Pest&Crop

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In This Issue

Insects, Mites, and Nematodes

Serious Alfalfa Weevil Damage in Central Indiana - (*John Obermeyer, Rich Edwards, and Larry Bledsoe*) -

- Alfalfa weevil going gangbusters this year!
- Alfalfa in southern and central Indiana needs to be scouted for damage NOW
- Northern fields should be scouted earlier than normal this year
- Larvae continue to hatch, don't treat too soon unless necessary
- Recommended insecticides for alfalfa weevil larval control included

Surveys of east and west central Indiana alfalfa fields this past week (see "Alfalfa Weevil Larval Survey") reveal that alfalfa weevil feeding has reached very high levels in most fields. The number of plants with tip feeding has reached as high as 96% (range 56 to 96%). Weevil damage and subsequent populations are progressing sooner than anticipated with the given heat unit accumulations. This should be a warning to growers throughout northern Indiana as damage will increase with warming temperatures.

All Indiana pest managers should be scouting alfalfa for this pest and its damage. In this issue, we have included the recommended insecticides for alfalfa weevil larval control. Refer to *Pest&Crop* #3 for scouting techniques and guidelines for making management decisions in southern and central Indiana.

If possible, insecticides should not be applied until 400 heat units (base 48°F) have accumulated (see "Weather Update"). This will assure that most weevil eggs have hatched and the majority of larvae are controlled. If treatments are necessary before then, use products and/or rates that will give long residual control while carefully considering the harvest restrictions.

Insecticides for Alfalfa Weevil Larval Control[1,2]

Insecticide and formulation	Amount of formulation per acre	Harvest or pasture restriction	Remarks
carbofuran (Furadan)[3,5,7]	1/2 pt. 4 F 1 pt. 4 F 1- 1-1/2 pt. 4 F	7 days 14 days 28 days	Use only on pure stands of alfalfa. Use higher rate where residual control is needed.
chlorpyrifos (Lorsban)[6]	1 pt. 4 E	14 days	Some yellowing may be observed on young, rapidly growing alfalfa. Alfalfa will outgrow the yellowing and no loss should occur.
cyfluthrin (Baythroid 2)[2,3,4,7,8]	1.6-2.8 fl oz.	7 days	Use higher rates for heavy populations. Do not use on alfalfa grown for seed.
cyhalothrin (Warrior)[4,7,8]	2.56-3.84 fl oz. 1EC	1 day-forage 7 days-hay	
methyl parathion (Penncap-M)[3,7]	1 qt. 2 FM	15 days	
permethrin (Ambush)[7] (Pounce)[7]	 12.8 oz. 2EC 8 oz. 3.2EC	 14 days 14 days	For aerial application do not use within 100 yards of aquatic habitats. For ground application do not use within 20 yards of aquatic habitat. Do not apply more than 12.8 ounces (2EC) or 8 ounces (3.2EC per acre per cutting. DO NOT USE IN FIELDS WITH MORE THAN 2 LARVAE PER STEM AND BEFORE 600HU (Base 48°) HAVE ACCUMULATED.
phosmet (Imidan)[3,4]	1-1/3 lb. 70-WSB	7 days	

[1] Apply in 20 gal. water per acre to insure complete coverage; 10 gal. are sufficient for new growth 4-7 days after cutting.
[2] Avoid application during bloom (pollination); if not possible, apply material very late in day.
[3] Highly toxic to bees exposed to direct treatment or residue on crop or on blooming weeds.
[4] Registered for not more than one application per cutting.
[5] Registered for not more than two applications per season. Don't apply more than once per cutting.
[6] Do not make more than four applications per year. Don't apply more than once per cutting.
[7] Restricted use pesticide.
[8] Toxic to fish and aquatic invertebrates. Do not apply directly to water or where the product may drift or run off into bodies of water.

Alfalfa Weevil Larval Survey - 4/18/00 (Ron Blackwell)

County (Fields) Sampled	Stem Ht. (in.)	% Tip Feeding
Henry	11.8	56%
Henry	8.7	68%
Jay	8.0	96%
Lawrence	15.1	84%
Lawrence	13.1	72%
Putnam	10.6	64%
Randolph	10.1	60%
Randolph	7.9	72%
Wayne	7.5	84%
Wayne	9.4	68%

Alfalfa weevil pin-hole feeding

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Black Cutworm and Hoosier Hospitality - (*John Obermeyer, Rich Edwards, and Larry Bledsoe*) -

- Weather pattern shift has brought us cutworm moths
- Moths are seeking weedy fields to lay their eggs
- Early tillage or herbicide applications can help manage this pest

Several intensive captures (9 or more moths caught over a 2 night period) have been recorded by our dutiful cooperators throughout the state, see "Black Cutworm Adult Pheromone Trap Report." We will begin our heat unit accumulations to predict larval cutting (published in "Weather Updates"). This recent flush of moths may be attributed to wind currents shifting from northwest to southwesterly flows. Not only has this brought us some much needed moisture, but black cutworm moths from Mexico and the Gulf states as well.

The critical factor at this point is whether the impregnated female moths are finding fields suitable for egg laying. Have you driven down the county roads lately?!?! Black cutworm moths are particularly fond of winter annuals, such as chickweed and mustards, for egg laying. Fields that are covered in weedy vegetation are at highest risk for cutworm damage. Remember, corn and soybean are not the black cutworm's food of choice. These are normally the only plants remaining by the time larvae have hatched and weeds are dead. Research has shown that cutworm larvae starve if weeds are destroyed 2-3 weeks before corn emergence. This says something for early burn-down herbicides in the management of this pest. More later!

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White Grub Concerns? - (*John Obermeyer, Rich Edwards, and Larry Bledsoe*) -

- White grubs may be observed during tillage operations
- Early corn planting and cool soils increase likelihood of grub damage
- Identification of the grub species is important
- No rescue treatments are available for economic populations

We've had two calls concerning grubs this spring.; the first wondering where all the grubs have gone, the other concerned about the tremendous grub population seen during tillage operations. Sounds like a typical grub year! Grubs are often seen during tillage or planting operations or are observed close to the planted seed when farmers check for germination and/or seed/seedling condition. If corn is slow to emerge, it is often assumed that the grubs are feeding on the seed/seedling. However, cool soil temperatures are usually the reason for slow plant emergence. Additionally, grubs are less active in cool soils than they are in warmer soils, so little feeding occurs early when we have cool conditions like we have experienced recently.

Annual white grubs, e.g. Japanese beetle, do much of their feeding in late summer and early fall when field crops generally have massive root systems and are less susceptible to economic root damage. After overwintering, grubs move to the upper soil profile in the spring, when there is a relatively short period of time from initiation of feeding activity to pupation in late May or early June. In the spring, most of their feeding is on dead and/or decaying matter. However, if seedling roots are nearby they will feed on them. The length of this period and grub populations will govern as to whether economic damage will occur.

Corn planting after the first week in May reduces the chance of economic Japanese beetle grub damage. Producers who find grubs should collect several to take to their county extension educator, crop consultant, or agriculture chemical/fertilizer dealer for positive identification. Depending on the species, the numbers observed, the time of the year, and the crop to be planted control may or may not be warranted. Since rescue treatments are not available, the most effective way to control the grubs is to apply a soil insecticide at planting. If an economic grub population is observed in a field that has already been planted and the stand is threatened, a soil insecticide could be used as part of a replant operation. Replanting, however, is not recommended unless a critical level of plants is being significantly damaged or destroyed by grubs. Remember that a number of factors can cause stand reductions. If a stand is declining due to grub activity, make sure that the grubs are still actively feeding on the roots before making a replant decision.

Checking grub raster for species ID

Black Cutworm Adult Pheromone Trap Report
Week 1 = 4/6/00 - 4/12/00 Week 2 = 4/13/00 - 4/19/00
(Ron Blackwell)

County	Cooperator	BCW Trapped		County	Cooperator	BCW Trapped	
		Wk 1	Wk 2			Wk 1	Wk 2
Adams	Roe/Price Ag Services	0	10	Lake	Lake/Kliene (1)	0	13
Benton	Manning/Jasper Co. Extension	0	0	Lake	Lake/Kliene (2)	1	16*
Bartholomew	Ludwig/Growers Service	2	0	Porter	Mueller/Land O' Lakes	0	12
Clay	Kramer/PK Agronomics (1)	10	9*	Putnam	Nicholson Consulting	2	7
Clay	Kramer/PK Agronomics (2)	1	2	Randolph	Jackson/Davis-Purdue Ag Center (N)	2	4
Clay	Smith/Growers Coop (Bzl)	5	10	Randolph	Jackson/Davis-Purdue Ag Center (S)	1	2
Clay	Smith/Growers Coop (CC)	0	16*	Rush	Peggs/Pioneer	3	0
Clay	Smith/Growers Coop (BG)	1	8	Sullivan	Smith/Growers Coop (W)	0	7
Clinton	Blackwell/Purdue	9	38*	Sullivan	Smith/Growers Coop (E)	0	18*
Decatur	Miers/Pioneer	6	15*	Sullivan	Smith/Growers Coop (NL)	1	26*
Elkhart	Kauffman/Crop Tech (1)	0	0	Tippecanoe	Bledsoe/Purdue	0	0
Elkhart	Kauffman/Crop Tech (2)	0	0	Tippecanoe	Obermeyer/Purdue	2	23*
Fayette	Schelle	6	9	Tipton	Johnson/Pioneer	4	9
Gibson	Hirsch Farms	8	0	Tipton	Sybouts/Top Ag (DP)	1	18*
Gibson	Shupe/Gibson Co. Coop (1B)	17*	0	Tipton	Sybouts/Top Ag (E)	15*	4
Gibson	Shupe/Gibson Co. Coop (2H)	13	4	Vigo	Smith/Growers Coop	0	20*
Grant	Sybouts/Top Ag	0	17*	Washington	Ballard/Floyd Co. Extension	6	0
Hamilton	Mroczkiewicz/Novartis	5	2	White	Reynolds/Orville Redenbacher 1K	7	16*
Henry	Henry/Schelle	13*	7	White	Reynolds/Orville Redenbacher 2P	7	9
Jasper	Manning/Jasper Co. Extension	6	4	Whitley	Walker/NEPAC	0	13*
Johnson	Truster/Ag Excel Inc.	15	0				

* = Intensive Capture.... An intensive capture occurs when 9 or more moths are caught over a 2-night period.

Weeds

Additives in New Formulations of Glyphosate Herbicides - (*Case R. Medlin and Tom T. Bauman*) -

In past seasons most producers were faced with choosing a burndown herbicide from a relatively small group of products. The same was true for picking which glyphosate (the active ingredient in Roundup) containing product to apply postemergence in Roundup Ready soybean. Roundup Ultra was perhaps the most widely used product used last year in Roundup Ready soybean. Although Roundup Ultra (and several other glyphosate formulations) will still be market this year, so will several new glyphosate formulations. As with all pesticides, you should carefully read the entire label before using; however, you should pay special attention to the required additives for application. The new glyphosate formulations vary in their amount and kinds of formulated additives. The following table lists the active ingredient(s), formulation concentration, and recommended additives for each glyphosate-containing product.

Trade Name	Active Ingredient(s) [found in which product]	Formulation (lb ai/gal)	Recommended Additives	Labeled for Use In
Backdraft	glyphosate [Roundup] imazaquin [Scepter]	1.25 lb/gal + 0.25 lb/gal	0.125% NIS[a]	Roundup Ready Soybean
Credit	glyphosate [Roundup]	4 lb/gal	0.5% NIS[a] 1 to 2% AMS[b]	Roundup Ready Soybean
Extreme	glyphosate [Roundup] imazethapyr [Pursuit]	2 lb/gal + 0.17 lb/gal	0.125% NIS[a]	Roundup Ready Soybean
Glyphomax	glyphosate [Roundup]	4 lb/gal	0.5% NIS[a] 1 to 2% AMS[b]	Roundup Ready Soybean
Glyphomax Plus	glyphosate [Roundup]	4 lb/gal	1 to 2% AMS[b]	Roundup Ready Soybean
Ready Master AZT	glyphosate [Roundup] atrazine [AAtrex 4L]	2 lb/gal + 2 lb/gal	1 to 2% AMS[b]	Roundup Ready Corn
Roundup Ultra	glyphosate	4 lb/gal	1 to 2% AMS[b]	Roundup Ready Corn and Soybean
Touchdown 5	glyphosate [Roundup]	5 lb/gal	0.25% NIS[a] 1 to 2% AMS[b]	Roundup Ready Soybean

[a]Non-ionic surfactant (NIS).
[b]Although optional, 1 to 2% by weight ammonium sulfate (AMS) may enhance the performance of this product.

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Effects Of Dry Weather On Weed Control – (***Bob Hartzler, Department of Agronomy, Iowa State University***) -

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Most forecasters are saying that there is a good likelihood that the current weather patterns will continue into spring. Several growers have inquired whether they should continue with their normal weed management practices or make changes based on the projected dry spring. In this article we discuss the impacts of dry weather on herbicide effectiveness and how resultant weed management risks can be minimized.

First, effective weed management is more critical in dry years than in years with normal rainfall patterns. Weeds impact crop yields primarily by competing with the crop for resources such as light, water, nutrients, and space. Under Iowa conditions, moisture is typically the limiting resource for crop growth, thus in dry years, competition for water is more important.

Effect of rainfall on soil-applied herbicides. Most growers are aware that the effectiveness of soil-applied herbicides is reduced under dry conditions. Rain and soil moisture availability affect soil-applied herbicides by 1) moving the herbicide off the soil surface into the soil profile (herbicide activation), and 2) influencing the availability of the herbicide for absorption by plants.

Herbicides that remain on the soil surface are ineffective, thus the product must be moved into the soil profile either by rain or mechanical incorporation. How much rain is needed to activate a herbicide? As a rule of thumb, a half-inch is often stated to be the minimum rainfall needed to activate a herbicide. Several factors such as soil type, soil moisture level, herbicide characteristics, and weed species influence the moisture requirement, thus the actual amount needed varies considerably.

Soil moisture levels at application and during the early part of the growing season also influence herbicide performance. First, if a herbicide is applied to dry soil, it takes more rain to activate it than if the herbicide was applied to a soil at field capacity. When a herbicide is applied to a soil at field capacity, any additional rainfall percolates through the soil profile and carries some of the herbicide into the profile as it moves downward. However, if the soil is dry at the time of application, the initial rain after application must first wet the soil, thus there is less downward movement of water and the herbicide. Under current conditions with dry soil it is likely that more than a half an inch of rain to activate surface-applied herbicides will be required.

Herbicides are less active in dry than wet soils, even if they are distributed evenly throughout the zone of weed emergence. As soils dry out, herbicides bind more tightly with soil colloids and are less available to weeds. Consequently performance drops under dry conditions even if the herbicide is present at the proper depth within the profile. Of course, if the soil is too dry weeds won't germinate. In summary, rain and soil moisture have a major impact on the performance of soil-applied herbicides. Rainfall after application is critical in activating herbicides, but soil moisture prior to application and later in the season also influences performance.

Effect of rainfall on postemergence herbicides. Rainfall and soil moisture do not influence the performance of postemergence products as much as soil-applied herbicides; however, these products generally perform less consistently under dry conditions than situations with favorable soil moisture. If dry conditions persist into the postemergence season, timeliness of application will be more critical than in past years for two reasons. First, weeds under water stress are more difficult to kill. Second, weeds will begin to compete with crops earlier in the season if soil moisture is limiting than if there is plentiful soil moisture. Therefore, delaying application until 4 or 5 weeks after planting in an attempt to get by with a single post application may result in both poor weed control and significant yield losses from those weeds that emerged with the crop.

Management considerations for dry conditions. The forecast of continued dry weather should not force major changes in weed management plans; however, anticipating potential impacts of weather on herbicide performance can alleviate unexpected problems. Expect preemergence herbicides to be less effective than normal if the dry weather continues. Timely rotary hoeing is the simplest method to eliminate much of the inconsistency with these herbicides brought on by dry conditions. Rotary hoeing typically does not dry soils enough to increase the moisture availability problem.

Should you consider switching to a herbicide that may need less moisture to maintain performance? Research and practical experience have shown that Dual requires slightly more rain to sustain its activity than other amide herbicides; however, keep in mind that performance of all products drops under dry conditions. Bill Simmons (University of Illinois) evaluated the performance of three amide herbicides (Dual, Frontier, and Surpass) with differing amounts of rainfall after application. Although the activity of Frontier and Surpass responded to as little as 0.25 inch of rain compared with Dual, which required 0.5 inch, all three herbicides required at least 0.5 inch to achieve 85 percent or greater foxtail control. The likelihood that sufficient rain will occur to optimize performance of some products and not others is small, but products that are less tightly bound to soil colloids should perform more consistently than those more tightly adsorbed.

Application timing for postemergence herbicides is more critical under dry conditions than when moisture is adequate. The consistency of post-treatments drops much more quickly as weed size increases under dry conditions. We haven't experienced a hot, dry period during the peak post application season the past few years; thus, many growers have gotten by with delaying applications to minimize the risk of late-emerging weeds. This type of strategy is likely to fail if current weather patterns continue. Early application to small weeds not only increases the likelihood of acceptable control but also reduces the likelihood of yield losses due to early-season competition.

Summary. Rainfall patterns have a significant impact on the performance of all weed control tactics. Anticipating problems and monitoring fields regularly to detect weed escapes will provide managers with sufficient time to react to developing problems. The rotary hoe can be a farmer's best friend in years when limiting moisture reduces herbicide performance. Although postemergence herbicides won't be influenced as much as soil-applied products, application timing will be critical to ensure adequate control and to eliminate early-season competition.

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Plant Diseases

Wheat Disease Prospects - (*Gregory Shaner*) –

• So far, no major disease problems in wheat

As of now, the wheat crop in Indiana does not appear to have major disease problems. There have been isolated reports of yellowing, which is most likely the result of infection by one or both of two common soilborne viruses – wheat spindle streak mosaic virus and soilborne wheat mosaic virus. Symptoms of these viruses appear during periods of wide temperature fluctuation. Considering the widely fluctuating temperatures that characterized weather this spring, we might have expected to see much more infection by these viruses. Both viruses survive in a soilborne fungus (*Polymyxa graminis*) and are transmitted to wheat when this fungus infects roots. Infection of roots requires wet soils. The dry conditions during the fall, winter, and early spring probably were unfavorable for infection by the fungus, and therefore unfavorable for infection by the viruses.

Two of the most destructive diseases of wheat in Indiana – Septoria blotch and Stagonospora blotch – are unlikely to be a serious problem unless there is an abrupt change in weather pattern very soon. These pathogens blight foliage and one of them also blights heads (glume blotch). Both require several prolonged wet periods during the growing season to cause severe infection. Even though we have had some rains recently throughout the state, these have not been of the type that is so favorable for leaf blotch — a "steady drizzle" that persists for 2 or 3 days.

Leaf and stem rust are always a threat, but most varieties have good to moderate resistance, so a widespread epidemic is unlikely. Unlike Septoria and Stagonospora, the leaf and stem rust fungi do not require prolonged wet periods to infect. A few hours of dew during the night are sufficient for infection. Stem rust requires warmer temperatures than leaf rust for optimum development, so we usually only see this disease when wheat maturity is delayed. The rapid development of wheat we are seeing this year, because of the unusually warm spring, makes it unlikely that stem rust will have a chance to develop before the crop matures. Leaf rust is more common in Indiana than is stem rust. If a variety happens to be susceptible to leaf rust, it could suffer damage.

Powdery mildew is favored by lush, dense crop canopies, high rates of nitrogen fertilizer, and cloudy and humid weather. I have not seen any significant powdery mildew this year, nor have I received any calls about it or seen it on specimens submitted to the Plant and Pest Diagnostic Laboratory. Many varieties grown in Indiana have a degree of resistance to powdery mildew, but a few are susceptible. Powdery mildew can be a rather insidious disease. Under our conditions, it usually does not progress up to the flag leaf. So, inspection of a field while driving down the road, or even while standing at the edge, may fail to detect what may be a severe infection. It is necessary to go out into the field and look beneath the topmost leaves. Even though the upper canopy may be a deep green and the stand appears thick, there can be a lot of powdery mildew down in the canopy. Main culms seem to withstand infection fairly well, but powdery mildew can essentially shut many tillers off at about the time they are heading. Heads fail to emerge, or cease development shortly after emergence and produce no grain. Severe powdery mildew can greatly reduce the number of productive heads per acre.

As I mentioned at the outset, the wheat crop appears to be generally healthy this year. However, it is still a good idea to walk fields and scout for any problems. Resistant varieties are the main strategy for managing these wheat diseases. If a problem is noted, think about changing varieties next year. Early scouting will also allow timely application of a fungicide if a problem is starting to develop.

Agronomy Tips

Tillage and Soil Temperatures in 2000 – (*Tony Vyn)* - Low air temperatures in early April might have producers concerned about corn and soybeans that have already been planted, and about possible cool soil temperatures in no-till fields.

Our daily monitoring from April 3 to April 11 of maximum and minimum soil temperatures at the 2-inch depth on a tillage experiment near Lafayette (Purdue Research Farm) has resulted in some interesting observations for 2000.

First, soil moistures to the 6" depth are considerably lower in plowed than in no-till plots. Fall plowed plots averaged 20% H_20, while no-till plots following soybeans averaged 29% H_20 on a volumetric basis. Although plowing usually results in drier soils in spring, soil moistures are so low in areas that have received little rainfall in the last 6 weeks that the differences between plowed and no-till soil is much bigger than normal for this time of year. The more extensive the soil loosening, and the lower the surface residue cover, the lower the relative soil moistures are likely to be in tilled soil.

Second, dry soil conditions provide less buffering to swings in soil temperatures in response to air temperature fluctuations. Less moisture in the surface soil means more air, and air is much easier to heat or cool than water.

Third, the results of the above conditions have meant that plowed soil reaches higher maximum soil temperatures as well as lower minimums at seed depth. In the 9 day period from April 3 to 11, plowed soil reached lows of near freezing (35°F) on two separate occasions. No-till soil following soybeans never went below 38°F. Average maximum soil temperatures for that 9 day period were 51°F for plow, versus 48°F for no-till. Average minimum soil temperatures were equal (41°F) for both plowed and no-till fields, but the extreme lows were much lower in plowed soil

Fourth, average soil temperatures in both no-till and plowed plots were below 50°F in 9 of 10 days from April 3 to April 12. By comparison, cold germination tests for soybean seeds in Indiana usually includes a 7 day exposure to a 50°F temperature before movement of seeds to a warmer temperature environment.

Implications for Management:

For fields that are already planted, seeds endured more cold temperature stress in plowed than in no-till soils. With such dry soil conditions, planting depth had less impact on soil temperatures at seed depth than would normally be the case in moist springs. Soybeans generally have more emergence difficulty in cool soil conditions, and soybeans planted in early April in plowed fields may have encountered more stress than those planted in no-till fields. Seed with low germination tests to begin with would be at even bigger risks than seed with high vigor. Corn seed likely survived reasonably well in fields with cool but dry soil conditions, but the time from planting to emergence will be longer than desired for optimum productivity. Corn seeds have been at greater risk by the prolonged exposure to soil-borne insects and diseases. Even if the final corn plant populations haven't been reduced by the early planting itself, corn yield potential might have been lowered somewhat relative to successful planting later in April with warmer average (and minimum) soil temperatures.

For those who haven't planted, the earlier tillage recommendations still hold. Chief among those are to preserve seedbed moisture by using no-till wherever possible and performing any required secondary tillage at shallow depths, with just a single pass, and only immediately before planting. See the March 17 *Pest&Crop* newsletter for additional details. Conserving seed moisture will reduce soil temperature fluctuations at seed depth.

Although no-till fields are typically planted later than conventional fields, the drier than normal soil conditions in certain northern parts of Indiana suggest that soil temperatures are already very similar to those in conventional fields. Soil temperatures alone are not sufficient reason for a decision to delay no-till planting in 2000.

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Emergence Process in Corn - (*Bob Nielsen*) -

- Understanding the process helps you troubleshoot problems with emergence

Growth stage VE refers to emergence of the coleoptile or first leaves through the soil surface. Successful germination does not guarantee successful emergence of the crop. The coleoptile must reach the soil surface before its internal leaves emerge from the protective tissue of the coleoptile.

As with all of corn growth and development, germination and emergence are dependent on temperature, especially soil temperature. Corn typically requires from 100 to 150 MGDD (growing degree days) to emerge. Under warm soil conditions, the calendar time from planting to emergence can be as little as 5 to 7 days. Under cold soil conditions, it can easily take up to four weeks to emerge.

Elongation of the **mesocotyl** elevates the coleoptile towards the soil surface. The mesocotyl is the tubular, white, stemlike tissue connecting the seed and the base of the coleoptile. Technically, the mesocotyl is the first internode of the stem.

Useful Tip: Physiologically, mesocotyls have the capability to lengthen from at least a 6-inch planting depth. Realistically, corn can be planted at least three inches deep if necessary to reach adequate moisture.

As the coleoptile nears the soil surface, exposure of the mesocotyl to the red light portion of the solar radiation spectrum halts mesocotyl elongation. Continued expansion of the leaves inside the coleoptile ruptures the coleoptile tip, allowing the first true leaf to emerge above the soil surface. Since the depth at which the mesocotyl senses red light is fairly constant, the resulting depth of the crown (base) of the coleoptile is nearly the same (1/4 to 3/4 inch) at seeding depths of one-inch or greater.

Useful Tip: When corn is seeded very shallow (less than about 3/4 inch), the crown of the coleoptile will naturally be closer to the soil surface if not right at the surface. Subsequent development of the nodal root system can be restricted by exposure to high temperatures and dry surface soils.

Troubleshooting Considerations

Several factors can cause the coleoptile to split prematurely, allowing the leaves to emerge underground. Usually, more than one of the following factors are present when this problem occurs, making it difficult to place the blame on any one factor.

Exposure to light at deeper soil depths than usual due to cloddy seedbeds, dry seedbeds, sandy soils, or open slots in no-till.

Injury from certain herbicides, particularly under stressful environmental conditions. Symptoms include corkscrewed coleoptile, swollen mesocotyl and true leaves emerged from side of coleoptile.

Surface crusting, planter furrow compaction, or otherwise dense surface soil that physically restricts mesocotyl elongation and coleoptile penetration. The pressure of the expanding leaves within the coleoptile eventually ruptures the side of the coleoptile. Symptoms include corkscrewed coleoptile, swollen mesocotyl and true leaves emerged from side of coleoptile. Note the similarity to those symptoms from herbicide injury.

Cold temperature injury, either from exposure to long periods of soil temperatures around 50°F or from exposure to wide daily swings (25 to 30°F) in soil temperatures. Symptoms include absence of emerged coleoptile, corkscrewed mesocotyl or coleoptile and true leaves emerged from side of coleoptile. Note the similarity to those symptoms from herbicide injury.

Useful Tip: The mesocotyl should remain firm, white and healthy through at least the 6-leaf stage, if not longer. If it is mushy, discolored, or damaged prior to this stage, then it is likely part of the crop problem being investigated.

Don't forget, this and other timely information about corn can be viewed at the Chat 'n Chew Café on the World Wide Web at http://www.kingcorn.org/chatchew.htm . For other information about corn, take a look at the Corn Growers' Guidebook on the World Wide Web at http://www.kingcorn.org/index.html

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Requirements for Uniform Germination and Emergence of Corn - (*Bob Nielsen*) –

- Successful germination & emergence requires adequate moisture, temperature and seed-to-soil contact

Rapid, uniform germination and emergence of corn helps set the stage for maximum grain yield at the end of the season. Without such a successful start to the season, the crop is behind the proverbial 'eight-ball' right from the beginning. The good news is that there are only three simple requirements for uniform germination and emergence of corn. The bad news is that one or more of the requirements are often missing from one field to another.

Adequate and uniform soil moisture at the seed zone. Adequate soil moisture is most simply defined as not too dry and not too wet. Uneven soil moisture in the seed zone can be caused by soil characteristics, tillage patterns, unusual weather conditions and uneven seeding depth control. Uneven soil moisture in the seed zone is the primary cause of uneven emergence, the results of which can be yield losses ranging from 10 to 20 percent.

Adequate and uniform soil temperature at the seed zone. Adequate soil temperature is most simply defined as being greater than 50°F at the 2-inch depth. Corn will not germinate or emerge quickly or uniformly when soil temperatures are less than 50°F. When soils warm to the mid-50°F or greater, emergence will occur in seven days or less if soil moisture is adequate.

Uneven soil temperature can be caused by soil characteristics, uneven residue cover in reduced tillage systems and uneven seeding depth control. Temperature variability is most critical when average soil temperatures are barely within the desired minimum 48 to 50°F range for corn germination.

__Useful Tip__: Dark-colored soils will typically warm more quickly than light-colored soils. If soils dry differently across the field, the drier areas will typically warm faster than the wet areas. Uneven residue cover in reduced tillage systems causes significantly lower soil temperatures under the heavier cover than under barer spots in the field. Uneven seeding depth exposes deeper planted seeds to slightly cooler seed zones than seeds placed shallower.

Adequate and uniform seed-to-soil contact. In order for the kernel to absorb moisture quickly and uniformly, soil must be firmed around the kernel completely. Seed-to-trash contact results from 'hair-pinning' of surface trash into the seed furrow during no-till planting when soil and/or trash are too wet for adequate coulter cutting action. Seed-to-clod contact results from planting into cloddy fields created by working soil too wet. Seed-to-rock contact is, needless to say, not good for proper germination either. Seed-to-air contact results from open planter furrows when no-till planting into excessively wet soils. Germination of kernels lying in open planter furrows is dependent on rainfall keeping the open furrow environment moist.

Seed Size Considerations. Small sized seed require less total water to germinate than larger sized seed, thus possibly offering an advantage in drier soil conditions. On the other hand, larger sized seed (especially more dense seed) may have an advantage in poor growing conditions where a slowly developing seedling may depend on seed reserves longer than normal.

University of Wisconsin data documented the stand establishment difficulty that small rounds could have under early plantings or no-till conditions. Vigor of large rounds, particularly from butt of ear, can also be low due to rewetting occurrences of the ear and handling damage during seed processing.

• • P&C • •

The Germination Process in Corn - (*Bob Nielsen*) -

- Understanding the process helps you troubleshoot problems with germination

Germination is the renewal of enzymatic activity that results in cell division and elongation and, ultimately, embryo emergence through the seed coat. Germination is triggered by absorption of water through the seed coat. Corn kernels must absorb (imbibe) about 30% of their weight in water before germination begins. Less than optimum absorption of water (perhaps due to a rapidly drying seed zone) may slow or stop germination. Repeated wetting/drying cycles can decrease seed viability.

By comparison, soybeans must imbibe about 50% of their weight in water. But since soybeans are approximately 2/3 the weight of corn kernels, the total amount of absorbed water required for germination is relatively similar.

The visual indicators of germination occur in a distinct sequence. First of all, the **radicle root** emerges first, near the tip end of the kernel, within two to three days in warm soils with adequate moisture. In cooler or drier soils, the radicle root may not emerge until one to two weeks after planting.

The **coleoptile** emerges next, from the embryo side of the kernel, within one to many days of the appearance of the radicle, depending on soil temperature. The coleoptile (commonly called the 'spike') is a rigid piece of plant tissue and has a pointed tip with no visible openings. The coleoptile encloses four to five leaves (plumule) that were formed during grain maturation the previous year. These leaves begin to enlarge during the germination and emergence processes.

The **lateral seminal roots** emerge last, near the dent end of the kernel.

Troubleshooting Considerations

When temperatures are optimum, these three parts of the seedling may emerge from the kernel on nearly the same day. Excessively cool soils may delay the appearance of the coleoptile and lateral seminal roots for more than a week after the radicle root emerges. It is not uncommon in cold planting seasons to dig seed two weeks after planting and find only short radicle roots and no visible coleoptiles.

When excessively cold and/or wet soils delay germination and/or emergence, the kernel and young seedling are subjected to lengthier exposure to damaging factors such as soil-borne seed diseases, insect feeding and injury from preplant or pre-emergent herbicides and carryover herbicides from a previous crop.

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Seeding Depth Decisions for Corn - (*Bob Nielsen*) -

- Corn seeding depth decisions should be made at time of planting
- An all-purpose depth is 1-1/2 inches.
- Aim for seed placement into uniform seedbed moisture conditions

Uptown at Happy's Bar and Grill, asking someone how deep they are planting their corn is a common way to open a conversation this time of year. Everyone has an opinion on the matter and everyone has their own experiences to back up their opinions:

"If you don't see a few kernels on top of the ground, you ain't planting shallow enough!"

"If you plant deeper than one inch, crust will get you every time!"

"If you plant too shallow, the crown roots will form at the surface and dry out!"

"The deeper you plant the seed, the deeper the roots will grow!"

The reality is that the correct seeding depth should be based on the conditions of the seedbed and the 10-day weather outlook at the time of planting. The conditions of every one of your fields may vary dramatically enough as to warrant a slightly different seeding depth for each one. Conversely, you may end up using a common seeding depth setting for every field this year. The point is that you need to spend some time evaluating each field at the time of planting. Don't simply use the setting that you finished up with last year!

An all-purpose seeding depth for corn that is practical under many conditions is 1-1/2 inches. Planting shallower than that increases the risks associated with a rapidly drying seedbed, shallow crown root development and (in some locations) feeding damage by birds and rodents.

Under dry or potentially dry seedbed conditions, do not hesitate to increase seeding depth to 2 – 3 inches if that depth is where uniform moisture exists. Physiologically, corn can easily emerge from those seeding depths. If dry conditions exist at shallower depths and the short-term (10-day) weather forecast is dry, the risk associated with deeper planting is less than the risk of inadequate or uneven moisture at shallower depths.

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Wheat Condition As Of April 19, 2000 – (*Charles Mansfield and Ellsworth P. Christmas*) -

- The 2000 wheat crop looks great

Wheat all across Indiana looks exceptionally good at this time. Wheat in far southwestern Indiana has reached Feekes's Stage 9 and at the Agronomy Research Center it is at Stage 6 or 7 depending on the variety. Some concerns were expressed last week related to the marginally low temperatures that occurred the morning of April 9. To date only one report has been received that indicates stem injury. All other reports indicate only a slight amount of leaf tip burn. As the wheat crop moves to the boot stage, Feekes's Stage 10, the plant becomes more vulnerable to freeze injury. A low temperature of 28 degrees or lower for a two hour period can cause severe damage to the wheat plant. This damage can range from leaf discoloration to stem injury or floret sterility.

Weather Update

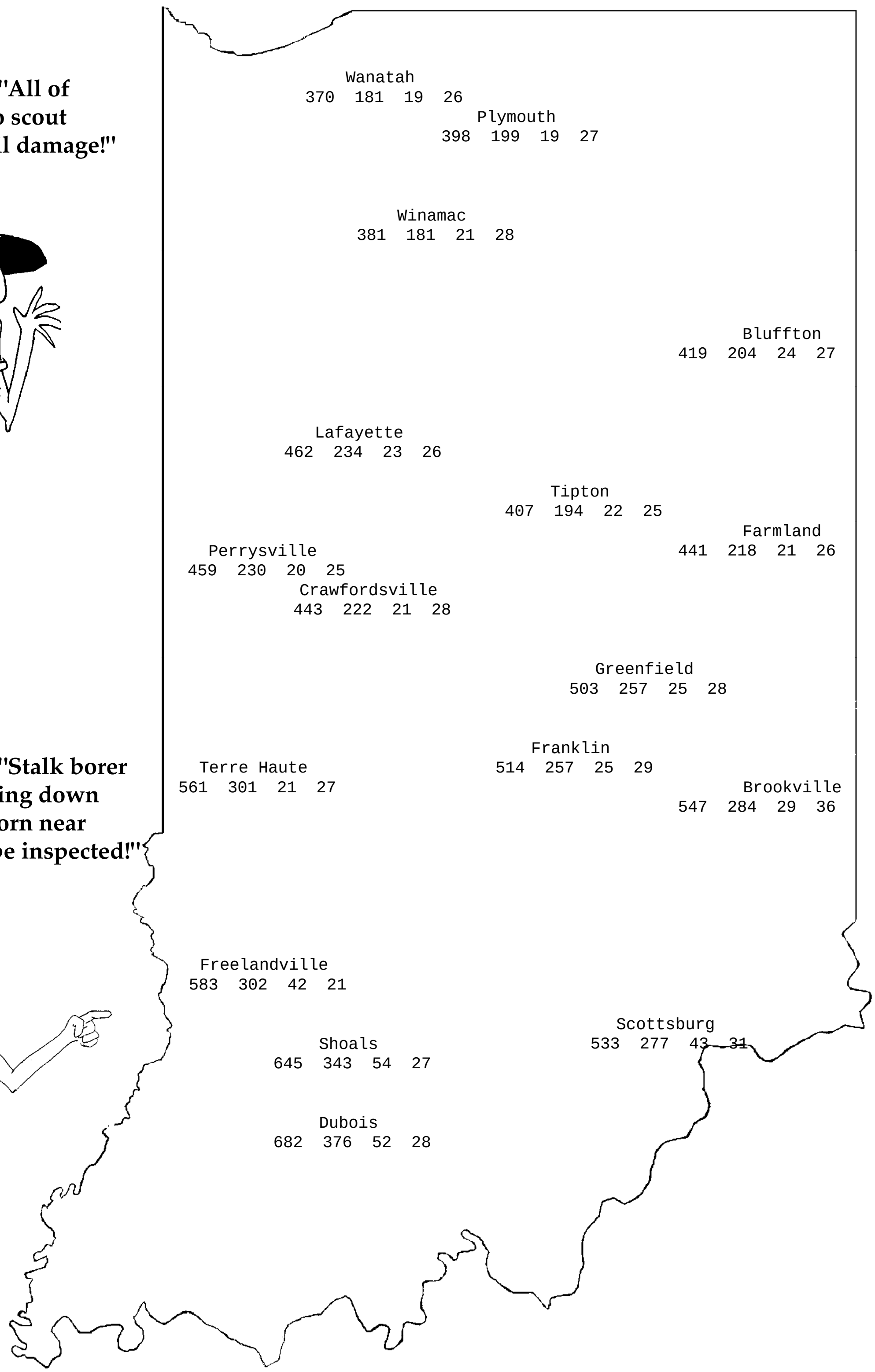
MAP KEY

Location
HU41 HU48 HU50 GDD(5)

Temperature Accumulations from Jan. 1 to April 19, 2000

HU41 = heat units at a 41°F base from Jan. 1, egg hatch at approx. 600, larval movement from grasses to corn at approx. 1,400
HU48 = heat units at a 48°F base from Jan. 1, for alfalfa weevil development (begin scouting at 250)
HU50 = heat units at a 50°F base from date of intensive moth capture, for black cutworm development (larval cutting begins about 300)
GDD(5) = Growing Degree Days from April 15 (5% of Indiana's corn planted), for corn growth and development

Bug Scout says: "All of Indiana needs to scout alfalfa for weevil damage!"



Bug Scout says: "Stalk borer should be hatching down here. Emerged corn near grasses should be inspected!"

4" Bare Soil Temperatures 4/19/2000

Location	Max.	Min.
Bluffton	52	48
W Laf Agro	55	47
Tipton	57	49
Farmland	50	47
Perrysville	58	55
Crawfordsville	55	51
Trafalgar	58	53
Terre Haute	60	52
Oolitic	62	51
Dubois	65	48

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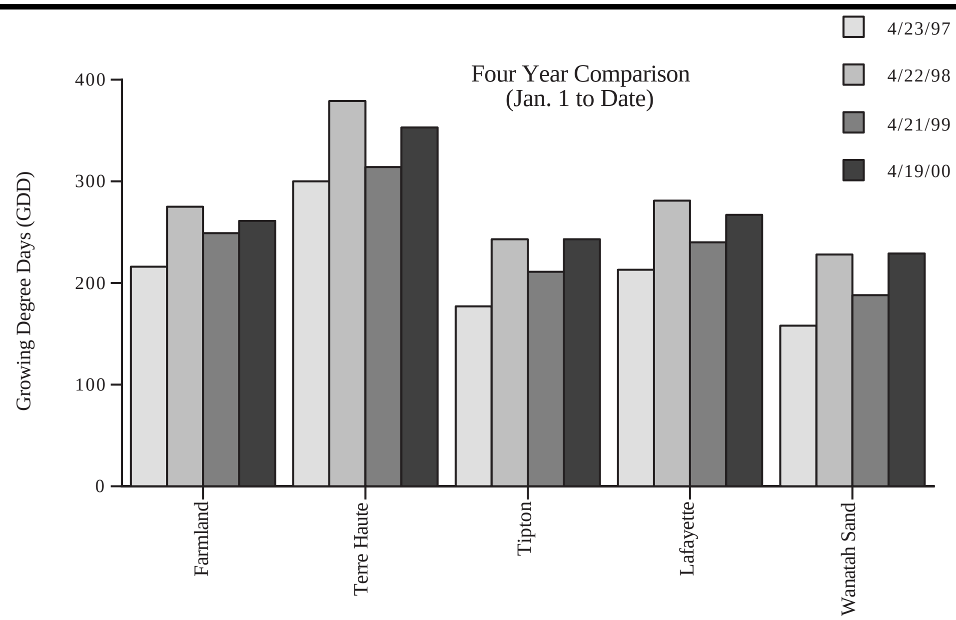

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