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# Ohio Pesticide Applicator Training



Field Crops  
Student Workbook

## Acknowledgements

We would like to express our appreciation to the following individuals for contributing to or reviewing the manuscript prior to publication:

Anne Dorrance, Dept. of Plant Pathology, OSU  
Pat Lipps, Dept. of Plant Pathology, OSU  
Mark Loux, Dept. of Agronomy, OSU  
Diana Roll, Ohio Dept. of Agriculture

## Preface

This workbook was prepared by Ohio State University Extension for use as a self-study guide or in combination with an educational program. It has been developed to assist pesticide applicators in better preparing themselves for taking the exams required for certification in 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 in order 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 Ohio State University Extension. All references are available from any county office of Ohio State University Extension.

Bulletin 789 *Weed Control Guide for Ohio Field Crops*  
Bulletin 827 *Corn, Soybean, Wheat and Alfalfa Field Guide*  
Bulletin 545 *Insect Pests of Field Crops*  
CORN Newsletter: <http://corn.osu.edu/agcrops.html>

Users of this workbook should read the bulletins for each section before attempting to answer the questions. When completing this workbook, use the flap on the back cover to conceal the answers while answering the questions on the left hand page. Once all the questions for a section are answered, 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.

A variety of question formats are used in this study guide to assist in learning. However, most questions on the actual exam are multiple choice format or a few questions may be “true and false.”



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Keith L. Smith, Associate Vice President for Ag. Adm. and Director, OSU Extension

TDD No. 800-589-8292 (Ohio only) or 614-292-1868

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# **Ohio Pesticide Applicator Training Field Crops Student Workbook**

## **Prepared by:**

Jeff Stachler, Program Specialist, Weed Science, OSU  
Roger Bender, OSU Extension Agent, Shelby County  
Bruce Eisley, Research Associate Entomology, OSU

## **Compiled by:**

Joanne Kick-Raack, Coordinator  
Pesticide Applicator Training  
June Allen, Extension Associate  
Pesticide Applicator Training

# Field Crop Weed Control

Author: Jeff Stachler, Extension Program Specialist,  
Weed Science, The Ohio State University

1. **If atrazine is the only herbicide used on continuous corn, what weed will most likely become a problem?**
  - A. Pigweed
  - B. Common ragweed
  - C. Fall panicum
  - D. All of the above
  
2. **What is the best description of 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 a prominent and white midrib. The ligule is hair-like and may have hair on the sheath and under-side of the leaf blade when the plant is small.
  - 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 an herbicide program, which of the following should be considered?**
  - A. Soil type
  - B. Tillage practices
  - C. Current and following crop
  - D. Weeds species currently and previously observed in the field
  - E. Cost
  - F. All of the above

## ANSWERS

**1. Correct Answer: C**

Explanation: Atrazine is listed in the table entitled “Weed Response to Herbicides in Corn” that can be found in Bulletin 789, *Weed Control Guide for Ohio Field Crops*. Thus, the answer is C, fall panicum.

**2. Correct Answer: C**

The identification of fall panicum is important because postemergence herbicides need to be applied when plants are small. Responses “B, D, and E” contain “perennial” in the description, however, fall panicum is an annual. “A” indicates that the leaf is completely green, while “C” indicates the leaf has a prominent and white midrib. “C” is the best description.

**3. Correct Answer: E**

Cultural control is important even when herbicides are used. All of the above is the correct answer.

**4. Correct answer: F**

Soil type, tillage practices, current and following crop, weed species currently and previously observed in the field and cost are all important characteristics that should be considered when designing an herbicide program.

- 5. Herbicide performance is *not* affected by:**
- A. Soil conditions
  - B. Weather conditions
  - C. Application evenness
  - D. Application rate
  - E. Application procedure
  - F. Cost
- 6. The difference between postemergence herbicide programs and soil applied (preplant or preemergence) programs is:**
- A. The danger of a fish kill in ponds is greater for postemergence applications
  - B. The weather conditions before and after the postemergence application are more important than for preemergence applications
  - C. Thorough coverage is more important for postemergence applications compared to preemergence applications
  - D. All of the above
  - E. B & C above
- 7. Bicep II Magnum is the trade name for a product used in corn that contains two active ingredients. The common name for these ingredients are s-metolachlor and atrazine.**
- A. True
  - B. False
- 8. Atrazine needs to be applied to a corn field at 1.2 pounds of active ingredient per acre. How many gallons of AAtrex 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

**5. Correct answer: F**

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.

**6. Correct answer: E**

Weather conditions and thorough coverage are very important for effective weed control with postemergence herbicides. “B & C” are true and the answer is “E.”

**7. Correct Answer: A (True)**

Bicep II Magnum contains s-metolachlor and atrazine, which are the common names of the two active ingredients in this herbicide product. An herbicide that is given a trade name may contain one or more active ingredients.

**8. Correct Answer: C**

4L means that there are 4 pounds active ingredient per gallon.

Gallons of commercial product/acre =

$$\frac{\text{Pounds of active ingredient/acre}}{\text{Pounds of active ingredient in gallons}} = \frac{1.2 \text{ lb. /acre}}{4 \text{ lb. /gal.}} = 0.3$$

$$0.3 \text{ gallons of commercial product/acre} \times 10 \text{ acres} = 3 \text{ gallons}$$

Therefore “C” is the correct answer

- 9. Soil-applied herbicide performance 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 which are low in organic matter.**
- A. True
  - B. False
- 11. High pH soils allow triazine herbicides such as atrazine and simazine to be more active, thus providing better weed control but greater crop injury.**
- A. True
  - B. False
- 12. Herbicides that are very toxic to plants, such as paraquat (Gramoxone), can drift to non-target crops and result in illegal residues, even if the crop is not killed.**
- A. True
  - B. False
- 13. Herbicides with a short period of residual soil activity and low solubility are well-suited for early preplant application.**
- A. True
  - B. False

**9. Correct Answer: F**

Soil-applied herbicide performance is affected by all of the items listed so the answer is “F.”

**10. Correct Answer: A (True)**

Injury is more likely as less of the herbicide is “tied up” or absorbed in the soil by organic matter and clay.

**11. Correct Answer: A (True)**

The higher the soil pH, the more available soil-applied triazine herbicides become. As a result, better weed control is achieved in high pH soils but there is greater risk of crop injury.

**12. Correct Answer: A (True)**

Drift of Gramoxone to non-target plants, especially vegetables will injure them, but may not kill them. However, the residue may cause the sale of the crop to be illegal. For many herbicides no residue is allowed in food crops.

**13. Correct Answer: B (False)**

Herbicides with **long** (not short) soil residual are well suited for early preplant for two reasons. First, long residual assures season long weed 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 but are less likely to leach beyond the zone of effectiveness, so they are well suited for early preplant.

- 14. 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. Preemergence
  - D. Postemergence
  - E. None of the above
- 15. The following factors make postemergence 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
- 16. The following factor (s) or practice (s) increase the effectiveness of postemergence herbicides without increasing the chance of crop injury.**
- A. Smaller weeds
  - B. High temperatures
  - C. High relative humidity
  - D. Use of an adjuvant such as surfactant, crop oil, or fertilizer solution with the spray solution
  - E. None of the above
  - F. B, C, and D above
- 17. Translocated herbicides (those that move throughout the plant) may be effective with partial foliar coverage, while contact herbicides (those that work only where they come in contact with the plant) require more complete spray coverage.**
- A. True
  - B. False

**14. Correct Answer: C**

Preemergence 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 incorporated are applied before planting of the crop and postemergence applications are applied after the crop and weeds have emerged.

**15. Correct Answer: F**

Smaller weed size increases the effectiveness of postemergence herbicides so “A” is not the answer. High temperature and relative humidity also generally increase the effectiveness of postemergence herbicides. Drought conditions do make postemergence herbicides 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.

**16. Correct answer: A**

High temperature, high relative humidity, and the use of an adjuvant generally increase the effectiveness of postemergence herbicides, which also increase the risk of crop injury. Small weed size generally increases the effectiveness of weed control but does not increase crop injury. So the answer is “A.”

**17. Correct Answer: A (True)**

Glyphosate and other translocating herbicides can be applied with a carrier volume of 10 gallons/acre because these herbicides can move through the plant to where it kills the plant. However, paraquat needs a carrier volume of at least 15 gallons/acre and relatively high pressure because it is a contact herbicide. This allows for good spray coverage.

- 18. 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 surfactant or crop oil concentrate
  - F. A and B above
  - G. All of the above
  - H. A, B, and E above
- 19. To reduce drift of translocating herbicides, spray droplet size needs to be increased. This can be accomplished by using air induction (AI) nozzles.**
- A. True
  - B. False
- 20. To maximize drift reduction and maintain excellent weed control of postemergence herbicides, which nozzle should be used?**
- A. Floodjet nozzle for both contact and translocating herbicides
  - B. Drift reducing extended range flat fan nozzle for both contact and translocating herbicides
  - C. Air induction (AI) nozzle for translocating herbicides and drift reducing extended range flat fan nozzles for contact herbicides at low pressure
  - D. Full cone nozzles for both contact and translocating herbicides
- 21. Drift concerns may require that an applicator make efficacy compromises for the herbicides or else choose a nozzle that is not optimum for controlling drift.**
- A. True
  - B. False

**18. Correct Answer: H**

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.”

**19. Correct Answer: A**

Increasing the spray droplet size by using an AI nozzle is an excellent way to decrease drift and maintain excellent weed control with translocating herbicides. Increasing the droplet size can decrease the weed control of contact herbicides. You can increase droplet size as you reduce spray pressure or use a larger output nozzle.

**20. Correct Answer: C**

Floodjet and fullcone nozzles should not be used for any type of postemergence herbicide applications. Extended range flat fan nozzles allow too much drift of translocating herbicides. The best way to reduce the drift of postemergence herbicides is to use an air induction (AI) nozzle, however weed control may be decreased for contact herbicides. Therefore “C” is the correct answer.

**21. Correct Answer: A (True)**

- 22. Reduced tillage always results in more herbicide being used for corn and soybean production.**
- A. True
  - B. False
- 23. Burndown herbicide (s) commonly used in no-tillage crop production is (are):**
- A. Roundup WeatherMax
  - B. Paraquat
  - C. Gramoxone Max
  - D. Glyphosate
  - E. All of the above
  - F. None 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
- 25. It is against the law to apply:**
- A. An herbicide to a crop which is not on the label
  - B. More than the labeled rate of herbicide
  - C. Less than the labeled rate of herbicide
  - D. All of the above
  - E. A and B above

**22. Correct Answer: B (False)**

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 postemergence 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 very often best answered as false.

**23. Correct Answer: E**

Roundup WeatherMax is the trade name and glyphosate the common name for the same material which is used extensively to kill existing vegetation for no-tillage. Gramoxone Max 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.

**24. Correct Answer: B (False)**

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. Correct Answer: E**

It is against the law to apply any pesticide on a crop which 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, which can provide good weed control if applied to small( $\leq 2$ " in height) weeds, but will cause poor weed control when applied to large weeds.

- 26. Which of the following spray nozzles are the most wear-resistant, but also the most expensive?**
- A. Brass
  - B. Thermoplastic
  - C. Hardened stainless steel
  - D. Copper
  - E. 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 postemergence, rinsing the system with water only is sufficient.**
- A. True
  - B. False

**26. Correct Answer: C**

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**

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: B (False)**

Many herbicides, especially those applied postemergence, require very small concentrations to control weeds. For these herbicides it is necessary to clean the sprayer with ammonia, sal soda, or trisodium phosphate. For more information about tank cleaning agents locate the University of Missouri publication (number G4852) titled "Cleaning Field Sprayers to Avoid Crop Injury." It can be found at the web site: <http://muextension.missouri.edu/explore/agguides/crops/g04852.htm>

**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

**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

**29. Correct Answer: D**

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. Correct Answer: A (True)**

Numerous complaints reach ODA concerning drift to fields, gardens, lawns, trees, etc. Volatile herbicides can move long distances from the site of application and damage sensitive plants. 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 herbicide, 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**

All of the statements increase spray drift. Therefore, “E” or all of the above is correct.

**32. Which of the following herbicides is least volatile?**

- A. Clomazone (Command)
- B. Dicamba (Banvel)
- C. The ester formulation of 2,4-D
- D. The amine formulation of 2,4-D

**33. Herbicide carryover problems are increased when:**

- A. Soil temperatures are lower than normal
- B. Rainfall is lower than normal
- C. A herbicide persists for a long time
- D. The application rate is higher than normal
- E. The herbicide is applied later than normal
- F. Next year's crop is very susceptible to damage by the herbicide
- G. Next year's crop is under stress
- H. All of the above

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

- A. Atrazine (AAtrex) and Simazine (Princep)
- B. Trifluralin (Treflan), chlorimuron-ethyl (Classic and Canopy XL) and imazaquin (Scepter)
- C. Glyphosate (Roundup, etc.) and paraquat (Gramoxone Max)
- 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

**32. Correct Answer: D**

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 volatility is likely to impact non-target species.

**33. Correct Answer: H**

All of the statements increase the possibility of herbicide carryover problems. Therefore, "H" or all of the above is correct.

**34. Correct Answer: C**

Atrazine and simazine are triazines that have been used as corn herbicides for a number of years with high carryover potential. Oats are the best species to use for a bioassay. Trifluralin, chlorimuron-ethyl, and imazaquin also have high carryover risk, and are best bio-assayed by corn. Glyphosate and paraquat have no or very little soil residual, so carryover is usually not a problem for these materials.

**35. Correct Answer: A (True)**

Bioassay is the best way to test for possible herbicide damage for the approaching crop year. It allows you to isolate herbicide damage from plant growth problems due to other factors. Bioassays are only as good as the soil samples taken.

- 36. Traces of several common herbicides have been found in the 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 spray 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 water solubility
  - C. With higher herbicide rates
  - D. With persistent herbicides
- 40. Groundwater advisory statements are found on herbicide label (s) containing which of the following active ingredients:**
- A. Atrazine and simazine (AAtrex and Princep, respectively and many other products)
  - B. Isoxaflutole (Balance and Epic)
  - C. Metribuzin (and several premixes)
  - D. A and B
  - E. A and C
  - F. All of the above

**36. Correct Answer: A (True)**

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: A (True)**

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: A (True)**

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: B**

The potential for groundwater contamination is **greater**, not less, on sandy soils and with higher herbicide rates and with more persistent herbicides. However, the potential is **less** if a herbicide is used with a low leaching potential. An herbicide with low solubility is less likely to leach. So “B” is the correct answer.

**40. Correct Answer: F**

All of the active ingredients listed have a groundwater advisory statement on any label containing these ingredients. These have warnings because they have been found in groundwater. Therefore, “F” is the correct answer.

41. **Triazine herbicide injury in soybeans may result from high rates of atrazine and/or simazine (Princep) used in last year's corn crop year. Furthermore, the chance of injury is increased with the use of metribuzin containing products (such as Sencor, Canopy, Domain, Axiom, or Boundary) on the current soybean crop.**
- A. True
  - B. False
42. **What is the *maximum* rate of atrazine that can be applied preemergence if a field is considered to be highly erodible and has less than 30% crop residue on the surface?**
- A. 1.6 pounds active ingredient/acre
  - B. 1.8 pounds active ingredient/acre
  - C. 2.0 pounds active ingredient/acre
  - D. 2.5 pounds active ingredient/acre
43. **What is the *total* amount of atrazine that can be applied per calendar year?**
- A. 1.6 pounds active ingredient/acre
  - B. 1.8 pounds active ingredient/acre
  - C. 2.0 pounds active ingredient/acre
  - D. 2.5 pounds active ingredient/acre
44. **What is the *maximum* amount of atrazine that can be applied in a *single application* for soils highly erodible with greater than 30% residue cover, soils not considered highly erodible, or for a postemergence application?**
- A. 1.6 pounds active ingredient/acre
  - B. 1.8 pounds active ingredient/acre
  - C. 2.0 pounds active ingredient/acre
  - D. 2.5 pounds active ingredient/acre

**41. Correct Answer: A (True)**

The use of a triazine (atrazine or simazine) herbicide the previous year, coupled with the use of metribuzin on soybeans increases the chances of triazine injury to soybeans. The higher the triazine herbicide rate in corn, the greater the risk for soybean injury the following year.

**42. Correct Answer: A**

On soils considered to be highly erodible and having less than 30% residue cover, the **maximum** preemergence rate for atrazine is 1.6 pounds active ingredient/acre, which is answer "A."

**43. Correct Answer: D**

The **total** amount of atrazine that can be applied to a single field during one calendar year is 2.5 pounds active ingredient/acre. Therefore "D" is the correct answer. Two applications will need to be made to reach this maximum rate.

**44. Correct Answer: C**

The **maximum** amount of atrazine applied in a single application 1) to soils considered highly erodible with greater than 30% residue cover, or 2) to soils not considered highly erodible or 3) in postemergence applications is 2.0 pounds active ingredient/acre. Therefore "C" is the correct answer.

- 45. Herbicides that are active and applied at low rates require thorough cleaning of the sprayer and accurate calibration.**
- A. True
  - B. False
- 46. For which type of herbicide are adjuvants such as nonionic surfactant (NIS), methylated seed oils (MSO), crop oil concentrates (COC), and a nitrogen fertilizer (28%N or AMS) necessary to achieve maximum weed control?**
- A. Preemergence herbicides
  - B. Pre-plant incorporated herbicides
  - C. Postemergence herbicides
  - D. Residual herbicides
- 47. Which of the following cropping practices are most likely to cause the development of herbicide resistant weeds?**
- A. A corn/soybean/wheat/hay rotation, using conventional tillage, and using several different herbicide sites of action
  - B. Continuous soybeans, using continuous no-tillage, and using only one herbicide site of action
  - C. A corn/soybean/wheat rotation, using continuous no-tillage, and using several different herbicide sites of action
  - D. Continuous corn, using conventional tillage, and using several different herbicide sites of action
- 48. Which herbicide site of action has the most number of resistant weed species?**
- A. ACCase
  - B. EPSP synthase
  - C. Photosynthetic inhibitors
  - D. ALS inhibitors

**45. Correct Answer: A (True)**

Proper sprayer clean out and calibration is always important. However, it is critical for low use rate herbicides. Just a small amount of spray left in the sprayer of a highly active herbicide can cause significant damage. For highly active herbicides, proper calibration is important because too little herbicide applied will cause poor weed control and too much will cause excessive crop injury.

**46. Correct Answer: C**

Nearly all postemergence herbicides need an adjuvant such as NIS, MSO, COC, 28%N, or AMS. An adjuvant is used to break down the surface tension of spray droplets. As a result the spray mixture can spread over the leaf surface more readily and break down the leaf surface to allow more herbicide to enter the leaf. Therefore "C" is the correct answer.

**47. Correct Answer: B**

Proper crop rotation, tillage, and most importantly using herbicides with several different sites of action will delay the onset of herbicide resistant weeds for many years compared to planting the same crop every year, doing no tillage, and using a single herbicide site of action.

**48. Correct Answer: D**

ALS inhibiting herbicides such as cloransulam (First Rate), Chlorimuron (Classic), imazamox (Raptor), and others, have the most number of herbicide resistant weed species. Therefore "D" is the correct answer.

49. Indicate in the first column if each weed is an annual, winter (WA) or summer (SA), biennial (B), or perennial (P) by placing an “WA, SA 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.\*

bindweed, hedge	_____	_____
carrot, wild	_____	_____
chickweed, common	_____	_____
dandelion	_____	_____
deadnettle, purple	_____	_____
dogbane, hemp	_____	_____
foxtail, giant	_____	_____
foxtail, yellow	_____	_____
johnsongrass	_____	_____
lambquarters, common	_____	_____
marestail/horseweed	_____	_____
milkweed, common	_____	_____
morning glory, tall	_____	_____
nutsedge, yellow	_____	_____
panicum, fall	_____	_____
quackgrass	_____	_____
ragweed, common	_____	_____
ragweed, giant	_____	_____
shattercane	_____	_____
thistle, Canada	_____	_____
velvetleaf	_____	_____

\* Note: Most questions on the exam are multiple choice format. You will not be required to fill in charts.

**49. Correct Answers are listed below:**

The *Corn, Soybean, Wheat and Alfalfa Field Guide* has pictures of the weed species listed below and groups the weeds together by life cycle and type of plant. Most of the weeds below are discussed in the “Control of Problem Weeds” section of the *Weed Control Guide for Ohio Field Crops*. In that section, it is indicated whether a species is an annual (grows one year or less), a biennial (grows for two years), or a perennial (grows for more than two years). That section also indicates whether each species is a grass, broadleaf, or sedge. This information is very important in effectively controlling weeds.

bindweed, hedge	_____ P _____	_____ B _____
carrot, wild	_____ B _____	_____ B _____
chickweed, common	<u>WA (and SA)</u>	_____ B _____
dandelion	_____ P _____	_____ B _____
deadnettle, purple	_____ WA _____	_____ B _____
dogbane, hemp	_____ P _____	_____ B _____
foxtail, giant	_____ SA _____	_____ G _____
foxtail, yellow	_____ SA _____	_____ G _____
johnsongrass	_____ P _____	_____ G _____
lambsquarters, common	_____ SA _____	_____ B _____
maretail/horseweed	<u>WA (and SA)</u>	_____ B _____
milkweed, common	_____ P _____	_____ B _____
morning glory, tall	_____ SA _____	_____ B _____
nutsedge, yellow	_____ P _____	_____ S _____
panicum, fall	_____ SA _____	_____ G _____
quackgrass	_____ P _____	_____ G _____
ragweed, common	_____ SA _____	_____ B _____
ragweed, giant	_____ SA _____	_____ B _____
shattercane	_____ SA _____	_____ G _____
thistle, canada	_____ P _____	_____ B _____
velvetleaf	_____ SA _____	_____ B _____

# Field Crop Insect Pests

Author:

Bruce Eisley, Research Assistant, Entomology  
Ohio State University Extension

- 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 covered 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 beetles
  - 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

## ANSWERS

**1. Correct answer: E**

The potential for armyworm outbreaks is 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 population.

**2. Correct answer: B**

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**

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**

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. What stage of the alfalfa weevil causes the most damage to alfalfa foliage?**
- A. Adult
  - B. Pupa
  - C. Nymph
  - D. Larvae
- 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

**5. Correct answer: D**

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 foilage. Adult damage to the foliage is not considered significant.

**6. Correct answer: C**

Wheat sown on or after the fly-free date indicated for each county will escape most egg deposition by fall brood of Hessian fly. Maggots of the Hessian fly extract juices from stems of wheat and other grains.

**7. Correct answer: A**

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**

Cutworms or webworms may be the critters cutting off your corn plants. Such cutting may occur in corn up to the 6<sup>th</sup> leaf stage. Webworm cutting will be restricted to small plants due to their smaller size.

**9. Correct answer: D**

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. 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
- 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 implication 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

**10. Correct answer: B**

The corn rootworm can cause damage by feeding on the corn root system or by feeding on the silks during July and August.

**11. Correct answer: E**

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**

All of the answers are correct in this question. As a farmer, you must realize that the benefits 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**

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).

- 14. Honey bees are needed for pollination of our crops. During what time of day should we spray unwanted insects so that the honey bee will have a greater chance to survive?**
- A. During the middle of the afternoon
  - B. In early morning or late day when bees would not be active
  - 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 10 percent or more of the pods is likely
  - B. When beetles are clearly visible in the field
  - C. When injury to 25 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
- 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

**14. Correct answer: B**

Honey bees 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**

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.

**16. Correct answer: D**

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. Correct answer: C**

Weedy areas (especially where orchardgrass is present) and fields receiving minimum tillage are likely to have a higher common stalk borer population.

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.

<b>Symptom</b>	<b>Insect</b>
____ 18. Soybean foliage exhibits a speckled appearance and later may turn yellow or bronze	A. Seedcorn beetle
____ 19. Partially eaten corn seeds; loss of germination or stunted seedlings	B. Flea beetle
____ 20. Oblong holes in the corn; leaves in the pre-whorl stage	C. Potato leafhopper
____ 21. “Windowpane” feeding in corn and 1/8 inch long, black insects that jump when disturbed	D. Billbugs
____ 22. Stunting, leaf curling, necrosis or dying soybean leaves	E. Two-spotted spider mites
____ 23. “Skeletonizing” of soybean leaves	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	

## Correct Answers

18. E, Two-spotted spider mite

19. A, Seedcorn beetle

20. D, Billbugs

21. B, Flea beetle

22. C, Potato leafhopper

23. F, Mexican bean beetle

24. **Correct answer: A (True)**

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 2<sup>nd</sup> and 3<sup>rd</sup> cuttings reduces potato leafhopper numbers.

25. **Correct answer: B (False)**

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 for 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 OSU Extension Bulletin 545 prior to taking the private applicator exam.**
- A. True
  - B. False

**26. Correct answer: B (False)**

Adult beetles cause the 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 (True)**

In late spring, wheat is subject to attack by armyworm populations. Beard and head clippings, 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 (False)**

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 (False)**

Nearly all pesticides have preharvest limitations. Check the label before making applications.

**30. Correct answer: A (True)**

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.

# Field Crop Diseases

Author:

Roger Bender

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 can be effectively controlled by proper hybrid selection.**
  - A. True
  - B. False

## ANSWERS

**1. Correct answer: E**

Any factor that increases the likelihood of flooding will improve conditions for the infection of the phytophthora organism. Varietal resistance, tolerance, and seed treatment are all valuable tools to minimize losses due to *Phytophthora*.

**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.

**4. Correct answer: A (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. Which of the following are wheat diseases?**
- A. Stewart's wilt
  - B. Powdery mildew
  - C. Sclerotinia
  - D. Leaf rust
  - E. B and D
- 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 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

**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 soybeans and alfalfa crops.

**6. Correct answer: D**

Good agronomic practices like proper seeding rates, seeding dates, balance 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: B (False)**

Burying crop residues helps lessen the chance of fungal 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 fungal disease of soybeans and alfalfa.

**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* damping-off and 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

**13. Major corn diseases include:**

- A. Ear rot
- B. Leaf blight
- 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

**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: A (True)**

Although there are many diseases attacking the soybean plant, *Phytophthora* damping-off and root rot is the most destructive disease in Ohio.

**12. Correct answer: A (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. 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. 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
- 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

**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: B (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 leafhoppers 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: A (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. 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. 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 (150 PPM)
- D. A, B, and C
- E. A and B

**23. Planting corn, soybeans 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

**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: B (False)**

A recommended management practice for control of disease in corn, soybeans and wheat is to plant only high quality treated 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

**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, widespread outbreaks would be more prevalent when weather conditions are dry in the spring and wet later in the season.

**27. Correct answer: B (False)**

Cool, wet weather from mid-April through flowering is favorable for the development of powdery mildew and *Septoria tritici* leaf blotch while *Stagonospora nodorum* blotch and leaf rust are favored by warmer, wet weather. *Stagonospora 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: A (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. 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
- 31. The impact of Sudden Death Syndrome (SDS) is best managed by**
- A. Reducing soybean cyst nematode populations
  - B. Crop rotation
  - C. Improving soil drainage
  - D. All of the above
  - E. None of the above
- 32. Soybean cyst nematode populations**
- A. Can increase if winter annual weeds are not controlled properly
  - B. Are not reduced by crop rotation
  - C. Are best controlled by using resistant varieties
  - D. B and C

**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 an Ohio State University Extension office in each county. Disease samples can be submitted to the Plant and Pest Diagnostic Clinic at The Ohio State University for diagnosis.

**31. Correct answer: D**

All of the above. Best management practices for Sudden Death Syndrome include reducing soybean cyst nematode problems, crop rotation, improving soil drainage and planting of earlier maturing varieties.

**32. Correct answer: A**

Soybean Cyst Nematode populations can increase if winter annual weeds are not controlled properly. Management of soybean cyst nematode also includes use of crop rotation and resistant varieties, as well as preventing the introduction of the SCN pest.

# Score Card

**Number of Questions  
Answered Correctly**

**Percent Correct**

**Evaluation**

99—111

> 90%

***Excellent*** You have a very good understanding of weed, insect and disease control in the area of grain & cereal crops.

88—98

> 80%

***Good*** Be sure you understand those questions that you missed. It may help to read the study material again and re-answer the questions you missed.

77—87

> 70%

***Needs Improvement*** Your score indicates a borderline level of expertise. Be sure to re-read the study material and re-answer the questions you missed.

0—76

< 70%

***Re-read*** the study material and work through sections of the workbook again.

# **ATTENTION:**

**Use this flap to conceal answers on right-hand pages.**