

# Ohio Pesticide Applicator Training

Vegetable Production

Student Workbook

 For Sale Publication

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## Preface

This workbook was prepared by the Ohio Cooperative Extension Service 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 Vegetable Crops Category 3A. The sample questions presented in this manual will help the reader obtain a general understanding of vegetable crop pest problems, approaches to control, and general information needed to apply and use pesticides safely.

## How to Use This Workbook

This workbook is designed to serve as a supplementary study guide to the following bulletins published by the Ohio Cooperative Extension Service. Extension publications are available through county offices of the Ohio Cooperative Extension Service.

Bulletin 672 *Ohio Vegetable Production Guide*  
HYG-3038-96 *Using Fungicide Sprays Effectively*

### Additional References

HYG-3117-96 *Blossom End Rot of Tomato, Peppers, and Eggplant*  
HYG-3102-95 *Late Blight of Potato and Tomato*  
HYG-3101-95 *Early Blight of Potato and Tomato*  
HYG-3114-96 *Anthracnose of Tomato*  
HYG-3122-96 *Fusarium and Verticillium Wilt of Tomato, Pepper, and Eggplant*  
Bulletin 843 *The Worker Protection Standard for Agricultural Pesticide - How to Comply*  
HYG-3109-95 *Mosaic Virus Diseases of Vine Crops*  
HYG-2205-94 *Integrated Pest Management for the Home Vegetable Garden*  
Bulletin *Wilt Disorders of Cucurbits*  
NCR 261

Users should read the appropriate sections of these references before attempting to answer questions in the workbook. When using 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, check to see if the responses are correct, mark those incorrect, and read the Explanation for each question. If the Explanation is confusing or if you disagree with the answer or Explanation, refer to the section indicated in the reference.

## **Important Topics that Vegetable Applicators Should Recognize**

There are many crops that fall under the Vegetable category. In order to help guide your study when preparing for the applicator exam, the following list has been prepared. This list points to the key crops and the key pest problems that are emphasized on the exam.

### **Commodities**

Solanaceous Crops (Tomato / Potato / Pepper)

Sweet Corn

Vine Crops (Pumpkins / Cucumbers)

Cole Crops (Cabbage)

Lettuce

### **Tomatoes / Potato / Pepper**

- Early blight
- Anthracnose
- European corn borer : peppers
- Colorado Potato beetle : potato & tomato
- Late blight
- Tomato wilts
- Blossom-end rot
- Variegated cutworm : tomato
- Bacterial Diseases

### **Sweet Corn**

- European corn borer
- Corn earworm
- Stewart's wilt

### **Vine Crops**

- Bacterial wilt (cucumber beetles)
- Fungal diseases - powdery mildew
- Black rot & gummy stem rot
- Viruses
- Cucumber Beetles

### **Cole Crops**

- Loopers / worm complex
- Onion thrips
- Black leg & black rot

### **IPM**

- General pests
- Aphids
- Spider Mites
- Loopers
- Leafhoppers
- Tomcast
- Blitecast



# Pesticide Information

1. Days to harvest refers to:
  - A. Days it takes a crop to mature
  - B. Time between last application of a pesticide and harvest
  - C. Product and harvesting of the product
  - D. Number of days it takes to harvest the crop
  
2. During the restricted entry interval, a handler may enter a treated field:
  - A. Any time after a pesticide has been used
  - B. If he/she is trained and wearing protective equipment
  - C. When the smell is gone
  - D. When wearing normal clothing
  - E. After 48 hours
  
3. You should always use a spray adjuvant when applying crop protection products.
  - A. True
  - B. False
  
4. Pesticide recordkeeping is for the grower's use only.
  - A. True
  - B. False
  
5. As a general rule, one should not spray when temperatures exceed 90 F.
  - A. True
  - B. False
  
6. Failure of pest control may be caused by:
  - A. Delaying application until pests are large and numerous
  - B. Making applications with insufficient gallonage and worn nozzles
  - C. Selecting the wrong pesticide
  - D. Repeated use of the same pesticide
  - E. All of the above
  
7. Effective pest control can be achieved by:
  - A. Inspecting fields twice a week for pest buildup
  - B. Providing adequate coverage of plants
  - C. Selecting the proper crop protection product
  - D. Keeping the sprayer in proper working condition by calibrating and replacing worn nozzles
  - E. All of the above

1. **Correct Answer: B**, Bulletin 672  
Explanation: This time period provides a safe cushion from potentially harmful residues. It must be observed even if the crop is threatened by weather or other adverse conditions. You should check the label before using a pesticide to determine the legal harvest interval allowed.
  
2. **Correct Answer: B**, Bulletin 843, *How To Comply*  
Explanation: The statement concerning reentry is always printed on the label. Under the WPG (Worker Protection Standard) handlers may enter treated areas under the REI to perform handling tasks if they are trained and equipped with PPE. In general, workers must be kept out and information regarding where and for how long the REI is in effect must be communicated to workers. WPG allows worker entry into a treated area only in a few narrow work situations. When early entry is permitted under the WPG, special precautions must be given to the early-entry workers, such as protective equipment.
  
3. **Correct Answer: B**, Bulletin 672  
Explanation: It depends on the product used and the crop it is used on. Always read the label.
  
4. **Correct Answer: B**, Bulletin 672  
Explanation: Recordkeeping is required by law and is useful to the grower, as well.
  
5. **Correct Answer: A**, Bulletin 672  
Explanation: At high temperatures, some materials can be harmful to plants.
  
6. **Correct Answer: E**, Bulletin 672  
Explanation: Pest control measures may fail for several reasons, including all of those listed.
  
7. **Correct Answer: E**, Bulletin 672  
Explanation: Following these rules greatly increases the chances of effective pest control.



8. Pesticide resistance can be reduced by:
- A. Occasionally changing to a material of another chemical class
  - B. Using more of the chemical the first time to take out all the insects
  - C. Spraying as soon as some of the insects are observed in the field
  - D. All of the above
9. Some pyrethroid insecticides may be less effective when:
- A. Applied by an air-blast sprayer
  - B. The air is calm
  - C. Temperatures during and after application are above 85 F
  - D. None of the above
10. A grower wants to spray Bravo 720 fungicide on tomatoes and has twin rows on 60-inch beds. He wants to apply 50 gallons per acre. There are two nozzles per row. According to a spray calibration table, he would have to apply 50 ounces for every 136 feet of row to achieve 50 gallons per acre. He would like to travel at 3 miles per hour. Assume he has the proper nozzles and pressure to deliver the proper amount of spray material. In order to travel at 3 miles per hour, how many seconds will it take to travel the 136-foot test strip?
- A. About 15 seconds
  - B. About 30 seconds
  - C. About 45 seconds
  - D. About 60 seconds
11. A grower wants to spray Bravo 720 fungicide on 10 acres of tomatoes. He wants to apply 3 pints per acre. His spray equipment is calibrated to apply 50 gallons per acre. He has 10 acres he needs to spray. The spray tank size is 500 gallons. How many gallons of Bravo 720 must he add to the tank to get the proper application rate?
- A. 1.55 gallons
  - B. 2.25 gallons
  - C. 3.75 gallons
  - D. 5.35 gallons
12. The herbicide Treflan is applied at the rate of 1 pound active ingredient per acre for vegetables. If you want to apply this material in a band application over the row, you should:
- A. Apply at the rate of 1 pound per acre
  - B. Base the amount of herbicide used on the treated area
  - C. Never band herbicides in vegetable production
  - D. Apply at the rate of 1 pound per acre, but adjust the amount of herbicide used
13. If a herbicide is formulated as "Kill-All 50% WP," it contains:
- A. 50% of its liquid content as active ingredient
  - B. 5 pounds active ingredient per gallon
  - C. 2.5 pounds active ingredient in a 5-pound bag
  - D. 2.5 pounds active ingredient per gallon

8. **Correct Answer: A**

Explanation: Do not depend on one material to do the job, no matter how effective it is. Change to a material of another chemical class occasionally (monthly, for example). This may help reduce the development of pesticide resistance. Using the material only when needed and at the right rate will also reduce the potential for resistance. This practice is environmentally sound and will help preserve pesticide tools for the future. New pesticide development has slowed during the past several years.

9. **Correct Answer: C**

Explanation: Pay attention to temperature when using pyrethroids. Some may be less effective if temperatures during and after application are above 85 F.

10. **Correct Answer: B**

Explanation:

$5,280 \text{ feet per mile} \times 3 \text{ miles per hour} = 15,840 \text{ feet per hour}$

$136/15,840 = .0086 = \text{part of hour needed to cover 136 feet}$

$1 \text{ hour} = 3,600 \text{ seconds}$

$3,600 \text{ seconds} \times .0086 = 30.96 \text{ seconds}$

11. **Correct Answer: C**

Explanation:

$500 \text{ gallons} / 50 \text{ gallons per acre} = 10 \text{ acres of coverage}$

$3 \text{ pints per acre} \times 10 \text{ acres} = 30 \text{ pints}$

$30 \text{ pints} / 8 \text{ pints per gallon} = 3.75 \text{ gallons}$

3.75 gallons of Bravo 720 would be added to 496.25 gallons of water to make 500 gallons of spray material

12. **Correct Answer: B, Bulletin 672**

Explanation: Band application is used to reduce the cost per acre. While not practical with narrow-row spacings, it is very useful with wide-row spacings. While the rate used stays the same, the actual area treated determines the amount of herbicide to be used per acre.

13. **Correct Answer: C, Bulletin 672**

Explanation: 50 WP means that 50% of the contents is composed of active ingredient. In a 5-pound bag, the active ingredient is 2.5 pounds. WP stands for wettable powder, which is a dry formulation.

14. Factors that affect or control accurate herbicide application are (pick the best answer):
- A. Rate and formulation
  - B. Tank agitation
  - C. Tractor speed
  - D. Nozzle size
  - E. All of the above
  - F. None of the above
15. If the desired tractor speed for proper herbicide application is 4 mph, then slowing down at row ends to 2 mph means the rate of application will be:
- A. Double the normal rate
  - B. Half the normal rate
16. Granular applicators for herbicides can be calibrated at the beginning of the season and used without further attention.
- A. True
  - B. False
17. Herbicides cannot be applied at less than the labeled rates.
- A. True
  - B. False
18. Pesticide drift must be controlled because:
- A. It can damage near-by plants
  - B. It can cause illegal residues on near-by crops
  - C. It can result in financial damage responsibilities for the grower and applicator
  - D. All the above
  - E. None of the above
19. Herbicide rates are affected by:
- A. Weed size and soil type
  - B. Soil temperature
  - C. Moisture content of the soil
  - D. All the above
  - E. None of the above
20. Pesticides that are not compatible when mixed together can cause
- A. Loss of effectiveness against the target pest
  - B. Injury or damage to the treated area
  - C. Separation of ingredients or settling out
  - D. All of the above

14. **Correct Answer: E**, Bulletin 672  
Explanation: Herbicides must be applied at the correct rate. A lower rate can result in poor weed control, but can be effective in some vegetable crops. Too high a rate can result in crop injury. Be sure to pick the right formulation; granular herbicides may be more effective in certain situations. Tank agitation allows for thorough mixing and prevents settling in the bottom of the tank. The correct nozzle size ensures proper coverage with the desired spray pattern.
15. **Correct Answer: A**, Bulletin 672  
Explanation: If tractor speed is reduced by a factor of 50%, the chemical rate of application is doubled because it takes twice as long to cover the same distance or area.
16. **Correct Answer: B**, Bulletin 672  
Explanation: When granular herbicides are used, frequent calibration of granular equipment is important. Remember that each kind of granular herbicide requires separate calibration. Frequent calibration is important in all agricultural situations.
17. **Correct Answer: B**, Bulletin 672  
Explanation: The amount of herbicide applied per acre can be reduced below recommendations through experience. Or, with band applications, the actual area of the acre treated determines the amount of herbicide to be used per acre. But, growers should never exceed the recommended rate per acre for any chemical based on actual area treated.
18. **Correct Answer: D**  
Explanation: Drift is the number one complaint to the Ohio Department of Agriculture and may result in any one of the above adverse effects. Fines and penalties may result. Often damage from drift or off target movement by volatile materials is apparent long distances from the site of application. Special care needs to be taken to assure the safety of sensitive non-target plants such as tomatoes, grapes and tobacco. Most problems arise from spraying when windy, with high pressure, with a volatile material and at high temperatures.
19. **Correct Answer: A**, Bulletin 672, *Herbicide Recommendations*  
Explanation: Weed size and soil type can influence the rate of herbicide to be used. Smaller weeds are more easily controlled and may require a lower herbicide rate than older weeds. The type of soil will influence whether herbicides are bound to the soil or are more likely to leach or breakdown rapidly. Organic matter and clay content in the soil affects the amount of herbicide that should be used.
20. **Correct Answer: D**, Bulletin 843  
Explanation: Sometimes different pesticides can be mixed together to control a wider range of pests with a single application. Labels may list other pesticides that are compatible. Be careful with do-it-yourself mixes. You should do a jar test to make sure mixes are compatible and spray a small area of the field to see if the mixture will cause crop damage.

21. When using pesticides for agricultural plant uses, vegetable growers with one or more workers will have to comply with the following generic provisions of the WPS:
- A. Pesticide safety training
  - B. Decontamination sites
  - C. Emergency assistance
  - D. Central information posting
  - E. All of the above
22. On farms, any worker who might enter a treated area or walk within 1/4 mile of a treated area during application must be warned by:
- A. Oral notification of locations and description of treated area and / or posted warning signs
  - B. Oral notification of pesticide used
  - C. Oral notification of pest in treated areas
  - D. A & B
  - E. A & C

## Insect Control

23. Which insecticide is more toxic to bees?
- A. Carbaryl wettable powder (Sevin 50WP)
  - B. Carbaryl emulsifiable concentrate (Sevin XLR-Plus)
24. Two insecticides that are relatively non-toxic to bees are B.t. (Dipel) and rotenone.
- A. True
  - B. False
25. Precautions growers can take to protect bees include:
- A. Avoiding application when crops are in bloom
  - B. Spraying during early morning or late evening
  - C. Choosing the least-toxic insecticide
  - D. All of the above
26. If holes are eaten in seeds, the insects responsible might be:
- A. Root maggots
  - B. Wireworms
  - C. Seed maggots
  - D. Hessian fly
27. Which of the following is recommended to control root maggots?
- A. In-furrow treatments
  - B. Transplant water treatments
  - C. Both A & B
  - D. None of the above

21. **Correct Answer: E**, Bulletin 843

Explanation: A farm establishment with one or more employees who perform tasks related to the cultivation and harvesting of plants must comply with all the generic provisions of WPS, if the workers will be in an area which has been treated with pesticides within the last 30 days.

22. **Correct Answer: A**, Bulletin 843

Explanation: Farm owners and operators with one or more employees are required to comply with the generic provisions of the WPS. Among these provisions is the requirement to give either oral or written notification to workers who might enter or walk within 1/4 mile of a treated area. The oral warning must include the location and description of the treated area, time of REI, and instructions not to enter the treated area. A posted warning sign with certain requirements for site, color, wording, information and posting site may also be used to warn farm workers of treated areas.

23. **Correct Answer: A**, Bulletin 672 “Pollination”

Explanation: Insecticide particles from a WP insecticide can stick to a bee’s body and be taken back to the hive where they can be toxic; particles are less mobile in EC residues.

24. **Correct Answer: A**, Bulletin 672 “Pollination”

Explanation: *Bacillus thuringiensis* (Dipel) and rotenone are two of the four insecticides listed as being relatively non-toxic to bees.

25. **Correct Answer: D**, Bulletin 672 “Pollination”

Explanation: Avoid killing bees by noting these tips: Spray during the evening or early morning; avoid spray puddles when the rig is emptied or cleaned; choose pesticides that are least injurious to bees; and, if possible, avoid application when bees are visiting crops and when weeds are in bloom.

26. **Correct Answer: C**, Bulletin 672

Explanation: Seed maggots feed on germinating seeds.

27. **Correct Answer: C**, Bulletin 672

Explanation: Transplant water treatments, in-furrow treatments, and preplant” broadcast and postplant treatments may be recommended for control of root maggots in a specific crop.

28. Plants are yellow and wilting. You pull the plants and some of the roots are eaten off. The insect most likely responsible is:
- A. Cutworm
  - B. Slug
  - C. White grub
  - D. Wireworm
29. Some of your vegetable plants are cut near the soil surface, and some of the fruit is eaten on others. The insects most likely to cause this problem are:
- A. Slugs
  - B. Seed maggots
  - C. Cutworms
  - D. Both A & B
30. What soil insect is a slender, short legged larvae with a pale yellow to reddish-brown body and a brown flattened head?
- A. Seedcorn maggot
  - B. Wireworm
  - C. None of the above
31. Small tunnels are noticed in young, growing potato tubers. What insect is attacking them?
- A. Woolly worm
  - B. Seed corn maggot
  - C. Cutworm
  - D. Wireworm
32. Colorado potato beetles are insect pests of:
- A. Tomatoes
  - B. Eggplant
  - C. Potatoes
  - D. All of the above
33. Spider mite damage on beans or melons looks like:
- A. Brown holes in stems
  - B. White speckling on leaves
  - C. Ragged holes in leaves
34. Potato leafhopper damage on beans looks like:
- A. Ragged holes in leaves
  - B. Edges of leaves turn yellow
  - C. Leaves curl at edges
  - D. B & C
35. Very few vegetables commonly grown in Ohio are damaged by aphids.
- A. True
  - B. False

28. **Correct Answer: C**, Bulletin 672

Explanation: White grubs can be serious pests of vegetable crops. Grubs feed on roots and cause yellowing and wilting.

29. **Correct Answer: C**, Bulletin 672

Explanation: Cutworms injure plants in four principal ways. Surface cutworms, such as the black cutworm, sever plants near the soil surface. Climbing cutworms, such as the variegated cutworm, climb plants and eat leaves and fruit. Army worms occur in great numbers and consume nearly all plant foliage. Subterranean cutworms, such as the greasy cutworm, remain in the soil to feed on roots and underground parts of stems.

30. **Correct Answer: B**

Explanation: Wireworms are slender, short legged larvae with a pale yellow to reddish-brown body and a brown flattened head. When mature, they are 1 1/4 inches (32 mm) long and about 1/8 inch in diameter. Wireworms do more damage during cool, wet springs, especially in fields following sod or other grasses. Seeds are often hollowed out, leaving only the empty hull. Roots are pruned and usually rot. Wireworms also can tunnel in or feed superficially in the underground stem of seedlings. This injury causes wilting, distorted growth and often death of the injured plants.

31. **Correct Answer: D**, Bulletin 672

Explanation: Wireworms attack tubers and bulbs.

32. **Correct Answer: D**, Bulletin 672

Explanation: Eggplant, tomatoes and potatoes are subject to feeding damage by the Colorado potato beetle.

33. **Correct Answer: B**

Explanation: Mites suck on plant sap which results in the white speckling seen on the top of the leaf. Fine webbing occurs on the bottom of the leaf. If infestation is severe, leaves can turn brown and die.

34. **Correct Answer: D**

35. **Correct Answer: B**, Bulletin 672

Explanation: Most Ohio-grown vegetables, including those mentioned in Bulletin 672, can be attacked by aphids.



36. A seed treatment can be used to control seedcorn maggot and wireworms.
- A. True
  - B. False
37. The B.t. insecticides (such as Dipel and Javelin) are mainly used to control:
- A. Worms (caterpillars such as loopers)
  - B. White fly
  - C. Aphids
  - D. Thrips
38. Which of the following can be an effective strategy for control of thrips on cabbage?
- A. Use of B.t. insecticides
  - B. Use of insecticidal soaps
  - C. Use of resistant varieties
  - D. Use of spreader stickers
  - E. Delaying normal planting by two weeks
39. Which of the following worm pests can cause damage in cabbage and other crucifers?
- A. Imported cabbageworm
  - B. Larva of diamondback moth
  - C. Cabbage looper
  - D. All of the above
40. It is important to control the cucumber beetle in the production of cucumbers or melons.
- A. True
  - B. False
41. Caterpillars on cabbage are best controlled:
- A. When caterpillars are fully grown
  - B. Before eggs hatch
  - C. Just after eggs hatch
  - D. During the pupal stage
42. The repeated use of carbaryl (Sevin) on vegetable crops may cause a buildup of aphids or spider mites.
- A. True
  - B. False
43. *Bacillus thuringiensis* (B.t.) can be used on potatoes to help control Colorado potato beetle.
- A. True
  - B. False
44. The best method to control corn earworm is:
- A. Spray every seven days
  - B. Inspect fields weekly
  - C. Use integrated pest management, which includes insect traps to determine the number of earworm moths in a particular field

36. **Correct Answer: A, Bulletin 672**  
Explanation: Two products, diazinon and lindane, are recommended for seed treatment of beans to control seedcorn maggot and wireworms.
37. **Correct Answer: A, Bulletin 672**  
Explanation: Most B.t. products attack the intestinal track of larvae or worms only. Control may take up to a week in certain situations. A few new types of B.t. products are effective against other pests, but none can control whitefly, aphids or thrips.
38. **Correct Answer: C, Bulletin 672**  
Explanation: Use of resistant varieties is the best strategy among those listed. The B.t. insecticides are not effective against thrips.
39. **Correct Answer: D, Bulletin 672**  
Explanation: The footnote on the insecticide chart includes imported cabbageworm, diamondback moth and cabbage looper as worm pests of cole crops.
40. **Correct Answer: A, Bulletin 672**  
Explanation: Beetle control is very important for cucumbers and melons. The cucumber beetle transmits this disease. Later in the season, feeding by cucumber beetles and northern corn rootworm beetles can also scar the surface of the fruit and should be controlled. (Northern corn rootworm beetles resemble spotted cucumber beetles.)
41. **Correct answer: C, Bulletin 672**  
Explanation: Worms are best controlled when larvae are small. At this time they are more susceptible to insecticides and they eat less so they cause less damage.
42. **Correct Answer: A, Bulletin 672**  
Explanation: The repeated use of carbaryl (Sevin) may cause a buildup of aphids or spider mites because it is very toxic to natural enemies of these pests, such as lady beetles.
43. **Correct Answer: A, Bulletin 672**  
Explanation: Only certain “strains” of B.t. or types of B.t. products are effective against Colorado potato beetles. Be sure to select the correct product. Regular B.t. products for worms, such as Dipel and Javelin, will not be effective in controlling potato beetle larvae.
44. **Correct Answer: C**

45. To control insects in vegetables, growers should follow the economic threshold recommendations.
- A. True
  - B. False
46. The European corn borer can be an insect pest of peppers as well as sweet corn.
- A. True
  - B. False
47. Wireworms are controlled by most soil insecticides commonly used at planting time in sweet corn.
- A. True
  - B. False
48. The use of a soil insecticide at planting time is the only control measure available for corn rootworm larvae in sweet corn.
- A. True
  - B. False
49. Corn earworms require regular treatment during silking.
- A. True
  - B. False
50. Grasshoppers and crickets can be prevented from damaging tomato fruit by:
- A. Including an insecticide in every spray application
  - B. Treating the margins of tomato fields, roadsides, ditch banks, weed patches, and adjacent fields when grasshoppers and crickets are present
  - C. Planting a “catch crop” around the field
  - D. None of the above
51. Tomato plants being eaten off at ground level is an indication of:
- A. Colorado potato beetle
  - B. Grasshoppers
  - C. Cutworms
  - D. Stink Bugs
52. *Bacillus thuringiensis* (B.t.) insecticides such as DiPel, Javelin, or Novodor work as:
- A. Desiccants
  - B. Fumigants
  - C. Contact poisons
  - D. Stomach poisons
53. Diseases that can be best controlled by killing the insect vectors are:
- A. Early blight of tomatoes
  - B. Bacterial wilt of cucumbers
  - C. Stewart’s wilt of sweet corn
  - D. Powdery mildew of pumpkins
  - E. B and C

45. **Correct Answer: A**, Bulletin 672  
Explanation: The threshold gives a good indication as to when insecticide application is cost effective.
46. **Correct Answer: A**, Bulletin 672  
Explanation: European corn borer enters peppers at the edge of the fruit cap. Spray regularly during the time that the moths are active, and make a special effort to cover the stem end of the pepper pods.
47. **Correct Answer: A**, Bulletin 672  
Explanation: Chemicals labeled for wireworm control in sweet corn at planting include carbofuran (Furadan), chlorpyrifos (Lorsban), ethoprop (Mocap), phorate (Thimet and Rampart), and terbufos (Counter).
48. **Correct Answer: B**, Bulletin 672  
Explanation: Crop rotation is considered a method of controlling corn rootworm larvae. Insecticides can also be applied at cultivation time.
49. **Correct Answer: A**, Bulletin 672  
Explanation: During silking, treatment on a regular schedule is usually required. For corn earworm, a three- to five-day schedule is suggested. Treatment should be more frequent if pest populations are heavy or temperatures are high because silk grows faster as temperatures increase.
50. **Correct Answer: B**, Bulletin 672  
Explanation: Treating the margins of tomato fields, roadsides, ditch banks, weed patches and adjacent fields will prevent grasshoppers and crickets from damaging tomato fruits.
51. **Correct Answer: C or A**  
Explanation: Surface cutworms, such as the black cutworm, sever plants near the surface. Colorado potato beetle adults can act like cutworms.
52. **Correct Answer: D**, Bulletin 672  
Explanation: B.t. is a microbial insecticide that must be ingested before it will kill insects. Some B.t.s such as DiPel, Javelin are used strictly for caterpillar control, other B.t.s such as Novodor or M-Trak are used for Colorado potato beetle control.
53. **Correct Answer: E**, Bulletin 672, Bulletin NCR 261  
Explanation: Bacterial wilt of cucumbers is vectored by cucumber beetles. Stewart's wilt of sweet corn is vectored by the corn flea beetle.

54. Symptoms of crops attacked by sucking insects are:

- A. Holes in corn kernels
- B. Curled edges of leaves
- C. Ragged holes in leaves
- D. Yellowing along leaf edges
- E. B and D

55. Symptoms of crops attacked by chewing insects are:

- A. Holes in corn kernels
- B. Curled edges of leaves
- C. Ragged holes in leaves
- D. Yellowing along leaf edges
- E. A and C

56. Insect pests that injure crops by sucking plant sap are:

- A. Green peach aphid
- B. Squash bug
- C. Striped cucumber beetle
- D. Potato leafhopper
- E. A, B and D

57. Insect pests that injure crops by chewing plant tissue are:

- A. Colorado potato beetle
- B. Potato leafhopper
- C. Corn flea beetle
- D. Cabbage looper
- E. A, C and D

58. Integrated pest management programs can include:

- A. Biological control
- B. Chemical control
- C. Cultural control
- D. Mechanical control
- E. All of the above

59. Avoiding the use of broad-spectrum insecticides will allow lady beetles to survive and provide naturally occurring biological control.

- A. True
- B. False

60. Plant virus diseases are usually vectored by

- A. Cutworms
- B. Aphids
- C. Maggots

54. **Correct Answer: E**

55. **Correct Answer: E**

56. **Correct Answer: E**

57. **Correct Answer: E**

58. **Correct Answer: E**, Bulletin 672, HYG-2205-94

Explanation: Integrated pest management combines several types of control strategies.

59. **Correct Answer: A**, Bulletin 672, HYG-2205-94

Explanation: Lady beetles feeding on aphids is an example of naturally-occurring biological control.

Lady beetles may be killed by many broad-spectrum insecticides such as carbaryl [Sevin] or esfenvalerate [Asana].

60. **Correct Answer: B**, Bulletin 672, HYG-3109-95

The vegetable crops most commonly affected by viruses are pumpkins and squash. Although some viruses are vectored by cucumber beetles, most are vectored by aphids.

61. The vectors for bacterial wilt in vine crops are:

- A. Spotted cucumber beetle
- B. Stripped cucumber beetle
- C. Squash vine borer
- D. All the above
- E. None of the above

62. These tiny pests cause a stippling and yellow appearance as well as webbing. These pests which are not true insects are called:

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

63. Thrips damage can appear as:

- A. Silver-gray streaks on leaves
- B. Darkened green spots on leaves
- C. Rough brown patches on leaves
- D. A & B
- E. A & C

## Weed Control

64. Some herbicides must be incorporated to:

- A. Reduce loss from volatility or evaporation
- B. Place the herbicide in the vicinity of sprouting weeds
- C. Both the above
- D. None of the above

65. When herbicide is applied to a vegetable crop or soil, a waiting period may be required before the area can be replanted with another crop. The waiting period is:

- A. 24 hours after treatment
- B. One to six weeks
- C. Up to 12 months or longer
- D. All the above

66. Which of the following implements is **best** suited for incorporating herbicides?

- A. Plow
- B. Disk
- C. Spike tooth harrow
- D. Spring tooth harrow

61. **Correct Answer: D**, Bulletin NCR 261, *Wilt Disorders of Cucurbits*  
Explanation: Wilting on squash, pumpkin and watermelon can be attributed to squash vine borer damage. Bacterial wilt in cucumbers is closely associated with the striped or spotted cucumber beetle.
62. **Correct Answer: C**  
Explanation: Mites or spider mites are very tiny pests that attack beans, melons and other vegetables by sucking plant juices from leaves causing a yellowing and stippling. Spider mites and their webbing are usually found on the underside of leaves. Because they are small and can reproduce rapidly, they often go undetected until damage occurs. Mites are favored by warm to hot, dry weather. Since mites are not true insects, most insecticides will not control them. Dimethoate or dicofol (kelthane) may be used on some crops for mite control.
63. **Correct Answer: E**  
Explanation: Thrips feed by rasping plant tissue with their mouthparts and sucking plant juices. This feeding results in silver-gray streaks on onion or corn leaves, or in patches of rough brown leaf tissue on cabbage. Black dots of excrement on plant tissue are also a clue to thrips. Because of their small size and their preference for hiding between leaves, thrips often go undetected until much damage has already occurred. In the process of feeding, some thrips can transmit viruses. Tomato spotted wilt virus is transmitted to tomato transplants in greenhouses by the western flower thrips.
64. **Correct Answer: C**, Bulletin 672  
Explanation: Herbicides such as trifluralin (Treflan) and Eptam should be incorporated for best results. Eptam is incorporated to reduce losses from volatility or evaporation. Trifluralin, on the other hand, is incorporated to insure its presence in moist soils in the vicinity of sprouting weed seeds. It will fail in dry soil, because its solubility is exceptionally low. In contrast, Eptam's volatility is reduced by dry soil, and its performance is improved.
65. **Correct Answer: D**, Bulletin 672  
Explanation: All of the possible answers apply to different situations. If a crop appears on a particular label, it can be planted within 24 hours. Crops not on the label may not be planted for several weeks after application. With certain herbicides, the waiting period to avoid injury from residues may be 12 months or longer. Treflan is a good example of a herbicide with long waiting periods.
66. **Correct Answer: D**, Bulletin 672  
Explanation: The spring tooth harrow is the best tool for vegetable herbicide incorporation. It provides for thorough mixing and shallow incorporation. A disk tends to streak a herbicide and incorporates it too deeply. A spike tooth harrow has been unsatisfactory.



67. Nutsedge, johnsongrass, quackgrass and Canada thistle are considered problem weeds in vegetable crops because they are:
- A. Perennial
  - B. Winter annual
  - C. Summer annual
  - D. Biennial
68. Chemicals, shading and tillage all help prevent foliage growth and tuber formation in nutsedge.
- A. True
  - B. False
69. The “stale seedbed” technique can be used with vine crops. It involves preparing a seedbed earlier than nominal, delaying planting, allowing weeds to emerge, spraying weeds with Gramoxone, and then planting without disturbing the soil.
- A. True
  - B. False
70. Which of the following herbicides is labeled for postemergent control of annual and certain perennial grasses in many vegetable crops?
- A. Glyphosate (Roundup)
  - B. Trifluralin (Treflan)
  - C. Sethoxydim (Poast)
  - D. Bentazon (Basagran)
71. The herbicide Gramoxone Extra can be used in cabbage production when used as a :
- A. Direct shielded application
  - B. Preplant incorporated application
  - C. Preemergence application to emerged weeds
  - D. All of the above
72. Perennial weeds in tomatoes should be controlled by:
- A. Preemergent herbicides
  - B. Postemergent herbicides
  - C. Eradicating the weeds in another crop during the rotation
  - D. Cultivation
73. In selecting a vegetable field, it is important to know: (select best answer)
- A. If a long-residual herbicide was applied to the field in the last several years
  - B. What crop was grown in the field last year
  - C. A & B
74. A weed closely related to tomatoes that can cause a problem in tomato fields is:
- A. Smartweed
  - B. Lambsquarters
  - C. Ragweed
  - D. Black nightshade

67. **Correct Answer: A**, Bulletin 672  
Explanation: Perennials rely on vegetative propagation rather than seed production to reproduce. Any field practice such as plowing or disking can create numerous stem and root cuttings and help spread the weed.
68. **Correct Answer: A**, Bulletin 672  
Explanation: All help to reduce the strength of the tubers. Shading and tillage practices take time, but are effective in controlling nutsedge, especially in combination with chemical control. However, growers should realize that disking and cultivation in a heavily infested field can help the spread of nutsedge.
69. **Correct Answer: A**, Bulletin 672  
Explanation: This is an old technique that works in certain, but not all, situations. The soils must be in good filth. The stale seedbed method often is not feasible with soils that bake or crust.
70. **Correct Answer: C**, Bulletin 672  
Explanation: Glyphosate cannot be applied to a growing crop. Bentazon is labeled for only several crops and is a broadleaf-weed killer. Trifluralin is a preplant incorporated herbicide. Poast is a postemergence grass killer labeled for many vegetable crops, including beans, cole crops, celery, cucumbers, eggplant, greens, lettuce, muskmelons, peppers, potatoes, pumpkins, squash, tomatoes and watermelons.
71. **Correct Answer: A**, Bulletin 672  
Explanation: A non-selective herbicide such as Gramoxone Extra will kill crops as well as weeds if allowed to contact the crop.
72. **Correct Answer: C**  
Explanation: Where perennial weeds are a problem, growers should try to control them in the rotation before planting tomatoes. For specific suggestions on perennial weed control, refer to Bulletin 672 or Bulletin 472, Ohio Agronomy Guide.
73. **Correct Answer: C**  
Explanation: Vegetables should not be planted where atrazine was used the previous year. Soybeans and wheat appear to be good crops to plant the season before growing vegetables, but growers should be aware of possible residues from herbicides used on these crops.
74. **Correct Answer: D**

75. Which of the following is **NOT** a restricted use herbicide?
- A. Alachlor (Lasso)
  - B. Metolachlor (Dual II)
  - C. Paraquat (Gramoxone Extra)
  - D. Cyanazine (Bladex)
76. Herbicide soil residues can cause mild or severe damage to subsequent planted crops for periods of 12 months or longer.
- A. True
  - B. False
77. There are now many named premix combinations of herbicides that contain atrazine. Vegetable growers need to be aware of this in order to avoid atrazine residues and crop rotation restrictions. Which of the following named combinations do not contain Atrazine.
- A. Bicep
  - B. Bullet
  - C. Buckle
  - D. Laddock
78. Metribuzin (Sencor or Lexone) should not be applied:
- A. To direct-seeded tomatoes
  - B. On heavy soils
  - C. Within three days after periods of cool, wet or cloudy weather, or crop injury may result
  - D. None of the above
79. A herbicide that stops the emergence of weeds is said to be:
- A. Post-emergent
  - B. Pre-emergent
  - C. Non-emergent
80. A post-emergent herbicide should be applied:
- A. Before the weeds germinate
  - B. After the weeds germinate and are small
  - C. As plants are setting seed

## **Disease Control**

81. The first line of defense in protecting vegetable crops from disease is:
- A. Spraying fungicides as soon as possible
  - B. Fumigating the soil
  - C. Selecting resistant varieties, when available
  - D. Keeping on a routine spraying schedule

75. **Correct Answer: B**, Bulletin 672  
Explanation: Lasso and all triazine related herbicides (Bladex) have been added to the list of restricted use herbicides.
76. **Correct Answer: A**, Bulletin 672  
Explanation: Some chemicals suggested for weed control in vegetable crops have a soil-residue hazard for subsequent planted crops of less than 24 hours. Others can affect the growth of later-planted crops if the treated area is replanted within 1-6 weeks after the soil application. Or, a few chemicals used on vegetable crop plantings can cause mild or severe damage to subsequent planted crops for periods of 12 months or longer.
77. **Correct Answer: C**, Bulletin 672  
Explanation: Premixes such as Buckle for peas and Turbo for potatoes do not contain atrazine. However, the other premixes are for sweet corn and contain atrazine.
78. **Correct Answer: C**, Bulletin 672  
Explanation: To avoid possible crop injury, do not apply Sencor or Lexone within three days after periods of cool, wet or cloudy weather.
79. **Correct Answer: B**  
Explanation: Pre-emergent herbicides work on germinating seeds. They must be applied on a timely basis to prevent weed seeds from emerging. Most pre-emergence herbicides work best if they are incorporated either by cultivation or rainfall after the application.
80. **Correct Answer: B**  
Explanation: Post-emergent herbicides are applied after weeds emerge from the soil and are most effective against young, actively growing weeds. Old, established weeds may be hard to kill with some types of post-emergent herbicides. Post-emergent herbicides may control weeds systemically or may only kill parts of weeds they contact.
81. **Correct Answer: C**, HYG 3038-96  
Explanation: Growers should select available resistant varieties to reduce the need for costly control measures later.

82. Effective use of fungicides relies on:
- A. Right diagnosis
  - B. Right material
  - C. Right method
  - D. Right timing
  - E. All of the above
83. Making the right diagnosis of a plant disease problem is important because:
- A. Fungicides can be selected for specific diseases and specific situations
  - B. Broad-based materials are thought to be too damaging to the environment
  - C. None of the above
  - D. All of the above
84. Selection of the right material is important because:
- A. Several materials may be effective against the same disease
  - B. The target crop must be listed on the label
  - C. Both A & B
85. How do most fungicides work?
- A. They act as a barrier on plant surfaces before the pathogen arrives and can prevent infection in the plant
  - B. They sterilize pathogens that infect plants
  - C. They work systemically in the plant and eradicate infection
86. Fungicide activity can be increased by:
- A. Paying special attention to thorough coverage of both the upper and lower leaf surfaces
  - B. Use of spreader stickers to break surface tension and increase adhesion
  - C. All of the above
87. Fungicides break down because of:
- A. Rain and sunlight
  - B. Microbial action and oxidation
  - C. Both A & B
88. Effective disease control mechanisms include:
- A. Resistance and avoidance
  - B. Eradication and sanitation
  - C. Insect and weed control
  - D. All of the above
89. Sanitation for disease control includes plowing down old plant parts and removing weeds and trash.
- A. True
  - B. False

82. **Correct Answer: E**, HYG 3038-96  
Explanation: Effective disease control depends on all four principles.
83. **Correct Answer: A**, HYG 3038-96  
Explanation: The most effective fungicides today have been developed for specific diseases and specific situations. Gone are the days of general materials for general disease control.
84. **Correct Answer: C**, HYG 3038-96  
Explanation: The crop must be listed on the label, and the material should be effective for control of the specific disease problem.
85. **Correct Answer: A**, HYG 3038-96  
Explanation: Most fungicides provide a chemical barrier and work on the principle of prevention or a protective layer. A few fungicides can, however, work systemically and eradicate a pathogen if caught early after infection.
86. **Correct Answer: C**, HYG 3038-96  
Explanation: A complete barrier is important. Thorough coverage and a fungicide spray that spreads and sticks makes for more effective disease control.
87. **Correct Answer: C**, HYG 3038-96  
Explanation: Rain, sunlight, microorganisms and chemical reactions all work to break down fungicides.
88. **Correct Answer: D**, Bulletin 672  
Explanation: All of the principles listed are included in an effective disease control program. The choice of disease control measures must be based on accurate knowledge of the disease, its life cycle and the time of infection.
89. **Correct Answer: A**, Bulletin 672  
Explanation: Old plant parts and trash can harbor diseases and insects. Weeds not plowed down can go to seed and increase weed problems. Once weeds are incorporated, the breakdown process will help kill some pests.

90. Below-ground diseases are no more difficult to control than foliar diseases.
- A. True
  - B. False
91. Nematodes are soil-borne organisms usually controlled by:
- A. Crop rotation
  - B. Insecticides
  - C. Nematicides
  - D. Soil fumigants
  - E. C&D
  - F. A, C & D
92. This common soil-borne disease of crucifers is characterized by thick, shortened roots. It is best controlled by long rotations and adjusting soil pH to 7.2.
- A. Nematodes
  - B. Club root
  - C. Black leg
93. Most soil fumigants work best when soil temperatures are:
- A. Above 60 F
  - B. Below 60 F
  - C. Temperature is not a factor
94. For soil fumigation to be effective, the soil should be in good tilth.
- A. True
  - B. False
95. Effective control of leaf spot diseases by fungicides is based on:
- A. Using the recommended material for the identified disease
  - B. Applying the fungicide as a protectant barrier
  - C. Thoroughly covering the plant surfaces
  - D. All the above
  - E. None of the above
96. Certified disease-free seed and certified disease-free transplants should be used in cabbage to control:
- A. Black rot and black leg
  - B. Alternaria leaf spot and downy mildew
97. Some fungicides are used to control this major lettuce disease, but rotation, use of raised beds and deep plowing should minimize its incidence.
- A. Downy mildew
  - B. Damping off
  - C. Rhizoctonia bottom rot

90. **Correct Answer: B**, Bulletin 672  
Explanation: Below-ground diseases are more difficult to control than leaf diseases. Soil-borne diseases require special control measures.
91. **Correct Answer: F**, Bulletin 672  
Explanation: Chemical control of nematodes is often necessary. Soil-borne nematodes are typically controlled with soil fumigants. Contact/systemic nematicides are available for control of nematodes on a limited range of crops. Nematodes can also be controlled by crop rotation. Nematodes are parasitic organisms that feed off the roots of a plant.
92. **Correct Answer: B**, Bulletin 672  
Explanation: Club root attacks all crucifers.
93. **Correct Answer: A**, Bulletin 672  
Explanation: Most fumigants work best when soil temperatures are between 60 F and 80 F. Consider this when picking the time of year to fumigate the field.
94. **Correct Answer: B**  
Explanation: A very cloddy soil is one of poor tilth. Large clods allow the gas to leave the soil too quickly for effective disinfection by fumigants. Soil structure breaks down because of such factors as working wet soil, loss of organic matter and excessive use of heavy machinery.
95. **Correct Answer: D**, HYG 3038-96  
The right diagnosis leads to selection of the right material. There usually will be several materials that are effective against the type of disease with which you are dealing. Fungicide sprays usually work because they act as a barrier on leaf, stem or flower surfaces of plants. When the fungus pathogen arrives on the plant surface, it encounters this barrier and is unable to infect the plant. Effective use of fungicides requires that this barrier be as complete as possible. A spray method must be selected that will provide the best combination of practical usefulness and good coverage. Special attention must be given to undersurfaces of leaves, especially the lower leaves on the plants.
96. **Correct Answer: A**, Bulletin 672  
Explanation: Black rot and black leg are two serious bacterial diseases of cabbage. Growers should use only certified transplants or purchase seed that has been hot-water treated and evaluated for the presence of these two diseases.
97. **Correct Answer: C**, Bulletin 672  
Explanation: Rotation, deep plowing and the use of raised beds are suggested to minimize the incidence of Rhizoctonia bottom rot in lettuce.



98. To control bacterial wilt of cucumbers and other vine crops, you need to control:
- A. Nematodes
  - B. Anthracnose
  - C. Cucumber beetles (striped or spotted)
  - D. Thrips
99. Angular leaf spot of cucumbers can be controlled with:
- A. A three-year rotation
  - B. Disease-tolerant varieties
  - C. Fixed copper sprays
  - D. All of the above
100. Virus diseases (cucumber mosaic, zucchini yellows mosaic and watermelon mosaic) of squash and pumpkins can be partially controlled by:
- A. Killing perennial weeds within 150 feet of plantings
  - B. Using aluminum foil mulches to help repel aphids, which are vectors of the disease
  - C. A&B
  - D. None of the above
101. Cucumber mosaic virus in peppers is spread from diseased perennial weeds, tomatoes, cucumbers, squash or melons by cucumber beetles.
- A. True
  - B. False
102. Fungicides are effective in preventing smut in sweet corn.
- A. True
  - B. False
103. Potato scab can be controlled with fungicides.
- A. True
  - B. False
104. Before applying Maneb, growers should check with potential buyers to see if crops treated with this fungicide are acceptable.
- A. True
  - B. False
105. Stewart's wilt disease of sweet corn is controlled by:
- A. Early applications of insecticide to control the vectors, flea beetles
  - B. Early application of insecticide to control the vectors, aphids
  - C. Use of resistant or tolerant varieties
  - D. A and B only
  - E. A and C only
  - F. B and C only

98. **Correct Answer: C**, Bulletin NCR 261  
Explanation: This important disease of vine crops is spread by the spotted and striped cucumber beetle. While infection can occur when the seedling is pushing through the ground, the vines usually do not show any wilt until the time of fruit set.
99. **Correct Answer: D**, Bulletin 672  
Explanation: All of the listed disease control measures are necessary to control this disease.
100. **Correct Answer: C**, HYG 3109-95  
Explanation: Weeds can act as alternate hosts for virus diseases. Aluminum foil helps repel aphids, which transmit the virus.
101. **Correct Answer: B**, HYG 3109-95  
Explanation: Cucumber mosaic virus is spread by aphids from diseased perennial weeds, tomatoes, cucumbers, squash or melons.
102. **Correct Answer: B**, Bulletin 672  
Explanation: No fungicides are available for control. Late varieties are reported to be more tolerant than early varieties.
103. **Correct Answer: B**, Bulletin 672  
Explanation: To control scab, keep soil pH below 5.5, and do not apply manure to fields used for potato production. Avoid susceptible varieties such as Denali and Katahdin in scab-prone areas. If irrigation is available, provide adequate moisture during tuber formation.
104. **Correct Answer: A**, Bulletin 672  
Explanation: Before applying Maneb (or other EBDC fungicides), check with potential buyers to determine if treated crops will be commercially acceptable.
105. **Correct Answer: E**, Bulletin 672  
Explanation: The vector of Stewart's wilt is the corn flea beetle, which should be controlled by early applications of insecticide. Use of resistant or tolerant varieties will help control the disease and increase the threshold level for insecticide application.

106. Symptoms of early blight of tomato include:

- A. Dark brown to black target-spots on leaves
- B. Black, water-soaked lesions with a cottony white mold (on the underside) in the early morning hours
- C. Yellowing of the leaves and leaf drop beginning with the oldest leaves
- D. A and B only
- E. A and C only
- F. B and C only

107. The designation “VF” following some tomato cultivar names denotes tolerance to Verticillium wilt and Fusarium diseases.

- A. True
- B. False

108. Blossom end rot is a:

- A. Physiological disorder
- B. Bacterial disease
- C. Fungus disease
- D. Virus disease

109. Which of the following tomato diseases causes sunken, water-soaked circular spots on the fruit with a tan color and numerous dark specks accompanied by an internal semi-soft decay?

- A. Buckeye rot
- B. Bacterial canker
- C. Anthracnose
- D. Late blight

110. One of the most common foliage diseases of tomato and potato is:

- A. Late blight
- B. Early blight
- C. Bacterial speck
- D. Fusarium wilt

111. The tomato diseases early blight, late blight, anthracnose and Septoria leaf blight are best controlled through:

- A. A regular fungicide application program
- B. Cultivation
- C. Irrigation
- D. Control of insects that carry diseases

112. The basic disease control method for tomato bacterial diseases is:

- A. At least a three-year crop rotation
- B. Planting of disease-free transplants
- C. Use of bacterial sprays
- D. A&B

106. **Correct Answer: E**, HYG-3102-95, HYG 3101-95

Explanation: Black, water-soaked lesions on leaves with a cottony white mold (on the underside) are characteristic of late blight. Target spots beginning on the oldest leaves are good diagnostic symptoms of early blight.

107. **Correct Answer: A**, HYG 3122-96

Explanation: Fusarium-tolerant tomato varieties are the primary means of control. Verticillium-tolerant cultivars of tomatoes are available in some cases.

108. **Correct Answer: A**, HYG 3117-96

Explanation: Blossom end rot is a physiological disorder associated with a low concentration of calcium in the fruit. Calcium is required in relatively large concentrations for normal cell growth. When a rapidly growing fruit is deprived of necessary calcium, the tissues break down, providing the characteristic dry, sunken area at the blossom end. Blossom end rot occurs when demands for calcium exceed supply.

109. **Correct Answer: C**, HYG 3114-96

Explanation: The first symptoms of anthracnose are small, slightly sunken, water-soaked circular spots. These soon become darker and depressed and have concentric ring markings. The centers often become tan and show numerous dark specks, which are the fruiting bodies of the fungus. In moist, warm weather, these black bodies produce gelatinous pink spore masses. The spots enlarge to a diameter of 3/8 inch or more and become more depressed with age. In warm weather, the fungus spreads internally to form a semi-soft decay, rendering the fruit worthless.

110. **Correct Answer: B**, HYG 3101-95

Explanation: One of the most common foliage diseases of tomato and potato is early blight. It causes leaf spot, fruit rot and stem lesions on tomato and can be very destructive, resulting in complete defoliation under favorable conditions.

111. **Correct Answer: A**, HYG 3101-95, HYG 3102-95, HYG 3114-96

Explanation: Follow a regular fungicide application program to control early blight, late blight, anthracnose and Septoria leaf blight. Follow the recommendations in the current issue of Bulletin 672.

112. **Correct Answer: D**, Bulletin 672

Explanation: Bacterial diseases generally are difficult to control because bacteria multiply rapidly and there is a lack of effective bactericides. Crop rotations of at least three years, coupled with the use of disease-free transplants, are basic for disease control.

113. The major vector for spreading the tomato spotted wilt virus is:
- A. Aphids
  - B. Flea beetles
  - C. White flies
  - D. Thrips
114. The best control for the tomato spotted wilt virus is to:
- A. Use a regular fungicide spray program
  - B. Plant disease-free transplants
  - C. Use a regular insecticide spray program
  - D. Follow a good crop rotation
115. Two vegetable diseases that grow in the water-conducting tissue of tomato plants causing clogging and a brown discoloration in the stem are:
- A. Bacterial spot and Septoria leaf blight
  - B. Bacterial speck and bacterial canker
  - C. Tobacco mosaic virus and late blight
  - D. Fusarium wilt and Verticillium wilt
116. The best way to control Verticillium and Fusarium wilts on vegetables is to:
- A. Spray fungicides
  - B. Rotate crops
  - C. Cultivate
  - D. Plant resistant varieties
  - E. B&D
117. Fusarium wilt and verticillium wilt:
- A. Are examples of soil borne diseases
  - B. Are spread through insects
  - C. Can be treated in existing crops after the diseases are diagnosed
118. Sunscald on tomatoes can be prevented by:
- A. Irrigating
  - B. Planting resistant varieties
  - C. Maintaining an adequate leaf canopy over the ripening fruit
  - D. Applying ethephon

113. **Correct Answer: D**, Bulletin 672

Explanation: Tomato spotted wilt virus is carried by thrips and can cause major losses to peppers and tomatoes if the virus infects young plants. Control of thrips may slow the spread of the virus in the field and greenhouse.

114. **Correct Answer: B**, Bulletin 672

Explanation: If southern-grown transplants are used, growers should be certain they are grown from inspected, disease-free fields. Northern-grown transplants should be grown in isolation from ornamental crops.

115. **Correct Answer: D**, HYG 3122-96

Explanation: Vegetable plants may be infected at any age by the two different soil fungi that cause Fusarium wilt and Verticillium wilt. The wilt organisms usually enter the plant through roots and then grow in the water-conducting vessels of the roots and into the stem. As the vessels are disrupted or plugged, the water supply to the leaves is blocked off. With a limited water supply, leaves begin to wilt on sunny days and recover at night. Wilting may first appear in the top of the plant or in the lower leaves. The process may continue until the entire plant is weak, unthrifty and produces fruit of low quality.

116. **Correct Answer: E**, HYG 3122-96

Explanation: Use of resistant cultivars is the best way to control Fusarium and Verticillium wilt. A long (four-to six-year) rotation will reduce, but not totally eliminate, the fungus from the soil. When Verticillium wilt is present in a field, do not plant other susceptible hosts in the rotation. Disease-free transplants and hot-water-treated seed will reduce the spread of these wilt organisms into clean fields. Crop rotation will also help control Verticillium and Fusarium wilts.

117. **Correct Answer: A**, HYG 3122-96

Explanation: Fusarium diseases (wilts, yellows) - Losses may be severe on tomato, celery, radish, cabbage or melons. Fusarium-tolerant varieties are the primary means of control. Check with seed suppliers for availability. Crop rotation with a susceptible crop only once in three years is an aid in reducing infections. It aids in control of fruit rots caused by fusarium, also.

Verticillium wilt - This disease causes its greatest loss on eggplant and potato in Ohio, but it also attacks pepper, tomato and many other vegetable crops. It is best controlled by treating the soil with fumigants if economically feasible. Crop rotation with clover and grass or grass-type crops such as corn or grains helps reduce the potential inoculum of this disease in the soil. Verticillium-tolerant cultivars are available in some cases.

118. **Correct Answer: C**

Explanation: To avoid sunscald, protect plants from foliar diseases to maintain an adequate canopy over the ripening fruit.

119. Your tomato plants have twisted stems and leaf stalks. Leaves are narrow and twisted or cupped with light green parallel veining. These symptoms indicate damage from:
- A. An over-application of fungicides
  - B. A 2,4-D herbicide
  - C. An over-application of insecticides
  - D. A virus disease
120. “Catfacing” is a term for misshapen tomato fruit. The fruit has irregular bulges at the blossom end with bands of leathery, dark-green tissue in between. Catfacing is usually caused by:
- A. Improper fungicide application
  - B. Improper insecticide application
  - C. Improper ethephon application
  - D. Abnormal growing conditions, such as cold weather during blossoming
121. When tomato leaf edges roll upward and inward and the leaves become firm and leathery, you are observing:
- A. A physiological problem caused by an irregular supply of water
  - B. An insect problem caused by aphids
  - C. A disease problem caused by a virus
  - D. None of the above
122. The first method of defense against bacterial spot of pepper is to treat seed with a clorox treatment:
- A. True
  - B. False
123. TOMCAST is an IPM spray management aid based on weather and used to predict which of the following tomato diseases:
- A. Late blight
  - B. Early blight
  - C. Septoria
  - D. Anthracnose
  - E. Bacterial spot
  - F. A, B and C
  - G. B, C, and D
124. TOMCAST relies on the following parameters to predict the speed at which tomato diseases develop:
- A. Temperature
  - B. Wind velocity
  - C. Leaf wetness
  - D. A and B only
  - E. A and C only
  - F. B and C only

119. **Correct Answer: B**

Explanation: Tomato plants are very susceptible to 2,4-D injury. The first damage symptom is a downward cupping of the leaves and the tips of the growing points. If damage is severe, stems and leaf stalks will twist and become distorted. Leaves will become narrow and twisted or cupped with light-green, parallel veining. The main stem may become thick, stiff and brittle. Often it will split, and small shoots will develop at the opening. Mild leaf symptoms are often mistaken for those of common mosaic. Affected plants usually recover in due course and produce edible fruit. The fruits may become catfaced or plum-shaped, hollow and seedless.

120. **Correct Answer: D**, Bulletin 672

Explanation: Catfaced fruit is misshapen with irregular bulges at the blossom end interspersed with bands of leathery, dark-green tissue. These fruits are unmarketable for fresh market. Catfacing is most often found among first-formed fruit. Abnormal growing conditions such as cold weather during blossoming disturbs growth and causes a distortion of the fruit.

121. **Correct Answer: A**

Explanation: Leaf roll is a common physiological disturbance of tomato. The edges of the leaves roll upward and inward. In severe cases, this will continue until the margins of opposite sides touch or overlap. Leaf blades become firm and leathery. Most of the plant may exhibit these symptoms. Plant growth is not inhibited, and the plant returns to normal after a few days. This temporary disorder results from an irregular water supply.

122. **Correct Answer: A**, Bulletin 672

Explanation: A brief treatment with dilute clorox will reduce or eliminate bacterial spot from pepper seed. Bacterial spot is very difficult to control once it becomes established in the field.

123. **Correct Answer: G**, Bulletin 672 "Tomatoes" Section

Explanation: TOMCAST predicts when fungicides should be applied to control early blight, Septoria and anthracnose. Late blight and bacterial diseases are not predicted by this system.

124. **Correct Answer: E**, Bulletin 672 "Tomatoes" Section

Explanation: TOMCAST predicts when fungicides should be applied to control diseases based on leaf wetness and temperature, the most critical environmental factors in disease development.



125. White growth appearing on the leaves, flowers, fruits and stems is a sign of what disease?

- A. Early blight
- B. Anthracnose
- C. Powdery mildew

126. Condition(s) that favor late blight of potatoes and tomatoes is/are:

- A. Using cull pile for potatoes
- B. Using seed saved from crops rather than certified seed potatoes
- C. Allowing growth of volunteer potatoes and tomatoes
- D. All of the above

125. **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.

126. **Correct Answer: D**, HYG-3102-95

Late blight is caused by a fungus that cannot survive in soil or dead plant debris. For an epidemic to begin, the fungus must survive the winter in tubers, be reintroduced on seed potatoes or tomato transplants or live spores must blow in with rainstorms.

Clearing the area of cull piles, old volunteers and infested debris will help control late blight. Disease development is further favored by cool, moist weather.

# Vegetable Pest Control

## Score Card

No. of Questions Answered Correctly	% Correct	Evaluation
113-126	> 90%	<b>Excellent</b> —You have a very good understanding of vegetable pests and their control.
100-112	> 80%	<b>Good</b> —Be sure you understand those questions you missed. It may help to read the references again and re-answer the questions you missed.
88-99	> 70%	<b>Needs Improvement</b> —Your score indicates a borderline level of expertise. Be sure to read the cited references again and re-answer the questions you missed.
0-87	< 70%	Re-read the recommended references and work through the workbook again.