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Ohio Pesticide Applicator Training

Field Crops

Student Workbook
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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 field crop categories (Private Applicator Category 1 and Commercial Applicator Categories 2A and 2C). The sample questions presented in this manual will help the reader obtain a general understanding of field crop pest problems, approaches to control, and general information needed to apply and use pesticides safely.

Your comments and suggestions to improve this study tool for future users would be appreciated. Comments should be directed to Pesticide Applicator Training; Extension Entomology; 1991 Kenny Road; Columbus, OH 43210.

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, The Ohio State University. All references are available from county offices of the Ohio Cooperative Extension Service.

1. Weeds
   Bulletin 789, Weed Control Guide for Ohio Field Crops
   Bulletin 472, Ohio Agronomy Guide

2. Insects
   Bulletin 545, Insect Pests of Field Crops

3. Diseases
   Bulletin 631, Field Crop Disease Management
   Bulletin 812, Crop Production Alternatives
   Other useful references:
   Bulletin 302, Corn Disease Control in Ohio
   Bulletin 741, The Soybean in Ohio
   Bulletin 811, Profitable Wheat Management
   Plant Pathology “Know & Control” Fact Sheets
   Hybrid and Varietal Test Publications

Users of this workbook should read the bulletins for each section before attempting to answer the questions. 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.
Field Crop Weed Control

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1. What weed is likely to become a problem where only atrazine has been used for weed control on continuous corn?
   A. Pigweed
   B. Common ragweed
   C. Fall panicum
   D. All of the above

2. Which one of the following descriptions best fits fall panicum?
   A. An annual grass with a wide completely green leaf blade that is covered with hair on the upper surface
   B. A perennial broadleaf weed
   C. An annual grass with loose, frequently purple sheaths. Blade midrib is white and leaf has sparse hairs.
   D. A perennial grass with flat stems
   E. A perennial grass with large nodes

3. Which of the following are effective cultural weed control practices?
   A. Crop rotation
   B. Planting at proper time to obtain adequate plant stand
   C. Assure adequate drainage for optimum crop growth
   D. Prevent weed seeds from getting on fields by cleaning machinery between fields
   E. All of the above

4. When designing a weed control program based on herbicides, which of the following should be considered?
   A. Soil type
   B. Tillage practices
   C. Current and following crop
   D. Weeds present in field previously and at present
   E. Cost
   F. All of the above

5. Herbicide performance is not affected by:
   A. Soil conditions
   B. Weather conditions
   C. Application evenness
   D. Application rate
   E. Application procedure
   F. Cost
1. Correct answer: C, page 70-AG*
   Table 2 gives OSU ratings of weed control effectiveness for various herbicides. Atrazine is listed first under the "Preplant" or "Preemergence" sections. In both places, pigweed and common ragweed are rated as excellent, but fall panicum is rated as poor. Thus, the answer is C, fall panicum.

2. Correct answer: C - no reference cited
   The identification of fall panicum is important as postemergent herbicides should be applied when it is small. Responses “B,” “D” and “E” contain “perennial” in the description, while fall panicum is an annual. “A” indicates the leaf is completely green, while “C” indicates the leaf has a white mid-rib. “C” is the best description of fall panicum, while “A” best describes giant foxtail.

3. Correct answer: E, page 1-WC; page 70-AG
   Cultural control is important even when herbicides are used. “All of the above” is the correct answer. All the answers are listed at the bottom of page 1 and top of page 2.

4. Correct answer: F, page 2-WC; page 71-AG
   All of the answers should be considered, so “F” is the correct answer.

5. Correct answer: F, page 2-WC; page 71-AG
   Herbicide performance is affected by soil and weather conditions as well as by the application evenness, rate and procedures; but performance is not affected by cost.

* AG = Agronomy Guide; WC = Weed Control Guide
6. When comparing postemergent herbicide programs to soil-applied (preplant or preemergent) programs:
   A. Danger of a fish kill in ponds is greater for postemergent application
   B. Weather conditions during application are more important for postemergent applications
   C. Thorough coverage is more important for postemergent applications
   D. All of the above
   E. B & C above

7. Lasso is the trade name and alachlor the common name for a herbicide used in corn and soybeans.
   A. True
   B. False

8. The correct amount of atrazine to apply in your situation is 1.2 pounds of active material per acre. How many gallons of AAtrax 4L should be applied to your 10-acre field?
   A. 0.3 gallons
   B. 1.2 gallons
   C. 3 gallons
   D. 4 gallons
   E. None of the above

9. Activity of soil-applied herbicides is affected by:
   A. Soil texture
   B. Organic matter content of soil
   C. Soil pH
   D. Soil moisture
   E. Soil tillage
   F. All of the above

10. Soil applied herbicides are more likely to injure crops in sandy soils low in organic matter.
    A. True
    B. False

11. The activity of triazine herbicides such as atrazine, simazine (Prinsep), and cyanozine (Bladex) is related to soil pH. With these herbicides, crop injury may occur with high pH, but weeds may not be controlled on soils with a low pH.
    A. True
    B. False

12. Herbicides that are very toxic to plants, such as paraquat (Gramoxone), can drift to nontarget crops and result in illegal residues, even if the crop is not killed.
    A. True
    B. False
6. Correct answer: E. page 2-WC; page 71-AG
Generally less material is necessary for postemergent application and it is applied at a time of year when the soil is less likely to be saturated. Therefore there is less chance of fish kill with post emergent application, so “A” is false. Weather conditions and thorough coverage are very important when the weeds have emerged, so “B” and “C” are true, and the answer is “E.”

7. Correct answer: True, page 2-WC; page 71-AG
Another trade name is Arena, which is used outside Ohio.

8. Correct answer: C, page 3-WC; Page 71-AG
4L means that there are 4 pounds active ingredient per gallon.

\[
\text{Gallons of commercial product/acre} = \frac{\text{pounds of active ingredient/acre}}{\text{pounds of active ingredient in gallon}} \quad \text{Gallons of commercial product/acre:} \\
\frac{1.21 \text{ acre}}{4} = 0.3 \\
\]

0.3 gallons of commercial product acre x 10 acres = 3 gallons
Therefore, “C” is the correct answer.

9. Correct answer: F, page 3-WC; page 71-72-AG
Soil-applied herbicides are affected by all of the answers listed, so the answer is “F.”

10. Correct answer: True, page 3-WC; page 71-AG
Injury is more likely as less of the herbicide is “tied up” or absorbed in the soil or with the organic matter.

11. Correct answer: True, page 3-WC; page 71-AG
Low pH soils are more common in Ohio, but high pH’s are not uncommon. Generally, the pH problem with triazines is the lack of weed control when the pH is too low. The higher the pH the more available are soil applied triazine herbicides. As a result, better weed control is achieved in soils with high pH but there is also more risk of crop injury. With low pH (common on the soil surface with long term no-tillage), weed control may not be achieved by using triazines.

12. Correct answer: True - no reference
For many herbicides no residue is allowed in food crops, and this is especially true for vegetables. Therefore, even Gramoxone may drift enough to cause dead spots but not kill a nontarget crop, yet still leave enough residue to cause the sale of the crop to be illegal.
13. Herbicides with a short period of residual soil activity and low solubility are well-suited for early preplant application.
   
   A. True  
   B. False

14. The following herbicide(s) may be incorporated but the label does not require incorporation into the soil:
   
   A. Treflan  
   B. Command  
   C. Lasso  
   D. Dual  
   E. C and D  
   F. A and B  
   G. All of the above

15. Herbicides that are applied to the soil surface after the crop is planted but before the crop seedlings appear above the ground are called:
   
   A. Early preplant  
   B. Preplant incorporated  
   C. Preemergent  
   D. Postemergent  
   E. None of the above

16. The following factors make postemergent weed control with herbicides less effective:
   
   A. Small weeds  
   B. Drought conditions  
   C. High temperatures and relative humidity  
   D. Rainfall during or soon after application  
   E. A and C  
   F. B and D  
   G. None of the above

17. The following factors or practices make the effectiveness of postemergent weed control greater without increasing the chance of crop injury:
   
   A. Smaller weeds  
   B. High temperatures  
   C. High relative humidity  
   D. Use of an adjuvant such as a surfactant, crop oil, or fertilizer solution with the spray solution  
   E. None of the above  
   F. B, C, and D above

18. Translocated herbicides (those that move throughout the plant) may be effective with partial foliar coverage, while contact herbicides (those active only where in contact with the plant) require more complete spray coverage.
   
   A. True  
   B. False
13. Correct answer: False, page 3-WC; page 72-AG
   Herbicides with long (not short) soil residual are well-suited for early preplant for two reasons.
   First, long residual assures season long control with an early preplant program. Second, the risk of
   carryover is reduced when long residual herbicides are applied earlier in the season.
   The second part of the statement is true, but the answer is false as the “and” between the statements
   indicates that both statements must be true for the answer to be true. Herbicides with low solubility
   require more moisture for them to be active and are less subject to leaching beyond the zone of
   effectiveness, so they are well-suited for early preplant.

14. Correct answer: E, pages 3, 4, 19, 29, and 31-WC
   Treflan and Command must be incorporated. Lasso and Dual may be incorporated, but the label
   does not require incorporation. Therefore, the correct response is “E.”

15. Correct answer: C, page 4-WC; pages 72 and 73-AG
   Preemergent herbicides are applied to the soil surface after the crop is planted but before crop
   seedlings appear above the ground, so the correct answer is “C.” Early preplant and preplant incor-
   porated are applied before planting of the crop and postemergent applications are applied after the
   crop and weeds have emerged.

16. Correct answer: F, page 5-WC; page 73-AG
   Smaller weed size increase the effectiveness or postemergent weed control so “A” is not the answer.
   High temperature and relative humidity also generally increase the effectiveness of postemergent
   herbicides. Drought conditions do make postemergent weed control less effective, but so does
   rainfall during or soon after application, as the herbicide can be diluted or washed off the target
   plant. Therefore, the correct answer is “F,” which indicates both “B” and “D” are the answers.

17. Correct answer: A, pages 4 and 5-WC; page 73-AG
   High temperature, high relative humidity, and the use of an adjuvant all generally increase the
   effectiveness of post emergent herbicides, but also increase the risk of crop injury. However, small
   weed size generally increases the effectiveness of weed control but does not increase crop injury. So
   the answer is “A.”

18. Correct answer: True, page 5-WC; page 73-AG
   Roundup can be applied with a wick rope applicator or with 10 gallons or less of water because it is
   a translocated herbicide. However, paraquat needs 20 gallons of water with relatively high pressure
   because it is a contact herbicide.
19. The following will aid in more complete foliar coverage:
   A. Increased spray volume
   B. Increased pressure
   C. High temperature
   D. High humidity
   E. Addition of an adjuvant such as a surfactant or crop oil concentrate
   F. A and B above
   G. All of the above
   H. A, B, and E above

20. The preferred nozzle for postemergence applications is:
   A. Low pressure flood nozzle
   B. Flat fan nozzle
   C. Raindrop nozzle
   D. All of the above
   E. None of the above

21. Reduced tillage always results in more herbicide being used for corn and soybean production.
   A. True
   B. False

22. Burndown herbicide(s) commonly used in no-tillage crop production is (are):
   A. Roundup
   B. Paraquat
   C. Gramoxone Extra
   D. Glyphosate
   E. All of the above
   F. None of the above

23. The following preemergent herbicide(s) also have postemergent activity on small weeds (less than 2 inches tall):
   A. Bladex (Cyanazine)
   B. Atrazine (Aatrex)
   C. Metribuzin (Sencor/Lexone)
   D. Linuron (Lorox/Linex)
   E. Preview and Lorox Plus
   F. All of the above

24. Because herbicides are made to kill plants and not insects or animals, there is no need to handle them with as much care and respect as is necessary with insecticides or rodenticides.
   A. True
   B. False
19. Correct answer: H, page 5-WC; page 73-AG
Increased pressure produces smaller droplets and improves penetration of dense canopies. Increased spray volume also increases foliar coverage, as does the addition of an adjuvant. However, temperature and humidity do not affect foliar coverage. Therefore, the correct answer is “H.”

20. Correct answer: B, page 5-WC; page 74-AG
Most labels do not recommend low pressure flood nozzles or raindrop nozzles for postemergent application, so answers “A” and “C” are not correct. However, the flat fan nozzle is generally recommended for postemergent application, so “B” is the correct answer.

21. Correct answer: False, pages 5 and 6-WC; pages 73 and 74-AG
Reduced or no-tillage does not always require more herbicides. Ways of maintaining herbicide rates with reduced or no tillage are early preplant programs with long residual herbicides or a total postemergent program. Also, if no or reduced tillage has been practiced for several years, the depth of tillage is reduced and fewer new seeds are brought up each year, which reduces weed pressure. The key word in this statement is “always.” Absolutes in a true or false statement are often best answered as false.

22. Correct answer: E, pages 5 and 6 and 82-WC; page 74-Ag
Roundup is the trade name and glyphosate the common name for the same material which is used extensively to kill perennial vegetation for no-tillage. Gramoxone Extra is the trade name and paraquat the common name for another burndown material used in no-tillage. Therefore, “E” is the correct answer as all of the responses are correct. Here is an instance where you can figure out the answer even if all the answers are not familiar to you. If you can find 2 or more answers you know are correct, and you don’t know about the rest, chances are the correct answer is “all of the above.”

23. Correct answer: F, pages 6 and 81-WC; page 74-AG
All of the above materials provide post emergent activity on certain small weeds less than 2 inches tall. Here is an example in which you can figure out the question even if you are not familiar with all of the materials listed. If you are sure that at least two of the answers of “A” through “E” are correct, but do not know about the rest of the answers, then the best guess if “F.”

24. Correct answer: False, page 6-WC; page 74-AG
Certain herbicides can be as toxic to humans and the environment as insecticides or rodenticides. It is always necessary to handle any pesticide with extreme care and respect, regardless of whether it is an insecticide, rodenticide or herbicide.
25. It is against the law to:
   
   A. Apply a herbicide to a crop that is not labeled
   B. Apply more than the labeled rate of herbicide
   C. Apply less than the labeled rate of herbicide
   D. All of the above
   E. A and B above

26. Which of the following spray nozzles is the most wear-resistant, but also the most expensive?
   
   A. Brass
   B. Thermoplastic
   C. Hardened stainless steel
   D. Copper
   F. Aluminum

27. Nozzles should be replaced and the sprayer recalibrated when the output from the sprayer has increased how much from the original output when the nozzles were new?
   
   A. 1%
   B. 10%
   C. 20%
   D. 30%
   E. 40%

28. For many of the new herbicides (especially those applied postemergent), rinsing the system with only water is not sufficient.
   
   A. True
   B. False

29. The order in which pesticides should be added to water or fertilizer when more than one formulation is used is:
   
   A. 1. Crop oil concentrates  
      2. Flowables or aqueous liquids (solutions)  
      3. Emulsifiable concentrates.  
      4. Wettable powders or dispersible granules
   
   B. 1. Emulsifiable concentrates  
      2. Wettable powders or dispersible granules  
      3. Crop oil concentrates  
      4. Flowables or aqueous liquids (solutions)
   
   C. 1. Flowables aqueous liquids (solutions)  
      2. Crop oil concentrates  
      3. Wettable powders or dispersible granules  
      4. Emulsifiable concentrates
   
   D. 1. Wettable powders or dispersible granules  
      2. Flowables or aqueous liquids (solutions)  
      3. Emulsifiable concentrates  
      4. Crop oil concentrates
25. Correct answer: E, page 6-WC; page 74-AG
   It is against the law to apply any pesticide to a crop that is not labeled and to apply more than the recommended rate. However, it is not against the law to apply less than the labeled rate, even though poor weed control may result and the manufacturer will not back up the product if less than the labeled rate is applied.

26. Correct answer: C, pages 6 and 7-WC; pages 74 and 75-AG
   Hardened stainless steel nozzles are consistently the most wear resistant, but also the most expensive. Ceramic nozzles are also wear resistant and expensive, but were not listed in the question.

27. Correct answer: B, page 7-WC; page 75-AG
   Nozzles do wear, and wear results in a larger orifice and higher output. Nozzles should be changed when output increases 10% from that of new nozzles.

28. Correct answer: True, pages 6 and 8-WC; pages 74 and 75-AG
   Many of the new herbicides (especially those applied postemergent) require very small concentrations to achieve desired results. For these herbicides it is necessary to clean the sprayer with ammonia, sal soda, or trisodium phosphate.

29. Correct answer: D, page 8-WC; page 76-AG
   Even with the correct order as indicated in “D,” it is imperative that agitation is continued between and after the addition of each pesticide. Spray tanks should be at least half-filled with the carrier before pesticides are added. If more than one pesticide is mixed without previous knowledge of their compatibility, it is recommended that the pesticides be tested by mixing appropriate proportions of all components in as small a batch as practical.
30. Drift or off-target movement of herbicides is the reason for most complaints to the Ohio Department of Agriculture concerning improper use of herbicides.

   A. True  
   B. False

31. The extent of spray drift increases as:

   A. The boom pressure increases  
   B. The size of spray droplets decrease  
   C. The boom height increases  
   D. The wind speed increases  
   E. All of the above

32. Which of the following herbicides is least volatile?

   A. Sutan  
   B. Command  
   C. Banvel  
   D. The ester formulation of 2,4-D  
   E. The amine formulation of 2,4-D

33. Herbicide carryover problems are increased by:

   A. Lower than normal soil temperatures  
   B. Lower than normal rainfall  
   C. A herbicide that persists a long time  
   D. Higher than normal rate of application  
   E. Later than normal herbicide application  
   F. A follow-crop that is very susceptible to damage by the herbicide  
   G. A stressed follow-crop  
   H. All of the above

34. Herbicides for which carryover is not a problem are:

   A. Atrazine and simazine  
   B. Treflan, Classic and Scepter  
   C. 2,4-D, Roundup and paraquat  
   D. All of the above  
   E. None of the above

35. A bioassay for herbicides is where one or more sensitive plants are grown in the “suspect” soil and compared to the growth in a similar soil not treated with the herbicide in question.

   A. True  
   B. False
30. Correct answer: True, page 8-WC; page 76-AG
Numerous complaints reach ODA concerning drift to fields, gardens, lawns, trees, etc. 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. Most problems arise from spraying when windy, with high pressure, with a volatile material, and at high temperatures. A homeowner’s tree is one of many to a producer, but a specimen to the homeowner.

31. Correct answer: E, page 8-WC; page 76-AG
Drift increases with each of the statements so the answer is “E,” all of the above.

32. Correct answer: E, page 8-WC; page 76-AG
All of the formulations listed are volatile except for the amine formulation of 2,4-D. For this reason the amine formulation should be used where drift is likely to impact non-target species.

33. Correct answer: H, page 9-WC; pages 76 and 77-AG
All of the statements increase the possibility of carryover problems.

34. Correct answer: C, pages 9 and 10-WC; page 77 AG
Atrazine and simazine are triazines that have been used as corn herbicides for a number of years with high carryover potential, for which oats are the best species to use for a bioassay. Treflan, Classic and Scepter also have high carryover risk and are best bioassayed by corn. Classic contains chlorimuron as the active ingredient, which is also used in Lorox Plus and Preview. Roundup, paraquat and 2,4-D have very little or no soil residual, so carryover is not a problem for these materials.

35. Correct answer: True, page 9-WC; page 77-AG
Bioassay is the best way to test for possible herbicide damage for the approaching crop year, especially for the newer herbicides. It allows one to isolate herbicide damage from plant growth problems due to other factors.
36. Traces of several common herbicides have been found in water sources for some municipal water systems in Ohio.
   A. True
   B. False

37. Erosion and water run-off from newly treated crop fields are major culprits in water contamination.
   A. True
   B. False

38. Most instances of groundwater contamination are due to leaching of pesticides from sprayer loading sites, leaching from disposal sites, or back-siphoning from the sprayer into wells.
   A. True
   B. False

39. The potential for groundwater contamination is less:
   A. On sandy soils
   B. With herbicides low in solubility in water
   C. With herbicides less likely to carry over to the next crop year (those less persistent).
   D. With higher herbicide rates
   E. All of the above
   F. B and C above

40. Groundwater warning statements are on the following herbicide(s):
   A. Atrazine and Princep
   B. Bladex
   C. Sencor/Lexone
   D. A and B
   E. A and C
   F. All of the above

41. Triazine injury in soybeans may result from high rates of atrazine and/or simazine (Princep) use in the previous crop year. Furthermore, the chance of injury is increased with the use of metribuzin containing products such as Sencor, Lexone, or Preview on the current soybean crop.
   A. True
   B. False

42. The reason reduced or no-tillage crop production has been strongly encouraged by the U.S. government is:
   A. Reduced use of fertilizer
   B. Reduced use of herbicides
   C. Reduced soil erosion
   D. Reduced yield
   E. All of the above
36. Correct answer: True, page 10-WC; page 77-AG
Atrazine, Lasso and others have been found in water sources for municipal water systems. The level is very low but we need to take every precaution to keep herbicides out of groundwater or surface water.

37. Correct answer: True, page 10-WC; Page 77-AG
The greatest risk to water contamination is erosion and water run-off from fields. Fertilizer and herbicides are materials carried from crop fields.

38. Correct answer: True, page 10-WC; pages 77 and 78-AG
Groundwater contamination generally occurs from careless handling of pesticides and often could have been prevented. Contamination of soil by pesticides at loading sites and back-siphoning of pesticides into wells needs to be guarded against closely.

39. Correct answer: F, page 10-WC; page 77-AG
The potential for groundwater contamination is greater, not less, on sandy soils and with higher herbicide rates. However, the potential is less if a herbicide is used with a low leaching potential (which is a herbicide with low solubility not strongly absorbed by soil particles, or one less persistent in the soil). So, both “B” and “C” are correct, with “F” being the correct answer.

40. Correct answer: F, page 10-WC; page 77-AG
Triazines currently account for most groundwater label warnings, which include all of the possible choices. These have warnings because they have been found in groundwater or are regarded as having a potential to move underground.

41. Correct answer: True, page 34-WC
The use of a triazine (atrazine or simazine) the previous year, coupled with the use of metribuzin on soybeans, increases the chances of triazine injury to soybeans.

42. Correct answer: C, page 6-AG
The major advantage to reducing tillage is reduced soil erosion. The use of fertilizer and herbicides on reduced tillage will at first increase, but later decrease, assuming adequate management.
43. Indicate in the first column if each weed is an annual (A), biennial (B), or perennial (P) by placing an “A,” “B,” or “P” in each blank. In the second column, indicate if each weed is a grass (G), broadleaf (B), or sedge (S) by placing a “G,” “B,” or “S” in each blank.

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<thead>
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<th>Weed</th>
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</table>
Correct answers are listed below:  Pages 54-60 - WC

Each of the weeds are discussed in the “Control of Problem Weeds” section of the *Weed Control Guide* (WC). In the discussion it is indicated if each is an annual (grows one year or less), a biennial (grows for two years), or a perennial (grows for more than two years). The discussion also indicates if each weed is a grass, broadleaf, or sedge. This information is very important in effectively controlling weeds.

<table>
<thead>
<tr>
<th>Weed</th>
<th>Annual</th>
<th>Biennial</th>
<th>Perennial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada Thistle</td>
<td>P</td>
<td></td>
<td>B</td>
</tr>
<tr>
<td>Jerusalem Artichoke</td>
<td>P</td>
<td></td>
<td>B</td>
</tr>
<tr>
<td>Wirestem Muhly</td>
<td>P</td>
<td></td>
<td>G</td>
</tr>
<tr>
<td>Foxtail</td>
<td>A</td>
<td></td>
<td>G</td>
</tr>
<tr>
<td>Johnsongrass</td>
<td>P</td>
<td></td>
<td>G</td>
</tr>
<tr>
<td>Shattercane</td>
<td>A</td>
<td></td>
<td>G</td>
</tr>
<tr>
<td>Quackgrass</td>
<td>P</td>
<td></td>
<td>G</td>
</tr>
<tr>
<td>Yellow nutsedge</td>
<td>P</td>
<td></td>
<td>S</td>
</tr>
<tr>
<td>Burcucumber</td>
<td>A</td>
<td></td>
<td>B</td>
</tr>
<tr>
<td>Annual Morningglory</td>
<td>A</td>
<td></td>
<td>B</td>
</tr>
<tr>
<td>Field Bindweed</td>
<td>P</td>
<td></td>
<td>B</td>
</tr>
<tr>
<td>Hedge Bindweed</td>
<td>P</td>
<td></td>
<td>B</td>
</tr>
<tr>
<td>Giant Ragweed</td>
<td>A</td>
<td></td>
<td>B</td>
</tr>
<tr>
<td>Hemp Dogbane</td>
<td>P</td>
<td></td>
<td>B</td>
</tr>
<tr>
<td>Common Milkweed</td>
<td>P</td>
<td></td>
<td>B</td>
</tr>
<tr>
<td>Velvetleaf</td>
<td>A</td>
<td></td>
<td>B</td>
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</tbody>
</table>
**Weed Control**

When calculating your score, disregard question 43.

**Score Card**

<table>
<thead>
<tr>
<th>No. of Questions Answered Correctly</th>
<th>% Correct</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>38-42</td>
<td>&gt; 90%</td>
<td><strong>Excellent</strong> — You have a very good understanding of weeds and their control in the area of grain &amp; cereal crops. Proceed to the next unit.</td>
</tr>
<tr>
<td>34-37</td>
<td>&gt; 80%</td>
<td><strong>Good</strong> — Be sure you understand those questions that you missed. It may help to read the “Weed Control Principles” section again and re-answer the questions you missed.</td>
</tr>
<tr>
<td>30-33</td>
<td>&gt; 70%</td>
<td><strong>Poor</strong> — Your score indicates a borderline level of expertise. Be sure to re-read the “Weed Control Principles” section again and re-answer the questions you missed.</td>
</tr>
<tr>
<td>0-29</td>
<td>&lt; 70%</td>
<td>Re-read the “Weed Control Principles” section of the <em>Weed Control Guide for Ohio Field Crops</em> and work through the previous section of the workbook again.</td>
</tr>
</tbody>
</table>
Ohio Pesticide Applicator Training

INSECT PESTS OF FIELD CROPS

Field Crop Insect Pests
Field Crop Insect Pests

Author:
K. Troy Putnam
County Associate Agent, Agriculture

1. What condition(s) can increase the chance that corn will be attacked by armyworms?
   A. Corn planted in fields adjacent to small grains
   B. Planting corn after soybeans
   C. Corn planted in a grass cover crop under a reduced-tillage program
   D. All the above
   E. Both A and C

2. Wireworms are the larval stage of which group of beetles?
   A. Japanese beetle
   B. Click beetle
   C. Bean leaf beetle
   D. Flea beetle development

3. What is the preferred method for preventing corn rootworm injury?
   A. Rotation of corn with an alternate crop
   B. Using insecticides
   C. Planting corn after corn
   D. None of the above

4. High organic matter, decaying vegetation, or cool, damp soil, are conditions where what insect can cause problems in corn?
   A. Rootworm
   B. Grubs
   C. European corn borer
   D. Seedcorn maggots

5. What stage of the alfalfa weevil causes the most damage to alfalfa foliage?
   A. Adult
   B. Pupal
   C. Nymph
   D. Larvae
1. Correct answer: E, page 9
   The potential for armyworm outbreaks are increased when corn is planted in a grass cover crop under a reduced-tillage program. Fields adjacent to small grains also may be subject to migrating larval populations.

2. Correct answer: B, page 5
   Wireworms are the larval state of a group of beetles commonly called “click beetles.” The larval stage of wireworms requires from two to five years or more to complete.

3. Correct answer: A, page 3
   Because corn is the preferred host of corn rootworms, larvae of rootworm populations only occur in significant numbers in corn fields preceded by corn.

4. Correct answer: D, page 5
   Seedcorn maggots are larvae of small flies that are attracted to germinating seeds, especially in situations where decaying organic matter is present. During a wet, cool spring, the corn seed may have difficulties germinating, and therefore the period of time that the maggot can attack is extended.

5. Correct answer: D, page 16
   When the alfalfa weevil larvae are 1/4 to 1/3 inch in length, they cause the most damage to alfalfa. Both the adult and larvae stages of the alfalfa weevil beetle feed on alfalfa foliage. Adult damage to the foliage is not considered significant.

* Page numbers refer to OCES Bulletin 545, *Insect Pests of Field Crops.*

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6. The Hessian fly can be a problem when:
   A. Wheat is planted after the Ohio fly-free date
   B. The fall is hot and humid
   C. Wheat is planted before the Ohio fly-free date
   D. Wheat is planted following wheat

7. An insect that feeds on the corn foliage starting with the edge of the leaf and defoliates a plant completely to a point that only the leaf midribs remain is the:
   A. Armyworm
   B. European corn borer
   C. Corn rootworm
   D. Corn leaf aphid

8. During a walk through your corn field you find stalks of young corn cut off at ground level. What insect(s) could have caused this?
   A. Sod webworm
   B. Cutworm
   C. Grubs
   D. Both B and C
   E. Both A and B

9. How do wireworms damage a corn stand?
   A. By feeding on germinating seeds
   B. By feeding on early seedlings
   C. They may bore into stalks at the soil level
   D. All the above
   E. None of the above

10. As you drive down the road you notice some of your corn lodged over or “goosenecked.” Upon closer examination, you also find several ears with the silks clipped off. What is the problem?
    A. Raccoons
    B. Rootworms
    C. Japanese beetles
    D. European corn borer
    E. Both B and C
6. Correct answer: C, page 19
Wheat sown on or after the fly-free date indicated for each county will escape most egg deposition by the fall brood of Hessian fly. Maggots of the Hessian Fly extract juices from stems of wheat and other grains.

7. Correct answer: A, page 9
The armyworm will chew the leaves, starting from the edge, and if populations are high enough strip the entire leaf and plant.

8. Correct answer: E, pages 6, 7 and 8
Cutworms or webworms may be the critters cutting off your corn plants. Such cutting may occur in corn up to the 6th leaf stage. Webworm cutting will be restricted to small plants due to their smaller size.

9. Correct answer: D, pages 5 and 6
The wireworm can cause damage by any of the methods listed. Wireworm injury is often associated with a small feeding hole at the base of the plant.

10. Correct answer: B, page 3
The corn rootworm can cause damage by feeding on the corn root system or by feeding on the silks during July and August.
11. The most common insect pest(s) attacking the corn seed after planting are:

A. Wireworms  
B. Seedcorn maggots  
C. Grubs  
D. All the above  
E. Both A and B

12. The decision to apply a pesticide must be based on:

A. The economic cost-benefit of the action  
B. The environmental implications of the action  
C. Applicator safety  
D. All the above

13. Soybeans become more sensitive to defoliation at what growth stage?

A. Emergence to bloom  
B. Bloom to pod-fill  
C. After pod-fill to plant yellowing  
D. Plant yellowing and beyond

14. Honeybees are needed for the pollination of our crops. During what time of day should we spray unwanted insects so that the honeybee will have a greater chance to survive?

A. During the middle of the afternoon  
B. Late in the evening (after 7:30 p.m.) or early in the morning (before 8 a.m.)  
C. Around noon  
D. Just before a rain

15. Bean leaf beetles often can feed on soybean pods. When is rescue treatment warranted?

A. When injury to 8 percent or more of the pods is likely  
B. When beetles are clearly visible in the field  
C. When injury to 18 percent or more of the pods is likely  
D. Treatment is not necessary after pods are set

16. In corn, what part of the plant do grubs prefer to feed on?

A. Roots and root hairs  
B. Newly emerged foliage  
C. The main shoot below ground level  
D. Both A and C  
E. Both B and C
11. Correct answer: E, pages 5 and 6
Wireworms and seedcorn maggots can both feed on the corn seed. (Seedcorn beetles are also a predator of the corn seed.)

12. Correct answer: D, page 2
All of the answers are correct in this question. As a farmer, you must realize that the benefit from using an insecticide must exceed the cost of application. We are becoming increasingly aware of environmental and user safety, therefore “B” and “C” would also apply.

13. Correct answer: B, page 11
Bloom to pod-fill is a critical time period for the soybean plant. Defoliation at this point could greatly reduce yields. The plant is no longer growing new leaves and insect feeding will cause a reduction in photosynthesis. Loss of photosynthesis affects reproductive growth (filling of the pods).

Honeybees are least active late in the evening or early in the morning, therefore we should attempt to spray insecticides at that time.

15. Correct answer: A, page 11
Pod-feeding is a definite threat presented by the bean leaf beetle. Once the pod is damaged, moisture and disease organisms have a greater chance of entering and reducing seed quality.

Explanation: In recent years grubs have become a problem in Ohio. They can feed on roots and root hairs, as well as the main shoot below ground level.
17. Common stalk borer damage in corn is best prevented by:

A. Using resistant varieties  
B. Not planting next to alfalfa  
C. Maintaining weed-free fields  
D. Treating seed prior to planting

Match the insect damage symptoms with the correct insect. Place the letter of the most correct insect on the line next to the plant symptom.

**Symptom**  

___ 18. Soybean foliage exhibits a speckled appearance and later may turn yellow or bronze.  
___ 19. Partially eaten corn seeds; loss of germination or stunted seedlings.  
___ 20. Oblong holes in the corn; leaves in the pre-whorl stage.  
___ 21. “Windowpane” feeding in corn and 1/8 inch long, black insects that jump when disturbed.  
___ 22. Stunting, leaf curling, necrosis or dying soybean leaves.  
___ 23. “Skeletonizing” of soybean leaves

**Insect**  

A. Seedcorn beetle  
B. Flea beetle  
C. Potato leafhopper  
D. Billbugs  
E. Two-spotted spider mites  
F. Mexican bean beetle

24. Timely cutting of alfalfa is an alternative to using insecticides for management of the alfalfa weevil or potato leafhopper.

A. True  
B. False

25. Most black cutworms overwinter in plant debris from the previous crop.

A. True  
B. False
17. Correct answer: C, page 9
Weedy areas, (especially where orchardgrass is present) and fields receiving minimum tillage are likely to have higher common stalk borer populations.

Correct Answers

18. E, Two-spotted spider mite, page 15

19. A, Seedcorn beetle, page 5

20. D, Billbugs, page 6

21. B, Flea beetle, page 8

22. C, Potato leafhopper, page 14

23. F, Mexican bean beetle, page 13

24. Correct answer: A, page 16
If alfalfa is tall enough to ensure root reserves, early cutting is an alternative. Beneficial parasite (such as the parasitic wasp) populations that control alfalfa weevil are kept at high numbers when cutting is used as the control method. Timely harvest of 2nd and 3rd cuttings reduces potato leaf hopper numbers.

25. Correct answer: B, page 6
In some parts of the state adults of the black cutworm may originate from overwintering pupae, but most adults of the black cutworm migrate into Ohio in the spring by way of southern weather fronts.
26. The adult Japanese beetle is a problem during the months of April and May when soybeans are young.

   A. True
   B. False

27. Armyworms can attack either wheat or corn.

   A. True
   B. False

28. Several species of aphids can be found in Ohio wheat fields. None of them ever warrants rescue treatment.

   A. True
   B. False

29. Most chemicals used for insect control have no preharvest limitation, which means after spraying there are no needed waiting days before harvest or grazing.

   A. True
   B. False

30. Not all insects were covered by this test. It would be advisable to become familiar with all the insects listed in OCES Bulletin 545 prior to taking the private applicator exam.

   A. True
   B. False
Adult beetles cause most foliar injury in late June, July and August. The adults emerge from the soil in late June where they have passed most of the year in the grub stage.

27. Correct answer: A, pages 9 and 19
In late spring, wheat is subject to attack by armyworm populations. Beard and head clipping, defoliation, and consumption of the whole plant are symptoms to watch for. Corn is also subject to attack by armyworms in late spring.

28. Correct answer: B, page 19
Ohio does recognize the greenbug, the English grain aphid, the oat-bird cherry aphid, and the corn leaf aphid as small grain pests. Of those, the greenbug may prove to be the most serious pest. If populations are high enough, all aphids could cause damage that warrants rescue treatment.

29. Correct answer: B, pages 7, 12, 16 and 19
Nearly all pesticides have preharvest limitations. Check the label before making applications.

30. Correct answer: A
It is the intent of the author that the preceding questions on insects will have better prepared you for the private applicator exam. The actual exam will be different and preparation on your part is essential. We recommend you spend time in each section of the book.
# Insect Control

## Score Card

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<thead>
<tr>
<th>No. of Questions Answered Correctly</th>
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<tr>
<td>27-30</td>
<td>&gt; 90%</td>
<td><strong>Excellent</strong> — You have a very good understanding of insects and their control for the area of grain and cereal crops. Proceed to the next unit.</td>
</tr>
<tr>
<td>24-27</td>
<td>&gt; 80%</td>
<td><strong>Good</strong> — Be sure you understand those questions that you missed. It may help to re-read <em>Insect Pests of Field Crops</em> and re-answer the questions you missed.</td>
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<tr>
<td>0-21</td>
<td>&lt; 70%</td>
<td>Re-read <em>Insect Pests of Field Crops</em> and work through previous section of the workbook again.</td>
</tr>
</tbody>
</table>
Field Crop Diseases

Author:
Roger Bender
County Extension Agent, Agriculture

1. Which of the following conditions make soybeans more susceptible to phytophthora root rot?
   
   A. Significant soil compaction
   B. Excessive rainfall
   C. Lack of resistance
   D. B and C
   E. A, B and C

2. The disease generally most damaging to field corn is:
   
   A. Leaf blight
   B. Stalk rot
   C. Root rot
   D. None of the above

3. Fungicides are:
   
   A. Pesticides
   B. Insect control agents
   C. Disease control products
   D. Harmless
   E. A and C

4. Corn leaf blight is most effectively controlled by proper hybrid selection.
   
   A. True
   B. False

5. Which of the following are wheat diseases?
   
   A. Stewart’s wilt
   B. Powdery mildew
   C. Sclerotinia
   D. Leaf rust
   E. B and D
1. Correct answer: E
Any factor that increases the likelihood of flooding will improve conditions for the infection of the phytophthora organism. Varietal resistance is a valuable tool to minimize losses due to phytophthora root rot.

2. Correct answer: B
Stalk rots are the most important and common diseases of corn. Gibberella and anthracnose stalk rot are fungus diseases that can cause premature ripening, chaffy ears and lodging.

3. Correct answer: E
The general term “fungicide,” is often used to describe chemicals that combat fungi. (OCES Bulletin 713, Applying Pesticides Correctly, page 14.)

4. Correct answer: True
Leaf blight diseases are most effectively controlled by selecting hybrids with disease resistance. Rotation away from corn and burial of corn residue may also be helpful.

5. Correct answer: E
Powdery mildew and leaf rust are two of many wheat diseases. Stewart’s wilt is a corn disease and sclerotinia affects soybean and alfalfa crops.
6. Optimum disease control can be enhanced by:
   A. Proper fertilization
   B. Improved weed control
   C. Proper seed bed preparation
   D. All of the above
   E. None of the above

7. Using a rotation sequence of two or more years:
   A. Increases the incidence of take-all in wheat
   B. Favors the development of Cephalosporium stripe
   C. Reduces the fungal carryover of take-all and stripe
   D. None of the above

8. Clean tillage does not help reduce fungus diseases in “grain” crops.
   A. True
   B. False

9. Which of the following is not an important oat disease?
   A. Sclerotinia
   B. Loose smut
   C. Crown rust
   D. Barley yellow dwarf
   E. None of the above

10. Head scab in wheat:
    A. Is not preventable by use of resistant varieties
    B. Is usually more severe when wheat is planted after corn
    C. A and B
    D. None of the above

11. Phytophthora root rot is the most destructive soybean disease in Ohio.
    A. True
    B. False

12. Delayed germination can increase seedling disease prevalence in corn, soybeans, wheat and oats.
    A. True
    B. False
6. Correct answer: D
Good agronomic practices like proper seeding rates, seeding dates, balanced fertility, crop rotation, weed control, insect control and seedbed preparation all help control diseases.

7. Correct answer: C
Both take-all and Cephalosporium stripe are favored by wheat year after year in the same field. Rotating away from wheat two or more years helps reduce fungal carryover.

8. Correct answer: False
Burying crop residues helps lessen the chance of fungus diseases by enhancing decomposition of plant material and death of the disease-causing fungi.

9. Correct answer: A
Oat diseases that have caused problems in recent years include loose smut, covered smut, crown rust and barley yellow dwarf virus. Sclerotinia is a fungus disease of soybeans and alfalfa.

10. Correct answer: C
There are no varieties of wheat resistant to head scab. This disease is usually more severe when wheat follows corn because the fungi causing scab and Gibberella stalk rot are the same.

11. Correct answer: True
Although there are many diseases attacking the soybean plant, phytophthora root rot is the most destructive disease in Ohio.

12. Correct answer: True
Anything that prolongs the time from when the seed is placed in the ground, to the time the plant no longer needs to draw from food stores in the seed itself, increases the possibility of disease infestation. Poor seed placement, cold temperatures, excessively wet or dry soil conditions and a host of other factors can contribute to the problem.
13. Major corn diseases include:
   
   A. Ear rots  
   B. Leaf blights  
   C. Stalk rots  
   D. All of the above  
   E. None of the above

14. The Gibberella fungus:
   
   A. Is the most important corn ear rot disease  
   B. Causes head scab in wheat  
   C. Can cause stalk rot in corn  
   D. A, B, and C  
   E. A and C

15. Sclerotinia stem rot in soybeans:
   
   A. Develops as a white mold creating a lesion that girdles the stem  
   B. Can be controlled with use of resistant varieties  
   C. Can be controlled in no-till conditions with a two-year rotation  
   D. A and B  
   E. A and C

16. The use of fungicides is the primary control method of field crop diseases.
   
   A. True  
   B. False

17. Corn virus diseases are often more severe in fields heavily infested with johnsongrass and:
   
   A. Can be transmitted by aphids and leafhoppers  
   B. Are controlled by the use of resistant and tolerant hybrids  
   C. Include maize dwarf mosaic and maize chlorotic dwarf  
   D. All of the above  
   E. None of the above

18. No chemical control methods are recommended for soybean leaf diseases.
   
   A. True  
   B. False

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13. Correct answer: D
The major corn diseases can be grouped into four categories: leaf blights, stalk rots, ear rots and virus diseases.

14. Correct answer: D
Gibberella causes head scab in wheat, stalk and ear rot in corn and seedling diseases in both crops.

15. Correct answer: A
Sclerotinia stem rot, or white mold, can be recognized as a white mold beginning soon after flowering that causes a girdling lesion on the stem. Although some varieties show smaller yield losses under disease conditions, there is no resistance to the white mold. Since deep plowing is needed to bury sclerotia, a two-year no-till rotation away from soybeans would not provide effective control.

16. Correct answer: False
Most measures prescribed for control of field crop diseases are non-chemical, simply because fungicides and other disease control chemicals are expensive. Use of resistant varieties and hybrids, crop rotation and good agronomic practices all help control diseases.

17. Correct answer: D
The corn virus diseases, maize dwarf mosaic and maize chlorotic dwarf, are potentially destructive in fields infested with johnsongrass. Aphids and grasshoppers pick up the virus by feeding on johnsongrass and subsequently may transmit the virus to nearby corn plants. Planting resistant or tolerant hybrids helps control the disease.

18. Correct answer: True
Although several leaf diseases are common every year, they seldom destroy enough tissue to reduce yield. All varieties show susceptibility and continuous cropping may increase the problem. No chemical controls are recommended.
19. Excessive use of nitrogen fertilizer in wheat favors:
   A. Septoria
   B. Powdery mildew
   C. Leaf rust
   D. A and B
   E. B and C

20. Disease in a field crop most likely occurs when:
   A. Resistant varieties are grown
   B. Environmental conditions favor infection
   C. Pathogens attack a vulnerable plant
   D. B and C
   E. All of the above

21. Phomopsis seed decay in soybeans:
   A. Can result in poor germination and emergence
   B. Occurs when wet weather persists during soybean dry-down and maturation
   C. Is caused by bacteria and viruses
   D. A and B
   E. A, B and C

22. Which of the following tends to increase the possibility of corn stalk rot?
   A. Stalk borers
   B. Continuous corn
   C. Soil potassium level of 300 lbs. K/A
   D. A, B and C
   E. A and B

23. Planting corn, soybean and wheat seed that has a high germination will have insignificant effect on the likelihood of seedling disease.
   A. True
   B. False

24. Yield loss from corn leaf diseases:
   A. Is most severe when the upper leaves become infected at or soon after tasseling
   B. Causes loss of green leaf tissue resulting in lowered photosynthesis
   C. May result in shriveled and lighter weight test grain
   D. All of the above
   E. None of the above
19. Correct answer: D
Use of resistant varieties is important for control of powdery mildew, leaf rust and Septoria diseases. Supplying optimum nutrition to produce healthy plants will help reduce the harmful affects of foliage diseases. However, excessive use of nitrogen fertilizer will favor the development of powdery mildew and Septoria diseases.

20. Correct answer: D
Field crop diseases occur when pathogens attack susceptible plants, during environmental conditions that favor infection and growth of the pathogen within the plants.

21. Correct answer: D
Phomopsis seed decay results from fungal infection of pods and seeds when plants mature during wet weather. Prevalence of wet weather during seed dry-down will enhance the disease development. Moldy seeds have poor germination and will probably die before emergence.

22. Correct answer: E
Plant stress due to lack of moisture, leaf disease, insect injury and nutrient deficiency tends to increase the incidence of stalk rot. Continuous corn tends to contribute to stress and stalk borers permit stalk rot fungi to enter the plant. A soil test value of 300 lbs. K/A is excellent for corn production.

23. Correct answer: False
A recommended management practice for control of disease in corn, soybeans and wheat, is to plant only high quality seed with a high germination percentage.

24. Correct answer: D
All leaf blight diseases cause loss of green leaf tissue and may cause shriveled and lighter test weight grain. When leaf damage is severe, plants may be predisposed to stalk rot diseases. Yield loss is usually related to the time when the upper leaves of the plant become infected. Severe yield loss occurs when the upper leaves (the ear leaf and those above the ear) become infected at or soon after tasseling. If disease does not occur on these leaves until six to eight weeks after tasseling, yield loss will be minimal.
25. Proper identification of diseases:
   A. Takes too long if the corrective treatment is to be timely
   B. Is not necessary if broad spectrum fungicides are used
   C. Has little to do with long term prevention and control strategies
   D. All of the above
   E. None of the above

26. Widespread outbreaks of Rhizoctonia root rot in soybeans usually occurs:
   A. When we have a wet growing season
   B. When weather is dry in early spring and wet later in the season
   C. When weather is wet in early spring and dry later in the season
   D. None of the above

27. Hot, rainy weather from mid-April through flowering favors the development of wheat diseases such as powdery mildew, leaf rust, septoria and head scab.
   A. True
   B. False

28. Seedborne disease problems can be reduced by:
   A. Planting seed deeper when soil is cold
   B. Utilization of fungicide seed treatments
   C. Ensuring optimum seed to soil contact to improve germination
   D. A, B and C
   E. B and C

29. Integrated Pest Management (IPM) practices should be used for all crop pest control, including diseases, insects and weeds.
   A. True
   B. False

30. When planning a crop disease management strategy, a farmer should:
   A. Refer to field histories in planning rotations and fertilization
   B. Obtain hybrid and varietal publications from Extension and private sources to assist in selecting seed supplies
   C. Collect publications with color identification photographs
   D. Obtain correct identification of disease problems that have occurred on the farm
   E. All of the above
25. Correct answer: E
The key to successful disease control is correct identification of disease problems. This can be done quickly by using publications with color I.D. photographs and/or advice from competent sources. Fungicides may provide effective or economical control of some diseases, but proper identification is essential for both short- and long-term disease prevention and control.

26. Correct answer: B
Although Rhizoctonia root rot can be identified under almost any weather condition, wide spread outbreaks would be more prevalent when weather conditions are dry in the spring and wet later in the season.

27. Correct answer: False
Cool, wet weather from mid-April through flowering is favorable for the development of powdery mildew and Septoria tritici leaf blotch while Septoria nodorum blotch and leaf rust are favored by warmer, wet weather. Septoria nodorum glume blotch and head scab are likely to appear if wet weather persists through early June.

28. Correct answer: E
Because rapid germination and seedling growth reduces the probability of seedborne diseases, placement of seed in warm soil with optimum seed to soil contact is a critical non-chemical practice. Judicious use of a seed treatment fungicide may also help minimize seed and seedling diseases.

29. Correct answer: True
Integrated Pest Management, while having many definitions, involves the use of economically and environmentally sound practices. IPM helps crop producers identify all pests, determine the need for control methods, and choose the appropriate combination of control methods for the situation. (General IPM definition derived from several publications.)

30. Correct answer: E
The cornerstone of successful disease control is correct identification of disease problems. Producers facing specific problems can fine tune their disease control strategies to those few diseases encountered each year. Those with little experience identifying diseases should seek help from competent sources. Several publications are available that provide color photos of the major diseases and complete descriptions of factors affecting their development. These can be obtained from the Ohio Cooperative Extension Service office in each county. Disease samples can be submitted to the Plant and Pest Diagnostic Clinic at The Ohio State University for diagnosis.
# Disease Control

## Score Card

<table>
<thead>
<tr>
<th>No. of Questions Answered Correctly</th>
<th>% Correct</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>27-30</td>
<td>&gt; 90%</td>
<td><strong>Excellent</strong> — You have a very good understanding of diseases and their control in the area of grain and cereal crops.</td>
</tr>
<tr>
<td>24-27</td>
<td>&gt; 80%</td>
<td><strong>Good</strong> — Be sure you understand those questions you missed. It may help to read <em>Field Crop Disease Management</em> again and re-answer the questions you missed.</td>
</tr>
<tr>
<td>21-24</td>
<td>&gt; 70%</td>
<td><strong>Poor</strong> — Your score indicates a borderline level of expertise. Be sure to read <em>Field Crop Disease Management</em> again and re-answer the questions you missed.</td>
</tr>
<tr>
<td>0-21</td>
<td>&lt; 70%</td>
<td>Re-read <em>Field Crop Disease Management</em> and the other suggested references, and work through this section of the workbook again.</td>
</tr>
</tbody>
</table>