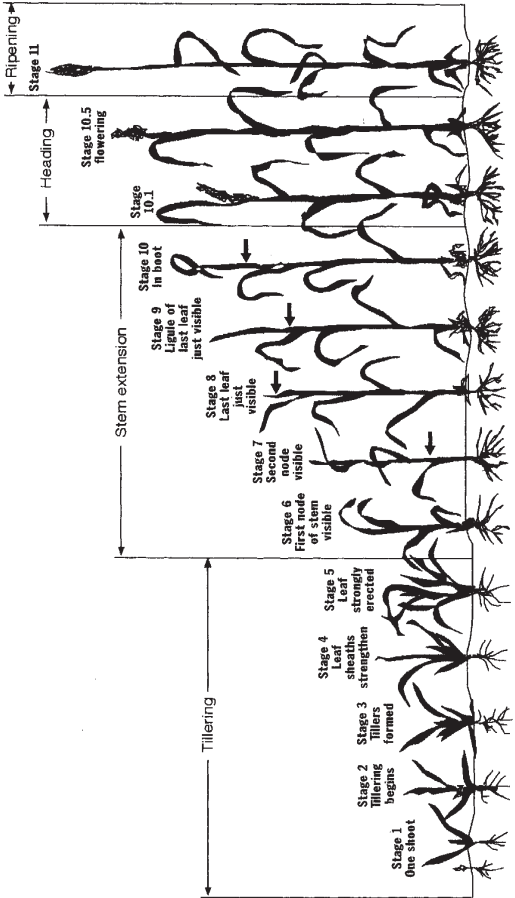


WHEAT MANAGEMENT



INSECT SCOUTING CALENDAR FOR WHEAT

Pest	Sep/Oct	April	May	June
Hessian Fly				
Cereal Leaf Beetle				
Common or True Armyworm				
Cereal Aphid				

CEREAL LEAF BEETLE

*CLB Adult**CLB Larva*

Identification & Incidence: Cereal leaf beetle (CLB) larvae may defoliate small grain foliage in the spring. Black larvae are coated with a slimy substance that readily spots a field inspector's clothing. Heavily infested fields will exhibit a frosted appearance. Oats can also be severely injured by CLB.

Sampling: Evaluation of an infested field should include sampling of 30 or more plants to determine number of larvae per stem and stage of larval development. Early larvae are less than 1/4 inch, late larvae are approximately 3/8 inch prior to pupating.

Economic Threshold: An average of 2 or more larvae per stem may be regarded as economic.

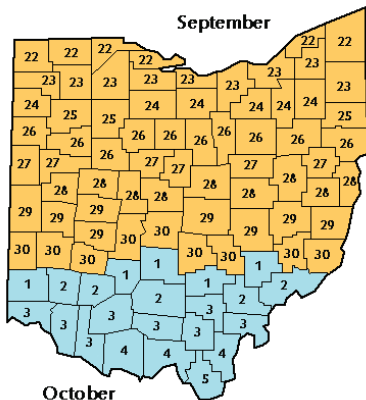
Management Options: CLB is generally controlled by a complex of beneficial wasps. Treatment of fields may be warranted when mild winters adversely affect natural control. For a list of labeled insecticides, see <http://entomology.osu.edu/ag/>.

HESSIAN FLY

Identification & Incidence: Lodging and stem breakage of wheat in the early summer plus the presence of flaxseeds (puparia of the fly) near the joints are primary indicators of Hessian fly injury, which also causes stunted growth and thin stands. Life cycle includes 2 generations per year, of which adults of the 2nd generation concludes egg laying between late September and early October in Ohio.

Sampling & Assessment: Wheat fields should be scouted in June to determine presence or absence of problem.













Management Options: Primary cultural practice for preventing problem is planting wheat in the fall after fly-free dates. Use of resistant varieties should be emphasized.



Wheat sown on or after the date indicated for each county will escape most egg deposition by the fall brood of Hessian fly.

HESSIAN FLY DEVELOPMENTAL CHART

(Adapted from: USDA Farmers' Bulletin 1627, 1953)

APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER
<p>EGGS ON LEAF GREATLY ENLARGED.</p>  <p>FLY LAYS EGGS ON LEAVES OF HEALTHY PLANT</p>	<p>LARVA OR MAGGOT GREATLY ENLARGED</p>  <p>MAGGOT HATCHES ON LEAF AND GOES TO HEALTHY STALK</p>	<p>FLAXSEED IN STALK</p>  <p>HAVING DAMAGED WHEAT, MAGGOT BECOMES FLAXSEED</p>	<p>FLAXSEED LEFT IN STUBBLE</p> 	<p>FLY, ENLARGED</p>  <p>FLAXSEED BECOMES FLY</p>	 <p>MAGGOT HATCHES AND FEEDS IN CROWN</p>
OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH
<p>MAGGOT BECOMES FLAXSEED</p> 	<p>FLAXSEED READY FOR WINTERING</p> 	<p>PLANT WEAKENED AND FAILING TO TILLER</p> 	<p>FLAXSEED WINTERING</p> 	<p>FLAXSEED WINTERING</p> 	<p>FLAXSEED ABOUT TO BECOME ADULT</p> 

CEREAL APHIDS



Greenbug

Identification & Incidence: Aphids commonly found on Ohio wheat are English grain aphid (EGA) and Bird oat cherry aphid (BOCA). Greenbug has not been identified as a pest of small grains in Ohio, although it does affect Ohio turfgrass. EGA and BOCA may occur in significant numbers, but rarely cause economic injury warranting treatment.

Sampling: Evaluation of an infestation should include a random inspection of numerous heads to determine average incidence. Presence of insect predators, which often control infestations should be noted.

Economic Threshold: Rescue treatment is warranted if an average of 50 greenbugs are found per linear foot of row on small plants in the fall, or 100 per linear foot of row in the spring.

Management Options: Heavy aphid infestations, lacking predator activity, may warrant rescue treatment. For a list of labeled insecticides, see <http://entomology.osu.edu/ag/>.

COMMON OR TRUE ARMYWORM

*Larva*

Identification & Incidence: The larva is green to brown and has stripes on each side of its body. Full grown larvae are almost 1½ inches in length. Larvae feed at night and hide in the soil debris during the day. Infestations tend to occur more often during wet spring seasons.

Sampling: Sample several areas of the wheat field and count the number of larvae per row foot collecting several larvae to make a size determination.

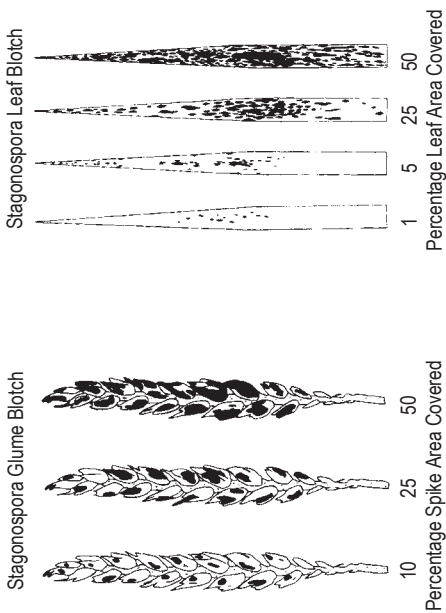
Economic Threshold: A rescue treatment is warranted if 6 or more armyworm larvae are found per 1 ft of row or if head cutting occurs prior to flowering. Where larvae are abundant enough to justify action, treatment should be applied when larvae are in the early stage of development.

Management Options: There are a number of natural enemies that may keep the armyworm in check. Check for these natural enemies before any treatment is applied. For a list of labeled insecticides, see <http://entomology.osu.edu/ag/>.

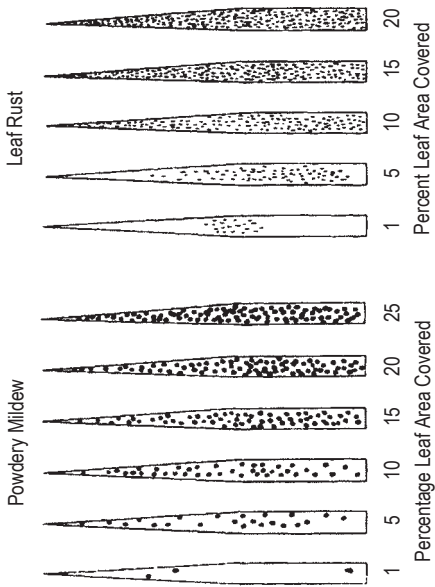
TIME OF DISEASE OCCURRENCE ON WHEAT

Disease	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Powdery mildew	■							■	■	■	
Septoria tritici blotch	■						■	■	■	■	
Stagonospora nodorum blotch	■								■	■	
Leaf rust	■								■	■	
Fusarium head blight (Scab)									■	■	
Bunt or stinking smut									■	■	■
Loose smut									■	■	
Wheat yellow mosaic	■	■					■	■	■	■	
Barley yellow dwarf	■							■	■	■	
Cephalosporium stripe					■	■	■	■	■	■	■
Take-all root rot	■						■	■	■	■	■
Sharp eyespot						■	■	■	■	■	■

DISEASE ASSESSMENT KEYS FOR DETERMINING SEVERITY BASED ON PERCENTAGE OF SPIKE AND LEAF AREA DISEASED



DISEASE ASSESSMENT KEYS FOR DETERMINING SEVERITY BASED ON PERCENTAGE AND LEAF AREA DISEASED



POWDERY MILDEW



Description: Powdery mildew is recognized as small, white, powdery pustules scattered over the leaves and stems, and occasionally on the spikes of more susceptible varieties. As leaves age, small black fruiting bodies (clistothechia) develop within the white pustules.

Location: Throughout Ohio, but more damaging in southern and north central areas.

Time of attack: Powdery mildew can be seen on seedlings of early planted wheat in the fall. Disease spread occurs in the spring when temperatures increase to 60°F or above, but spread stops at temperatures above 80°F.

Management:

- Resistant varieties
- Delayed planting
- Crop rotation
- Foliar fungicide application when 2-3 lesions present on leaf below flag leaf

SEPTORIA TRITICI LEAF BLOTCH



Description: Septoria tritici leaf blotch can be seen on the lower leaves as irregular, reddish brown blotches. As lesions age, the centers become bleached turning ash white. Small black fruiting bodies (pycnidia) develop within lesions centers.

Location: Septoria tritici leaf blotch occurs more frequently in western and northwestern Ohio than in other regions of the state.

Time of attack: Lesions are first detected on the lower leaves in early spring. During extended periods of cool (60-70°F) wet weather, the disease will spread to the upper leaves of the wheat crop.

Management:

- Resistant varieties
- Crop rotation
- Till residues
- Foliar fungicide application when 1-2 lesions present on leaf below flag leaf.

STAGONOSPORA NODORUM LEAF AND GLUME BLOTCH



Description: *Stagonospora nodorum* leaf blotch begins as small chocolate brown spots that enlarge into lens shaped lesions with dark brown margins. As the season progresses, the lesions coalesce giving the leaf a blotchy appearance. Some wheat varieties develop dark brown centers in the tan leaf lesions. Glume blotch occurs on the wheat heads as irregular brown blotches on the glumes, usually starting near the tips of the glumes.

Location: Widespread throughout Ohio.

Time of attack: *Stagonospora nodorum* attacks wheat in mid to late May and June during rainy periods when temperatures begin to warm (68° to 80° F).

Management:

- Resistant varieties
- Crop rotation
- Delay planting
- Foliar fungicide application when 1-2 lesions present on leaf below flag leaf

LEAF RUST



Description: Leaf rust is recognized as small oval, orange red pustules scattered over the upper leaves of wheat plants.

Location: Leaf rust can be found throughout the state in years favorable for disease spread. However, the disease generally spreads from southwest to northeast Ohio.

Time of attack: Leaf rust spreads up from southern wheat growing areas with frequent light rains during late May and June.

Management:

- Resistant varieties
- Foliar fungicide application when 5-10 pustules present on flag leaf

FUSARIUM HEAD BLIGHT OR HEAD SCAB



Description: Head scab is identified as dead, bleached-out florets on affected heads scattered throughout the field. Generally only a portion of the florets die whereas other florets on the head remain green. During periods of high humidity, salmon pink colored spores form on the margin of glumes of individual florets. Towards the end of the season, small black fruiting bodies (perithecia) may develop on affected heads. Seed from affected heads are light weight and shriveled, with a white to pinkish coloration, and are contaminated with vomitoxin.

Location: Throughout Ohio.

Time of attack: Wheat plants are most susceptible during the flowering stage of the plant (late May to early June). Wet, warm weather during this time generally means high disease levels.

Management:

- Resistant varieties
- Crop rotation with non cereal crop
- Do not plant wheat after corn
- Till residues
- Integrated management with resistant varieties, triazole-based fungicide, crop rotation, and tillage.

BUNT OR STINKING SMUT



Description: Diseased heads have more open florets due to smutted kernels. Affected kernels or bunt balls are dark colored and break open releasing a soft, black, pasty mass of smut spores. Heads and diseased kernels have a distinctive fishy odor.

Location: Not common, but can occur anywhere in Ohio, especially in fields planted with untreated seeds.

Time of attack: Bunt is seed-borne and effectively controlled with seed treatments. Symptoms appear at heading and disease kernels can be detected in June during grain fill.

Management:

- Seed treatment

LOOSE SMUT



Description: The kernels and florets of loose smut affected heads are converted to a mass of black, sooty fungal spores. After the diseased head emerges, the spores are blown away by the wind, leaving the rachis of the head bare.

Location: Not common, but can occur anywhere in Ohio, especially in fields planted with untreated seeds.

Time of attack: Loose smut is seed-borne and effectively controlled with seed treatments. Symptoms appear during heading of the crop in late May.

Management:

- Seed treatment

WHEAT SPINDLE STREAK MOSAIC



Description: Symptoms appear on the upper leaves as light-green to yellow dashes and short streaks. The discontinuous streaks are parallel to leaf veins and taper at the ends to form chlorotic spindle shapes. The symptoms begin to fade as temperatures rise in late spring. Plants with this viral disease are scattered throughout the field.

Location: This soil-borne viral disease has been found throughout the state.

Time of attack: Symptoms first appear in the fall on highly susceptible varieties which appear yellow compared to resistant varieties. In the spring leaf symptoms begin to be recognizable in mid-April and are evident by early May.

Management:

- Resistant hybrids
- Improve soil drainage

BARLEY YELLOW DWARF



Description: This virus disease is transmitted by aphids coming up from the south. Plants infected in the fall are stunted and leaf symptoms appear yellow to reddish or even purple. Plants infected in the spring are usually not stunted, but the upper leaves turn yellow with purple to red leaf margins. Affected leaves may lose their flexuous appearance and become erect with sharp pointed tips.

Location: Barley yellow dwarf occurs statewide.

Time of attack: Infections in the fall are most serious on early planted wheat. Spring infections are more common, but yield losses are proportional to the percentage of plants affected in the field.

Management:

- Delay planting until after the Hessian Fly safe date.

CEPHALOSPORIUM STRIPE



Description: Typical symptoms on leaves occurs during the wheat jointing to heading growth stages. Typical symptoms include chlorotic, interveinal stripes that extend the length of the leaf blade, or brown stripes bordered by yellow stripes. The veins within stripes are dark brown. Plants generally die prematurely and produce little grain.

Location: This disease can occur throughout Ohio, but appears to be more severe in compacted, heavy soils low in pH.

Time of attack: The fungus sporulates and enters roots in the winter. Leaf symptoms can be recognized in early spring before jointing, but the typical stripes are not easily detected until jointing. Evidence of the brown veins can be detected in prematurely killed plants.

Management:

- Crop rotation
- Till residues
- Improve drainage
- Adjust soil pH to 6.5 –7.0
- Control perennial grass weeds

TAKE-ALL ROOT ROT



Description: Plants affected by take all occur in patches in the field. Affected plants are stunted, yellowed, have fewer tillers and die prematurely. Prematurely killed plants have bleached-out heads or white heads that appear in contrast to the green heads of healthy plants. Diagnostic black, scurfy, mold symptoms occur on roots and lower stems.

Location: Take all may occur anywhere in Ohio. Fields with quackgrass infestations or fields planted back to wheat with no rotation are likely problem fields.

Time of attack: The fungus attacks young seedlings in the fall, but symptoms are usually not seen until early spring when affected plants remain yellow after spring green up. Blackening of root systems can be detected in late May and June.

Management:

- Crop rotation
- Till residues
- Adjust soil pH to 6.5-7.0
- Control perennial grass weeds

SHARP EYESPOT



Description: Lesions develop on lower stems in early to late spring. Lesions are oval in shape, with white to pale straw colored centers and dark brown borders. Stems of infected plants may die prematurely producing white heads and they may lodge.

Location: Sharp eyespot can occur throughout Ohio. It is usually associated with heavy soils with poor drainage that have saturated conditions during the spring.

Time of attack: The disease is caused by a soil borne fungus that is present in most soils. It attacks plants during the cold wet periods of early spring. Symptoms are easily detected in May and June.

Management:

- Improve soil drainage
- Crop rotation

WHEAT DISEASE THRESHOLDS FOR FOLIAR FUNGICIDES

Wheat growth stage	Disease	Leaf [*]	Disease level ^{**}
Flag leaf emergence GS8 to Boot (GS10)	Powdery mildew	2	2-3 lesions
Flag leaf emergence GS8 to Boot (GS10)	Stagonospora leaf blotch	2	1-2 lesions
Head emergence (GS10.1) to flowering (GS10.5.1)	Stagonospora leaf blotch	2	1-2 lesions
Head emergence (GS10.1) to flowering (GS10.5.1)	Leaf rust	1 (flag)	5-10 pustules

* Leaf number counted from top leaf (flag leaf = leaf 1) down on the tiller.

** Disease level based on average of 30-50 tillers randomly collected throughout the field.

NUTRIENT DEFICIENCY SYMPTOMS IN WHEAT

Nitrogen

- slow plant growth, general light green appearance, few tillers, short heads
- yellow discoloration from the leaf tip down in the form of a “V”, starting on oldest leaves first

Phosphorus

- bluish green to purple color in the leaves and stems, effects lower leaves first
- poor tillering and root development

Potassium

- stunted plants and yellowing of leaf tips and leaf margins

Calcium

- young leaves become yellow and dry, head is stunted and imperfect
- deficiencies are rare in Ohio

Magnesium

- oldest leaves lose green color, turn from yellow to brown, curl and die

Sulfur

- similar to nitrogen deficiency but more pronounced on younger leaves
- stunted plants, reduced tillering, yellow cast

Manganese

- shows up in young leaves first as an interveinal chlorosis
- severe cases exhibit elongated white streaks, the center of which may turn brown and fall out

NUTRIENT DEFICIENCY SYMPTOMS IN WHEAT (CONT.)

Iron

- young leaves develop interveinal chlorosis, veins remain green in the early stages
- progresses rapidly and may turn the entire leaf white
- deficiencies are rare in Ohio

Boron

- irregularly shaped white spots between veins which could develop into stripes with a waxy, raised appearance
- discoloration found on youngest leaves first, starting at the base of the leaf and progressing toward the tip

Copper

- youngest leaves become yellow and stunted, eventually turning pale while the old leaves die back
- dead leaf tissue may appear along the tips and leaf edges in a pattern similar to potassium deficiency

Zinc

- light green to white streaks on either side of the midrib that may develop into a broad band of bleached tissue most evident on lower leaves
- leaf midribs and margins remain green
- sometimes leaf edges appear to be tinted red or brown

Molybdenum

- light yellow young plants—similar to N deficiency
- wilted leaves, youngest leaves may twist
- deficiencies are rare in Ohio

NITROGEN RECOMMENDATIONS FOR WHEAT BASED ON YIELD POTENTIAL

Yield Potential	Pounds N to apply
bu/acre	lbs N/acre
50	40
70	75
90+	110

1. Recommended N rate is based on the relationship:

$$N \text{ (lb/acre)} = 40 + [1.75 \times (\text{yield potential} - 50)]$$
2. No credits are based on previous crop. Consult state recommendations concerning credits for organic waste materials such as manure.
3. Apply 15 to 30 lb N/acre at planting and remainder near green-up in spring; or, apply all N at planting as anhydrous ammonia plus a nitrification inhibitor, injected on 15" or narrower spacing.
4. On high organic matter soils (greater than 20% organic matter) reduce the N rate by 30 to 50 lb N/acre.

POTASH (K₂O) RECOMMENDATIONS FOR WHEAT AT VARIOUS YIELD POTENTIALS, CEC'S & SOIL TEST LEVELS.

Yield Potentials	bu/acre	50	60	70	80	90
Soil Test K	lb K ₂ O per acre					
ppm (lb/acre)						
	CEC	5 meq/100g				
25 (50) ¹		115	120	125	130	130
50 (100)		85	90	95	95	100
75 (150)		55	60	60	65	70
88-118 (176-235) ²		40	40	45	50	55
130 (260)		15	15	15	20	20
140 (280)		0	0	0	0	0
	CEC	10 meq/100g				
25 (50)		150	155	160	160	165
50 (100)		115	115	120	125	130
75 (150)		75	80	85	85	90
100-130 (200-260) ²		40	40	45	50	55
140 (280)		20	20	25	25	25
150 (300)		0	0	0	0	0
	CEC	20 meq/100g				
50 (100)		190	190	195	200	205
75 (150)		140	140	145	150	155
100 (200)		90	90	95	100	105
125-155 (250-310) ²		40	40	45	50	55
165 (330)		20	20	25	25	25
175 (350)		0	0	0	0	0
	CEC	30 meq/100g				
75 (150)		225	230	235	235	240
100 (200)		165	165	170	175	180
125 (250)		100	105	110	110	115
150-180 (300-360) ²		40	40	45	50	55
190 (380)		20	20	25	25	30
200 (400)		0	0	0	0	0

¹ Values in parentheses are lb/acre.

² Maintenance recommendations are given for this soil test range

PHOSPHATE (P₂O₅) RECOMMENDATIONS FOR WHEAT

Soil Test	Yield Potential - bu per acre				
	50	60	70	80	90
ppm (lb/acre)	lb P ₂ O ₅ per acre				
15 (30) ¹	80	90	95	100	105
20 (40)	55	65	70	75	80
25-40 (50-80) ²	30	40	45	50	55
45 (90)	15	20	20	25	30
50 (100)	0	0	0	0	0

¹ Values in parentheses are lb/acre.

² Maintenance recommendations are given for this soil test range.

NUTRIENT SUFFICIENCY RANGES FOR WHEAT

(Upper leaves sampled prior to initial bloom)

Nutrient Element	Unit	Sufficient
Nitrogen (N)	%	2.59-4.00
Phosphorus (P)	%	0.21-0.50
Potassium (K)	%	1.51-3.00
Calcium (Ca)	%	0.21-1.00
Magnesium (Mg)	%	0.16-1.00
Sulfur	%	0.21-0.40
Manganese (Mn)	ppm	16-200
Iron (Fe)	ppm	11-300
Boron (B)	ppm	6-40
Copper (Cu)	ppm	6-50
Zinc (Zn)	ppm	21-70

Sampling information on page 204