

Techniques for Diagnosing Field Crop Problems

Because a single symptom may result from different causes, it is often a good idea to collect as much information as possible about the field before attempting diagnosis. This includes:

- soil map of field
- cultivar planted
- tillage practices
- crops grown in the last 3 years
- weather conditions while the plants have been growing
- recent soil test values
- date of planting
- pesticides used both this year and last year
- drainage
- date, rate and method of fertilizer application

Plant Indicators of Production Problems

Yellow Corn Plants

Some growing seasons have considerable cool and wet conditions resulting in corn plants showing various shades of yellowing and interveinal leaf stripping. What may be the cause?

1. Cold temperatures. Not uncommon with early planting. Entire small plants can show lack of green color.
2. Wet soils. Corn roots need aerated soil for metabolic processes and nutrient uptake. Entire plants can show yellowing and many different symptoms, including phosphorus deficiency.
3. Slow soil organic matter mineralization. With cold temperatures, microbial conversion of organic nitrogen (N) compounds to inorganic N (ammonium and nitrate) is slow. If the corn plants are dependent on that source of plant available N, then plants could show N stress. Entire plants can show yellowing.
4. Sulfur (S) deficiency. This is related to item 3, that is, slow organic matter mineralization and lower supply of plant available sulfate-S (the form of S taken up by plants). Soil organic matter is the largest reserve of S in most soils, so slow mineralization can limit available S, especially in the upper soil profile. Classic S deficiency is the older leaves are green and the new leaves show yellowing and interveinal stripping. With severe deficiency, the entire plant will be yellow.
5. Continuous corn. In many springs, and again this year, corn following corn tends to show more yellowing than corn following soybean, especially in reduced till and no-till. This is related to many factors, such as same crop allelopathy and less mineralization (for N and S).
6. Potassium deficiency. It typically begins to show on larger plants, about calf to knee high. Symptoms appear first on older leaves, with yellow to brown

coloration on the leaf margins.

7. Corn hybrid. Some hybrids tend to show interveinal stripping more than other hybrids, and hybrids have different levels of greenness.

Compaction

- Subsoiling warranted only when well-defined, compacted soil layers are 4 inches or more deep
- Compaction might suspected when a significant number of roots have grown sideways before finding a crack in the soil and growing down again.

At the field look for:

1. Patterns of the symptoms across the field - Does damage appear to follow a planter, sprayer, tillage, fertilizer, or spray drift pattern?
2. Look closely at the symptoms on the vegetation
3. Check to see if the root system is abnormal or injured
4. For some problems, in-field tests are available to confirm diagnosis
 - Portable pH meters
 - Nitrate meter
 - SPAD meter
 - Soil penetrometer
 - Plant tissue test
 - GMO detection kits

Diagnosing Herbicide Injured Corn

Equipment needed for "Trouble-Shooters Toolbox"		
Plastic bags (gallon and garbage pail sizes)	2-gallon water jug	Gallon pail
Trowel	Mist bottle	Shovel
Linoleum knife	Flags and stakes	25' Tape measure
Paper towels	Multi-purpose tool	300' Tape
Marking pens	Dissecting kit	Soil probe
Penetrometer	Camera with date stamp	Notebook
Reference books	Hand lens	Rubber gloves

Stress Situations

1. Winter-Kill
2. Chemical Injury
3. Frost
4. Hail
5. Drought

Special Crop Problems

1. Bloat
2. Nitrate poisoning
3. Prussic Acid
4. Toxicities
5. Mycotoxins

Limits of Mycotoxins (Fumonsin, DON and T2) on a dry matter basis. Action levels established by FDA (BLS lowest level of detection (LLOD) = 0.2 PPM and level of quantification = 1.0 PPM)

Fumonisin:

- Equine / Rabbits = Corn, 5 ppm (not to exceed 20% of diet)
- Swine = Corn, 20 ppm (not to exceed 50% of diet)
- Breeding Ruminants/ Breeding Poultry (Includes lactating dairy cattle and hens laying eggs for human consumption) = Corn, 30 ppm (not to exceed 50% of diet)
- Ruminants >3 months of age being fed for slaughter = Corn, 60 ppm (not to exceed 50% of diet)
- Poultry for slaughter = Corn, 100 ppm (not to exceed 50% of diet)
- Other species and pets = Corn, 10 ppm (not to exceed 50% of diet)

DON (Vomitoxin) FDA advisory (LLOD = 0.1 PPM and level of quantification = 0.25 PPM)

- Swine and pet foods Corn, 4 ppm (not to exceed 10% of diet)
- Cattle Corn, 4 ppm (not to exceed 50% of diet)

T2 toxin No established limits from FDA. These are levels of concern (Level of quantification = 25.00 PPB)

- Cattle (Includes lactating dairy cattle) = 500 ppb in total ration
- Breeding swine = 300 ppb in total ration
- Young swine = 100 ppb in total ration
- Older feeder swine = 300 ppb in total ration

Aflatoxin LLOD = 2.0 PPB and level of quantification = 5.0 PPB



Corn Growth Problems

General categories

Poor emergence or reduced plant population

- soil crusting
- insect damage
- disease
- dry soils
- soils saturated with water for several days
- salt injury from fertilizer
- ammonia damage
- rodents
- herbicide damage
- poor quality seed
- planting too deep

Chlorosis: yellowing of plants across the entire leaf surface or between the veins

- nitrogen deficiency
- potassium deficiency
- sulfur deficiency
- zinc deficiency
- manganese deficiency
- iron deficiency
- cold soils
- cold air temperature
- herbicide injury
- diseases
- insects

Necrosis: spots or streaks of dead tissue

- fertilizer spray injury
- herbicide spray injury
- disease
- wind damage

- hail damage
- insects
- nitrogen deficiency
- potassium deficiency

Holes in leaf and stalk tissue, or plant tissue consumed

- insect feeding
- hail or wind damage

Buggy whip or onion leaf: failure of leaf tissue to unfurl from the whorl

- calcium deficiency
- biuret injury
- boron toxicity
- herbicide damage
- disease

Purple leaves: indicates accumulation of sugars in the tissue. Most often sugars accumulate due to problems with roots

- phosphorous deficiency
- zinc deficiency
- magnesium deficiency
- cold soils
- dry soils
- excessively wet soils
- insect damage
- mechanical root pruning
- herbicide damage
- disease

Lodging

- strong wind
- insect or herbicide damage to roots
- high plant populations
- nutrient deficiencies
- insect damage to stalks

Injury to ears

- disease
- insects

Weather related problems

- soil crusting
- poor seedling color
- frost injury
- dry weather
- heat damage
- wind damage
- hail damage
- flooding

Herbicide injury symptoms

- Acetamide and thiocarbamate injury
- Carfentrazone injury
- Bentazon, bromoxynil, paraquat, and pyridate injury
- Chlorimuron, chlorosulfuron, cloransulam, flumetsulam, halosulfuron, imazamox, imazaquin, imazethapyr, nicosulfuron, primisulfuron, prosulfuron, and rimsulfuron+thifensulfuron injury
- Clethodim, diclofop, fenoxoprop, fluazifop, quizalofop, and sethoxydim injury
- Clomazone injury
- Dinitroaniline injury
- Glyphosate and glufosinate injury
- Triazine injury
- 2,4-D, clopyralid and dicamba injury

Diseases

- Soil decay and seedling blight
- Root rots
- Nematodes
- Leaf diseases
 - Northern leaf blight
 - Southern leaf blight
 - Helminthosporium leaf spot
 - Anthracnose leaf blight
 - Gray leaf spot
 - Eyespot
 - Common rust
 - Southern rust
 - Stewart's disease
 - Goss' Bacterial wilt
 - Holcus leaf spot
- Common smut
- Head smut
- Crazy Top
- Maize dwarf mosaic
- Stalk rots
 - Anthracnose stalk rot

- Diplodia stalk rot
- Fusarium stalk rot
- Gibberella stalk rot
- Charcoal rot
- Ear and kernel rots
 - Fusarium ear and kernel rot
 - Gibberella ear rot
 - Diplosia ear rot
 - Aspergillus ear and kernel rot

Nutrient deficiency and toxicity symptoms

- Nitrogen deficiency
 - Symptoms of nitrogen deficiency appear first as a light green coloring of the plant.
 - As the deficiency becomes more severe, lower leaves turn yellow and may 'fire'.
 - The yellowing starts at the midrib of the leaf with the leaf edge remaining green.
- Phosphorous deficiency
- Potassium deficiency
- Calcium deficiency
- Magnesium deficiency
- Sulfur deficiency
- Boron deficiency
- Chloride deficiency
- Copper deficiency
- Iron deficiency
- Manganese deficiency
- Zinc deficiency
- Salt effect (fertilizer burn)
- Salt injury (foliar burn)
- Anhydrous ammonia toxicity (preplant)
- Anhydrous ammonia "leaf burn"
- Biuret damage
- Livestock waste
- Air pollution injury

Insect Injury

Early Season Injury: Planting to Early Whorl

- Injury to planted seeds
 - Seedcorn maggots
 - Seedcorn beetles
 - Wireworms
- Injury to roots

- Grape colapsis
- White grubs
- Garden symphylans

Key References

Uneven Emergence in Corn North Central Region 344

Scouting Corn--A Guide for Wisconsin Corn Production UWEX Bulletin A3547

Assessing Hail Damage to Corn National Corn Handbook - 1

Utilizing Drought-Damaged Corn National Corn Handbook - 58