusing or if you disagree with the answer or explanation, refer to the section indicated in the reference.

# General Knowledge

1. Which factors can lead to development of resistance?
  - A. Repeated use of the same compound
  - B. Repeated use of the same class of compounds
  - C. Improper rates
  - D. All of the above
2. When spraying insecticides on trees and shrubs that are in bloom, it is very important to:
  - A. Direct spray at the base of plant
  - B. Avoid spraying during the open-bloom period because of honeybees
  - C. Spray during midday to get good drying
3. The use of trapping and scouting for pest detection in combination with cultural, physical, environmental, chemical, and biological controls is known as:
  - A. MPI
  - B. PMI
  - C. IPM
4. Sex attractants (pheromones) used in integrated pest management are used primarily to lure the:
  - A. Female insect to the trap
  - B. Male insect to the trap
5. Pests often emerge at different times across the state from north to south.
  - A. True
  - B. False
6. The best methods for determining insect populations level and stages is:
  - A. Scouting
  - B. Pheromone traps/degree days
  - C. Calendar date
  - D. Red flags from inspector
  - E. A&B
  - F. All of the above
7.  $LD_{50}$  is a measure of toxicity of various pesticides. The smaller the  $LD_{50}$  number, the more toxic the substance. Which of the following insecticides is the least toxic?

A. Thiodan	$LD_{50}$ - 359
B. Sevin	$LD_{50}$ - 4000
C. Dursban	$LD_{50}$ - 2000
D. Orthene	$LD_{50}$ - 10,250

1. **Correct Answer: D**, Bulletin 504  
Explanation: Pest resistance is a real concern when using the same pesticide time after time. Resistance develops fastest in species with high reproduction rates. Pesticide classes should be rotated to prevent resistance from occurring. The use of improper or sublethal rates can, in time, lead to resistance of many pests because it allows pests to mutate to the pesticide.
  
2. **Correct Answer: B**, Bulletin 504  
Explanation: Honeybees are important pollinating insects. Ornamentals should not be sprayed during full bloom periods. Honeybees can also be working weedy fields and weeds should be mowed to remove bloom before spraying ornamentals. In the long run good weed management should be practiced.
  
3. **Correct Answer: C**, Bulletin 504  
Explanation: The abbreviation IPM stands for Integrated Pest Management and should be in every grower's vocabulary. Many nursery and landscape management techniques can provide pest control if used with understanding.
  
4. **Correct Answer: B**, Bulletin 504  
Explanation: Sex attractants or pheromone lures are used to attract the male species of the insect to a trapping device. By following the emergence numbers of male insects, one can begin to target spray schedules.
  
5. **Correct Answer: A**, Bulletin 504  
Explanation: The development and appearance of various pests in Ohio varies from south to north. Growers should keep early records to note emergence dates of various pests.
  
6. **Correct Answer: F**, Bulletin 504  
Explanation: Approximate calendar dates should be used as a beginning reference point, but scouting, placement of pheromone traps, and monitoring of degree days will help growers specifically time their control efforts. Although flag placement by nursery inspectors helps, these often cannot be relied on for timely pest detection. Growers must do the work of inspection. Active scouting is the only method of determining if an insect or mite pest is present.
  
7. **Correct Answer: D**, Bulletin 504  
Explanation: The LD<sub>50</sub> value indicates how toxic a product may be. In many cases, the oral LD<sub>50</sub> is much lower than the dermal dose. Normally, one does not swallow the chemical compounds, but can often dermally contact the insecticide when mixing or conducting field checks.

8. Water quality issues relating to pesticide application should be of concern to nursery and landscape managers because:

- A. Pesticide runoff could percolate down through the soil or along well casings to contaminate groundwater
- B. Emptying spray tank rinsates near storm sewers can contaminate streams or surface waters.
- C. Pesticides can contaminate well water or city water supplies if back siphon check valves are not in use when filling spray tanks
- D. Heavy broadcast applications of pesticides on sandy soil that over lie shallow aquifers can leach into ground water
- E. All of the above

9. The Worker Protection Standard (WPS) covers employees when they are in any step of the production of plant material.

- A. True
- B. False

10. If you are a horticultural pesticide user or an employer of horticultural/agricultural workers or handlers, the Worker Protection Standard (WPS) requires you to provide your workers and sometimes yourself and others:

- A. Information about exposure to pesticides
- B. Protection against exposure to pesticides
- C. Ways to reduce exposure to pesticides
- D. All the above

11. The Restricted-Entry Interval (REI) is the time you feel like waiting before you or your employee can enter a pesticide treated area.

- A. True
- B. False

12. A perennial weed is one that:

- A. Grows, flowers, then dies
- B. Grows, flowers and comes back next year
- C. Returns yearly from established plant parts
- D. B & C

13. A weed that completes its life cycle from seed to seed in one year is:

- A. Perennial
- B. Biennial
- C. Annual

14. An example of a group of weeds that are considered annuals is:

- A. Crabgrass, barnyardgrass, knotweed
- B. Quackgrass, tall fescue, ground ivy, red sorrel
- C. Tall fescue, clover, oxalis

8. **Correct Answer: E, *Protecting Our Groundwater***

Explanation: All the answers are correct. Pesticide applicators always need to be aware of water quality issues before they apply products. Some products can percolate through some soil types or run off in excess rain and contaminate ground and surface waters. You should be careful when emptying tanks of prepared spray or rinsate. Check valves should be in place to prevent back-siphoning of pesticide containing mixed into a water supply system. Make it a practice to keep the end of fill hose loose above the water level in the spray tank.

9. **Correct Answer: A**

Explanation: Employees are classified as either workers or handlers based on the task they are performing. As workers they may be doing hand labor tasks like potting, weeding, cultivating or others like moving irrigation equipment in a nursery field. Later in the day the same person might be a “handler” doing jobs such as mixing, loading, or applying pesticides. In each case the WPS applies and as the employer, you must do certain things for your employees according to WPS guidelines.

10. **Correct Answer: D, Bulletin 843 *How to Comply***

Explanation: All the above are correct. As an employer you must inform employees about exposure to pesticides by conducting pesticide safety training, displaying a pesticide poster, providing access to labeling and centrally locating a list of pesticides applied and application information. You must also provide protection from pesticides by following the REI and PPE requirements as printed on the label, informing and excluding workers from treated areas and reducing pesticide exposure by providing decontamination sites and emergency assistance. All the requirements are printed in the *How to Comply - What Employees need to know*, Bulletin 843.

11. **Correct Answer: B**

Explanation: The restricted-entry interval (REI) is the time immediately after a pesticide application when entry into the treated area is limited. REI's are listed on each label and are set by the Environmental Protection Agency. The reentry interval cannot be set by the grower. Read the label each time as REI intervals can be changed by the EPA. If you use two or more pesticides at the same time, you must follow the longest REI.

12. **Correct Answer: D, Bulletin 271**

Explanation: Perennials return yearly from roots or stems. Plants such as tall fescue, quackgrass, orchard grass, timothy and Canada thistle have perennial life cycles. Annuals grow flower and then die leaving only the seeds to regenerate the plant.

13. **Correct Answer: C, Bulletin 271**

Explanation: Annual broadleaves and grasses germinate, grow, flower, set seed, and die all within one year. The cycle starts again from seed each year.

14. **Correct Answer: A, Bulletin 271**

Explanation: Crabgrass, barnyardgrass, foxtail, goosegrass and knotweed are annuals. Pre-emergent herbicides are used in early spring to prevent germination of annual grasses and broadleaves.



15. Which of the following weeds reestablishes itself from underground rhizomes every year?

- A. Crabgrass
- B. Quackgrass
- C. Foxtail
- D. Annual bluegrass

16. For the following items, indicate if each weed is an annual (A), biennial (B), or perennial (P) by placing an "A," "B," or "P" in each blank.

- |                   |                        |                        |                    |
|-------------------|------------------------|------------------------|--------------------|
| _____ Black Medic | _____ Annual Bluegrass | _____ Common Chickweed | _____ White Clover |
| _____ Dandelion   | _____ Crabgrass        | _____ Henbit           | _____ Goosegrass   |
| _____ Knotweed    | _____ Quackgrass       | _____ Pigweed          | _____ Tall Fescue  |
| _____ Purslane    |                        |                        |                    |

## Ornamental Herbicides

17. Herbicides should always be used to control weeds in ornamentals?

- A. True
- B. False

18. It is important to know the weed species in the area being treated before selecting a herbicide.

- A. True
- B. False

19. Which of the following groups of chemicals are post-emergent herbicides?

- A. Gramoxone (paraquat), Poast (sethoxydim), Fusilade 2000 (fluazifop butyl)
- B. Dacthal (DCPA), Eptam (EPTC), Surflan (oryzalin)
- C. Brom-o-Gas (methyl bromide), Chlor-o-Pic (chloropicrin)

20. All post-emergent herbicides can be directly used on nursery field stock without harm.

- A. True
- B. False

21. Certain temperature ranges are needed for soil fumigants to work well. Which of the following is the correct range?

- A. 30 F to 40 F
- B. 40 F to 50 F
- C. 50 F to 60 F

22. Under what weather conditions should Casoron (diclobenil) or Kerb (pronamide) be applied?

- A. Hot, rainy weather
- B. Late fall or early winter
- C. Bright sunshine

15. **Correct Answer: B**

Explanation: Although quackgrass can germinate from seed, Quackgrass is the only weed listed above that re-sprouts from perennial underground rhizomes which makes it difficult to control using a preemergence herbicide. Crabgrass, foxtail, and annual bluegrass all germinate from seed every year thus making them more susceptible to pre-emergence herbicides.

16. **Correct Answer: See Below**

- |                      |                           |                           |                      |
|----------------------|---------------------------|---------------------------|----------------------|
| <u>A</u> Black Medic | <u>A</u> Annual Bluegrass | <u>A</u> Common Chickweed | <u>P</u> White Clove |
| <u>P</u> Dandelion   | <u>A</u> Crabgrass        | <u>A</u> Henbit           | <u>A</u> Goosegrass  |
| <u>A</u> Knotweed    | <u>P</u> Quackgrass       | <u>A</u> Pigweed          | <u>P</u> Tall Fescue |
| <u>A</u> Purslane    |                           |                           |                      |

17. **Correct Answer: B**

Explanation: Growers should develop a weed control strategy that incorporates the options of organic and inorganic mulches, sanitation, and pre- and post- emergent herbicides.

18. **Correct Answer: A**

Explanation: Knowledge of the most prevalent weeds is necessary for proper herbicide selection. In ornamentals, Ronstar, Treflan or Dacthal should not be selected if ragweed is a problem. It is important to distinguish among broadleaves, grasses and sedges.

19. **Correct Answer: A**

Explanation: Knowing which products are pre- or post-emergent can be difficult, but professional horticulturists and agronomists need a general working knowledge of herbicide materials. Product names may change over time, and so may active chemicals. Growers must keep updated by attending Extension classes on a yearly basis.

20. **Correct Answer: B**

Explanation: Post-emergent herbicides can be used after weed emergence, but should not contact desirable ornamental species during application. Prevent damage by avoiding contact with foliage, trunks or stems with green tissue. Soil type and organic matter are also points to consider before herbicides are applied.

21. **Correct Answer: C, Bulletin 297**

Explanation: Soil temperatures should be at least 50 F to 60 F when using chloropicrin. Moist and well-worked soil is necessary for effective weed control with fumigants. Follow specific label instructions to avoid crop and personal injury.

22. **Correct Answer: B**

Explanation: The herbicides Casoron and Kerb work best under cool-weather situations in the late fall or early winter. For best results, keep in mind that temperature restrictions may apply to some herbicides.

23. Nursery managers can use just about any herbicide to treat a liner bed of perennials.
- A. True
  - B. False
24. How many pounds of active ingredients are in a 50-pound bag of a 4% granular herbicide?
- A. 40 pounds
  - B. 4 pounds
  - C. 2 pounds
25. A given area measures 275 by 325 feet. How much acreage is this to treat?
- A. 1.75 acres
  - B. 2.05 acres
  - C. 2.75 acres
26. Soils previously treated with high rates of herbicides can be tested for herbicide carryover by sowing which of the following plants to see if normal germination and growth occurs?
- A. Corn
  - B. Oats
  - C. Wing bean
27. Herbicides applied to nursery stock can lead to toxic residues that could injure plants. Which of the following herbicides might lend itself to buildup in the soil causing harm to nursery stock?
- A. Glyphosate (Roundup)
  - B. Trifluralin (Treflan)
  - C. DCPA (Dacthal)
  - D. Simazine (Princep)
28. An overdose of a herbicide is applied in a nursery situation. What type of product works best for absorbing the herbicide?
- A. Peat moss
  - B. Sand
  - C. Clay
  - D. Activated carbon/activated charcoal
29. A nursery manager needs to treat 3 acres with 50% Kerb wettable powder at the rate of 10 pounds active ingredient per acre. How many pounds of Kerb 50 WP are needed?
- A. 50 pounds
  - B. 60 pounds
  - C. 120 pounds

23. **Correct Answer: B**

Explanation: Growers should know the plants being treated in the nursery both above and below ground. To avoid injury, always check labels for registered plant uses. Very few herbicides are registered for perennials.

24. **Correct Answer: C**

Explanation: A 4% granular material contains 4 pounds of active ingredient per 100 pounds of material. In our example, the 50-pound bag would contain only 2 pounds of active ingredients (.04 x 50 = 2 pounds).

25. **Correct Answer: B**

Explanation: Multiply 275 feet by 325 feet to get 89,375 square feet. Divide 89,375 by 43,560 square feet in one acre to get 2.05 acre.

$$275 \text{ ft.} \times 325 \text{ ft.} = \frac{89,375 \text{ sq.ft.}}{43,560 \text{ sq. ft. in 1 acre}} = 2.05 \text{ acre}$$

26. **Correct Answer: B**

Explanation: The use of living plants to test for herbicide carryover is known as a bioassay. Oats are fairly sensitive to many herbicides. Results of good or poor growth will be seen in about two to three weeks. If oats grow well, nursery crops can be planted.

27. **Correct Answer: D**

Explanation: Of the herbicides listed, simazine (Princep) is a longer lasting (greater than 6 months) herbicide. The residual time is sometimes noted on the label or attached product labeling. Repeated use of the same herbicide, especially one that does not degrade rapidly, can lead to damage of nursery stock.

28. **Correct Answer: D**

Explanation: Activated carbon or activated charcoal can be used at the rate of 150 pounds times the suspected active ingredient per acre to absorb the herbicide. Plant roots are sometimes dipped in activated charcoal to protect them at transplanting.

29. **Correct Answer: B, Bulletin 297**

Explanation: Use the following formula. (Note: a.i. is the abbreviation for active ingredient.)

$$\frac{\text{lbs. a.i. per acre}}{\% \text{ formulation}} = \text{lbs. required per acre}$$

Then: lbs. required per acre x number of acres to treat = total lbs. required

$$\frac{10 \text{ lbs. per acre}}{.50} \times 3 = 60 \text{ lbs. Kerb WP}$$

30. How much 4% granular herbicide is required to treat 10,000 square feet at a rate of 6 pounds of active ingredient per acre (aia) in a 1 foot band? The rows are 4 feet apart.

- A. 6 lbs.
- B. 8.5 lbs.
- C. 4 lbs.
- D. 10 lbs.

31. A sprayer used to apply 2,4-D and other closely related herbicides should not be used around the nursery to apply insecticides and fungicides.

- A. True
- B. False

32. A herbicide that stops the emergence of weeds is said to be:

- A. Post-emergent
- B. Pre-emergent
- C. Non-emergent

33. When applying herbicides to newly planted ornamentals you must be sure the plants are established.

- A. True
- B. False

## **Ornamental Insects**

34. When insects are detected on a crop, growers must spray every visible insect to have a pest-free crop.

- A. True
- B. False

35. When treating for scale insects, growers should spray every week.

- A. True
- B. False

36. The best chemical tactic for control of borers is:

- A. Spray to kill adults
- B. Apply protectant spray before egg laying or egg hatch
- C. Inject insecticide into plants already infested



37. Horticultural oils kill insects by:

- A. Action on the nervous system
- B. Action on the visual system
- C. Suffocation

38. To detect pests, nursery managers should do the following:

- A. Call the county agent
- B. Rely on commercial spray guides
- C. Inspect regularly during pest-buildup periods, looking for loss of leaf color, chewing and actual pests

39. Spray adjuvants (spreaders and stickers) should always be added to tank mixes to make them work better.

- A. True
- B. False

40. Insecticides are best used in early spring when lower temperatures are expected.

- A. True
- B. False

41. An insecticide that is absorbed and translocated within a plant is said to be:

- A. Lipophilic
- B. Contact
- C. Systemic

42. The major advantages of systemic insecticides are that they:

- A. Dissipate rapidly in the plant
- B. Have little direct effect on beneficial insects, are not subject to rapid environmental breakdown and are moved within the plant
- C. Are easy to apply

43. Microbial insecticides are now being used to control insects. A common one is B.t. or *Bacillus thuringiensis*. What insects are controlled with current Bt formulations?

- A. Aphids, leafhoppers, scale
- B. Caterpillars, elm leaf beetle, mosquitos
- C. Grasshopper, crickets, preying mantis

44. Soaps kill insects and mites by:

- A. Interfering with the respiratory system and outer membranes.
- B. Acting directly on the nervous system
- C. Acting on the visual system

37. **Correct Answer: C**, Bulletin 504  
Explanation: Horticultural oils are petroleum or plant based hydrocarbon products that have insecticidal/miticidal activity. Toxicity appears to be caused by suffocation and/or membrane disruption and so oils are often effective on both eggs and adults. Oils are available as dormant or summer sprays. When a dormant oil is used during plant dormancy it has minimal adverse effects on beneficial insects.
38. **Correct Answer: C**, Bulletin 504  
Explanation: Growers should know when to expect pests and then search fields on a regular basis during buildup periods. Search by looking at the back sides of leaves on both the upper and lower portions of the plant. Evening is a good time to inspect.
39. **Correct Answer: B**, Bulletin 504  
Explanation: Spray adjuvants should not be added unless specified by the pesticide label.
40. **Correct Answer: B**, Bulletin 504  
Explanation: The temperature at the time of insecticide treatment can influence effectiveness. It's a good policy to spray insecticides between 50 F and 90 F. Many insecticides are less effective below this range or may cause plant damage above the upper limit, especially if plants are under water stress.
41. **Correct Answer: C**, Bulletin 504  
Explanation: A systemic insecticide by its name indicates that the material is taken in by the plant roots, stems or leaves and is translocated by the movement of sap from the treated areas to other parts of the plant.
42. **Correct Answer: B**, Bulletin 504  
Explanation: Systemic insecticides are quite active and will move within the plant. Beneficial insects are not injured because they are not eating the plant tissue. Systemic insecticides will last a reasonable amount of time because of time they are protected inside the plant tissue.
43. **Correct Answer: B**  
Explanation: B.t. compounds are generally used to control the larva or caterpillars of a variety of moths and butterflies. There are also some B.t. strains that will kill larva of certain flies, mosquitoes, elm leaf beetle and colorado potato beetle. B.t. toxins attack the membrane of the gut lining of the larval insect. Such compounds are relatively non-toxic to humans and many other insect species so selective control measures can be applied in environmentally sensitive areas.
44. **Correct Answer: A**, Bulletin 504  
Explanation: Soaps apparently disrupt the respiratory system and disrupt cell membranes. Currently available soap products are derived from plant fats and oils. Generally the soft bodied insects are better targets for soap use. Soaps are considered a better choice for environmentally sensitive areas.



45. These tiny pests cause a stippling and yellow appearance as well as webbing on many types of ornamental leaves. These pests which are not true insects are called:

- A. Aphids
- B. Plant Bugs
- C. Mites
- D. None of the above

46. White pine trees can often be found covered with a soft-bodied insect that is white and cottony in appearance. The name of this insect is:

- A. Pine sawfly
- B. Pine shoot beetle
- C. Pine bark adelgid
- D. Pine needle scale

47. Which insect pest found on junipers, honey locust and other plants makes its home out of the needles and leaves of the plant it lives upon?

- A. Black vine weevil
- B. Oyster shell scale
- C. Bagworm
- D. Fall webworm

48. Which insect pest of nursery crops is not seen during the day, but damage is often seen as a notching along leaf margins? The larvae cause major damage to plant roots.

- A. Black vine weevil
- B. Japanese beetle
- C. Tent caterpillars
- D. Aphids

49. Adult Japanese beetle damage to ornamentals is often seen as:

- A. Skeletonized leaves
- B. Yellowing of leaves
- C. Leaves clipped off at the stem
- D. Chewed leaf edges

## **Ornamental Diseases**

50. The same fungicide should be used weekly, month after month, to control disease problems in ornamentals and turf.

- A. True
- B. False

45. **Correct Answer: C, Bulletin 504**

Explanation: Mites or spider mites are very tiny pest that attack ornamentals by sucking plant juices from leaves causing a yellowing and stippling. Proper identification is important in determining control timing. Their development is often favored by hot dry weather but there are “cool” season species that attack plants. Warm-season mites such as the two-spotted mite and European red mite are favored by warm to hot, dry weather. The cool-season mites are: spruce spider mite on conifers and southern red mite. Because mites are not true insects, often insecticides will not control them.

46. **Correct Answer: C, Bulletin 504**

Explanation: Pine bark adelgid is a soft-bodied insect with a cottony-like appearance. This insect sucks sap from the white pine tree. Dormant oil can be used in spring as a dormant treatment. Other labeled insecticides are applied when crawlers are active in mid-May. A fast stream of water can be used to wash many adelgids from trees.

47. **Correct Answer: C, Bulletin 504**

Explanation: Bagworms clip foliage from the plants they feed upon and build or weave together a portable (bag) in which to hide.

48. **Correct Answer: A, Bulletin 504**

Explanation: Black vine weevils are night-feeding insects that hide around the base of plants during the day. Notches on leaf edges are often the first indication of a problem. The larvae feed on roots, causing major plant damage. Since Black vine weevils are a major pest in nursery stock, growers should monitor for this insect. Many of the insecticides used to control BVW are in the very toxic class.

49. **Correct Answer: A**

Explanation: Adult Japanese beetle “skeletonize” or chew all of the leaf surface except the veins. This form of damage is very characteristic in July and August. Other skeletonizers are sawfly slugs and the oak leaf skeletonizers.

50. **Correct Answer: B**

Explanation: Constant use of one fungicide may lead to development of “resistant” fungus strains that are not controlled effectively. Growers should switch between chemical fungicide classes on a regular basis. Alternating pesticide classes is important when using insecticides or herbicides, as well.

51. The proper environment, a susceptible plant and a pathogen (or disease-causing organism) are the necessary elements for infectious plant disease to occur.
- A. True
  - B. False
52. Nursery growers should be aware of several bacterial diseases in ornamental crops. Common names for these bacterial diseases are:
- A. Fireblight, crown gall, bacterial leaf spot
  - B. Anthracnose, leaf spot, rust
  - C. Nematodes, virus, mycoplasma
53. Plant material showing general symptoms of vein banding, mosaic, flecking or ringed spotting is probably infected by:
- A. Anthracnose
  - B. Virus
  - C. Rust
  - D. Powdery mildew
54. White growth appearing on the leaves, flowers, fruits and stems is a sign of what disease?
- A. Rust
  - B. Anthracnose
  - C. Powdery mildew
55. Masses of orange to dark-red spores on plant leaves or twigs is a sign of:
- A. Powdery mildew
  - B. Rust
  - C. Anthracnose
56. Root and crown rots are caused by a number of fungi. One characteristic of these fungi is their ability to:
- A. Form specially adapted resting structures in the soil
  - B. Transfer to leaves of plants
  - C. Be found on flowers
57. Plant-wilting fungi such as *Verticillium* make their impact on plant material by:
- A. Spotting leaves
  - B. Plugging the vascular system
  - C. Causing swelling of the roots and stems
58. Several episodes of leaf wetting and splashing water are needed for development of what types of disease?
- A. Tomato spotted wilt virus
  - B. Anthracnose
  - C. Crown rotting

51. **Correct Answer: A**

Explanation: The three elements of host, environment and pathogen must come together for disease to occur. By changing the environment or the host, growers can prevent diseases.

52. **Correct Answer: A**

Explanation: Knowledge of various plant diseases is essential. Most diseases are caused by fungi. Of the relatively few caused by bacteria, fireblight, crown gall, and bacterial leaf spot can be destructive. Fireblight often attacks crabapples, pears, mountain ash, cotoneaster and other members of the rose family causing a distinctive shepherd's crook at the branch tip. Crown gall attacks a wider range of plants causing a round "golf ball" to baseball size irregular swelling on roots and stems of susceptible plants. Bacterial leaf spots are often seen on English ivy causing water soaked spots on the leaves.

53. **Correct Answer: B**

Explanation: Virus infections make the plant stick with various abnormalities such as a mosaic, vein banding, flecking, ringed spotting or large growths. A positive identification can be made by specific viral tests on plant tissue.

54. **Correct Answer: C**

Explanation: Powdery mildew expresses itself as a white powdery growth on plant tissue. Many small structures grow within plant cells, injuring them as they obtain food. Good air circulation, proper spacing and use of fungicides will control this disease.

55. **Correct Answer: B**

Explanation: Masses of red to orange spores are a good sign of a rust disease organism. Rust diseases are common on Washington hawthorns, asters, junipers, crabapples and snapdragons (and turf). Cool, wet weather generally favors rust disease.

56. **Correct Answer: A**

Explanation: Root and crown rotting fungi attack a wide variety of crops. Specialized resting structures allow the fungi to persist in the soil for many months. Avoid planting liners too deep, prevent excessive soil dryness and practice good sanitation.

57. **Correct Answer: A**

Explanation: The Verticillium fungus invades by growing in the vascular or water conducting system of the plant and plugging it. Fungal plugging of the vascular system prevents water from moving upward in the plant and thus causes wilting. Control involves selecting plant species resistant to the problem. Avoid planting susceptible plants in known Verticillium contaminated sites. Chemical controls are not practical at this time.

58. **Correct Answer: B**

Explanation: The leaf-spotting diseases such as anthracnose, black spot, scab and alternaria spots are spread by air and splashing water. Avoid overhead irrigation, or irrigate early in the day and apply protective fungicides before disease is expected.

59. When choosing plants for propagation, growers can select any plant from the field.
- A. True
  - B. False
60. Root rots in container production are often favored by heavy mixes and excess fertilization.
- A. True
  - B. False
61. Plants stored over winter in plastic covered structures often are attacked by what fungus problem?
- A. Rust
  - B. Botrytis
62. Fungicides can show systemic activity. Which of the following are considered systemic in action?
- A. Captan, Folpet
  - B. Chlorothalnil (Daconil 2787), Fixed Coppers, Vinclozolin (Ornalin)
  - C. Metalaxyl (Subdue Maxx), Phosetyl-A1 (Aliette), Triadimefon (Bayleton)
63. When a disease is discovered in plants, it is important to spray immediately.
- A. True
  - B. False
64. A correct plant disease diagnosis is not necessary because fungicide sprays are broad-spectrum in control.
- A. True
  - B. False
65. A fungicide or insecticide can be used on any plant that has the specific pest problem it is labeled to control.
- A. True
  - B. False
66. When using a fungicide, you need to spray only the upper leaf surfaces where you see the disease.
- A. True
  - B. False
67. Fungicide applications can wear away or lose effectiveness over time.
- A. True
  - B. False

59. **Correct Answer: B**

Explanation: Stock plants should be kept under close observation throughout the growing season. Make sure plants are healthy in the early spring as well as just before propagation time. Many viruses show symptoms only in the spring and become healthy-looking later in the season.

60. **Correct Answer: A**

Explanation: Production of container-grown stock means checking the mixes for aeration, drainage and fertilizer salts. All can prune roots with invading disease organisms, causing decline and death of the plant.

61. **Correct Answer: B**

Explanation: Botrytis gray mold is one of the most common storage diseases. Botrytis will grow in temperatures from 29 F to 90 F. Fungicides such as chlorothalonil, benomyl or mancozeb are labeled for preventive applications. New fungicides may be introduced, so check for updates.

62. **Correct Answer: C**

Explanation: There is no way to tell from the fungicide name whether the product is systemic in action. Periodic reading of publications and product literature will help keep growers current on fungicide properties. This knowledge can be advantageous to growers.

63. **Correct Answer: B**

Explanation: Spraying is important, but is really third in the line of defense. Growers should first make use of resistant varieties that have been grown in an environment favoring plant growth over disease.

64. **Correct Answer: B, HYG 3038-95**

Explanation: Gone are the days when general-use materials provided control for just about everything. New products are very specific, so correct diagnosis must be made. Be sure to consult Ohio State's Plant Pest and Diagnosis Clinic or your local Extension agent.

65. **Correct Answer: B, HYG 3038-95**

Explanation: Growers must make sure the intended crop or plant type is on the label. It is a violation of the federal pesticide law to use a chemical on any site or plant not listed on the label. It is illegal to use a pesticide in any manner inconsistent with the label.

66. **Correct Answer: B, HYG 3038-95**

Explanation: Growers may see disease symptoms only on upper leaf surfaces, but various diseases can get started on the lower leaf surface. Be sure to spray the under-surface of leaves, especially lower leaves on the plant. Spreader stickers or spray adjuvants are often incorporated into purchased sprays. You may need to add adjuvant to wet hairy or waxy leaf surfaces.

67. **Correct Answer: A, HYG 3038-95**

Explanation: Fungicides are worn away by rain, sunlight, oxidation and microbial activity. Reapplication may be necessary to keep an active fungicide barrier present to prevent disease.

68. For best control, most fungicides should be applied after the disease is noticed.

- A. True
- B. False

## **Animal Pests**

69. When growers see lower-stem girdling and root girdling on tree or shrub species, they should start looking for:

- A. Rabbits
- B. Mice
- C. Salamanders

70. What time of year is best to apply toxicant baits for mouse control in ornamentals?

- A. Spring
- B. Fall
- C. Summer
- D. Winter

68. **Correct Answer: B**, HYG 3038-95

Explanation: Most fungicides need to be applied before disease symptoms appear. Growers should know the conditions that favor disease so that they will know when diseases are likely to develop. Application timing should be just before the fungus arrives on the plant surface.

69. **Correct Answer: B**, Bulletin 504

Explanation: Mice damage ornamentals by root pruning and/or root and trunk girdling. Mice will feed low on the plant. Rabbits often feed higher up because of snow levels. The insect, black vine weevil, can also girdle trunks of plants.

70. **Correct Answer: B**, Bulletin 504

Explanation: The most effective period for mouse-bait application is in the fall before snow cover and after grass is down from frost. Select clear sunny days because mice are most active under these conditions.



## ORNAMENTAL PEST CONTROL

### SCORE CARD

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No. OF CORRECT ANSWERS	%CORRECT	EVALUATION
63-70	> 90%	<b>Excellent</b> You have a very good understanding of ornamental and turf pests and their control.
56-62	>80%	<b>Good</b> Be sure you understand those questions that you missed. It may help to read the references again, and re-answer the questions you missed.
49-55	>70%	<b>Needs Improvement</b> Your score indicates a borderline level of expertise. Be sure to re-read the cited references again and re-answer the questions you missed.
0-48	<70%	Re-read the recommended references and work through the workbook again.