In this presentation we will discuss injuries to crops caused by something other than insects, diseases, and weeds. These types of injuries are called noninfectious disorders.

Shown above are soybean plants damaged by hail (page 54, Soybean Field Guide 2nd Edition).
During the course of this presentation we will learn what noninfectious disorders are. We will then move to the differences between noninfectious disorders and disease, and the symptoms you should look for when examining crops for this type of injury.

There are several types of injury that we will discuss including those related to the environment, nutrients, herbicides, and mechanical damage.

We will then look briefly at other problems associated with noninfectious disorders.

[potassium deficiency on corn (page 68, Corn Field Guide)]
Noninfectious disorders

- Nonliving agents or factors
- Caused by any physical or chemical component of the environment that is harmful to the plant’s growth and development
  - Environmental conditions
  - Improper soil nutrient levels
  - Toxic chemicals
  - Mechanical damage

Noninfectious disorders are injuries to plants caused by nonliving agents or factors. A noninfectious disorder might be caused by any physical or chemical component of the environment that is harmful to the plant’s growth and development. Examples of noninfectious disorders are temperature and moisture extremes, hail, wind, lightning, unfavorable light, improper soil nutrient levels, toxic chemicals, and mechanical damage.

[This corn has been damaged by frost before it was mature. Notice grey-green color of leaves.]
Noninfectious disorders do not reproduce or spread from plant to plant. However, a group of plants in the same area may exhibit symptoms, as they may be subject to similar conditions.

Symptoms of noninfectious disorders may appear suddenly and often occur in patterns. Although symptoms on individual plants may change by becoming progressively better or worse, the area of a field that is affected will not increase over time. See the “Basics of Scouting” presentation for more information on patterns.
Noninfectious disorders may produce symptoms such as wilting, stunting, yellowing, plant tissue deformation, or death of plant tissue. Symptoms of noninfectious disorders often resemble those caused by infectious diseases. For instance, nutrient deficiency symptoms may resemble symptoms of root rot diseases. Another example is herbicide injury to soybean leaves which may resemble virus-like symptoms.
When looking for symptoms of noninfectious disorders, there are some clues to look for in the field which may help to determine what kind of problem is present. These are:

**Patterns in the field**
- Does it occur in a straight line or other shape? A sprayer may have overlapped herbicide application, causing plant damage.
- Does it occur only in low spots? These spots may have been flooded for long periods of time and plant roots may lack oxygen or a nutrient.

**Timing**
- Did symptoms show up after herbicide application? Herbicide drift from another field may have damaged crops on the adjacent farm.
- After certain weather events? Wind may have caused corn stalks to lodge or leaves may be tattered due to hail.

**Other plants**
- How do surrounding plants appear? If surrounding plants appear similarly injured, and not in progressive states of injury, it may indicate a noninfectious disorder.

[corn damaged by hail (page 76, Corn Field Guide)]
Many environmental factors contribute to noninfectious disorders. These include:

**Water damage**
- Drought
- Flooding
- Soil crusting

**Temperature extremes**
- Frost
- Heat stress

[Photos from top: Flooding in a field and corn seedling that leafed-out underground as it was not able to emerge thru the surface of the soil]
Other weather issues
- Hail
- Wind
- Lightening

Additional concerns
- Green stem
- Sunburn or sunscald

Other weather issues
- Hail causes damage to leaves and other plant tissues such as developing corn ears. (page 76, Corn Field Guide and page 54, Soybean Field Guide 2nd Edition).
- Wind may lodge plants.
- Lightening can create a dead spot in a field very quickly (page 56, Soybean Field Guide 2nd Edition).

Additional concerns
- Green stem (plants with moist, green stems at maturity) in soybean can be associated with viruses, but artificial lighting, genetic mutations, and other things may also contribute to this type of injury (page 54, Soybean Field Guide 2nd Edition).
- Sunburn or sunscald, appearing between leaf veins as red spots which later turn brown in the center, usually occurs on the lower leaf surface (page 56, Soybean Field Guide 2nd Edition).

[green stem of soybean]
Plants, like people and other organisms, require nutrients for proper development. There are the “macro” nutrients and the “micro” nutrients. Macronutrients are nitrogen, phosphorus, and potassium; plants need these in large amounts and they are the most significant. Micronutrients include iron, magnesium, sulfur, zinc, and others; these are needed by the plant as well, but in smaller amounts.

When these nutrients are lacking, or are unavailable to crops, development may be inhibited. Sometimes nutrients may be in the soil, but certain conditions exist so that plants are unable to take them out of the soil and use them. For example, in alkaline, high-pH soils, availability of iron is limited. In this situation, plants have difficulty obtaining iron from the soil, even though it may be present.

**Macronutrients**

- Nitrogen deficiency can cause leaf yellowing in corn and soybean. It can leach out of the soil after large amounts of rain (page 67, Corn Field Guide and page 60, Soybean Field Guide 2nd Edition).
- Phosphorus deficient corn plants have purplish coloring on leaves (page 67, Corn Field Guide and page 60, Soybean Field Guide 2nd Edition).
- Corn and soybean plants that lack potassium may have yellow and dying margins on older leaves (page 68, Corn Field Guide and page 61, Soybean Field Guide 2nd Edition).

**Micronutrients**

- Iron chlorosis in soybean can occur in high-pH soils. Soybean leaf veins stay green, but tissue between veins becomes yellow or lighter (page 59, Soybean Field Guide 2nd Edition).
- Magnesium deficient corn initially shows stripes between veins on lower leaves, followed by other symptoms (page 68, Corn Field Guide).
- Sulfur deficient corn appears as yellowing of young plants and top leaves may have yellowing between veins (page 69, Corn Field Guide).
- A lack of zinc can cause corn leaves to have light stripes between veins or a band starting near the leaf base that appears bleached (page 69, Corn Field Guide).

[phosphorus deficiency on corn leaf]
Fertilizers applied to fields may harm plants. They can do this in several ways:
  • Vapors from anhydrous ammonia sidedressing applications can scorch and kill plant tissue (page 70, Corn Field Guide).
  • Broadcast applications of certain urea-ammonium nitrate solutions or granular urea that falls into whorls can also burn corn tissue (pages 70 and 71, Corn Field Guide).
  • Banding applications of urea that occur with or next to corn seed can damage plants in several ways (page 71, Corn Field Guide).

Herbicide injury can happen several ways:
  • Drift occurs when herbicide is blown from its intended target.
  • Carryover happens when the herbicide persists in the soil from a previous years application.
  • Misapplication is when a herbicide is purposely applied to a crop that it was not intended to be applied on, such as glyphosate applications to non-tolerant varieties of soybean.
  • Tank contamination occurs when herbicide is left over in a spray tank from a previous application and is then applied along with a desired chemical in a subsequent spray.
Plant tissue damage due to herbicides is widely variable and includes:
• Scorched or burned leaves
• Yellowing
• Delayed emergence
• Leaf cupping
• Malformed or damaged roots
• Stunting
• Defoliation
• Death


[growth regulator herbicides may cause leaf cupping in soybean]
Mechanical injury

- Plant damage caused by equipment driving in the field
- Heavy equipment can compact soil, creating less than ideal growing conditions
- Improper combine settings during harvest may damage grain and increase harvest loss

Mechanical injury to plants is caused by equipment driving through a field such as a sprayer or tractor.

Heavy equipment can cause soil compaction, creating less than ideal growing conditions for crops.

Adjust combine settings appropriately during harvest to minimize damage to grain and reduce loss.
Plants stressed by noninfectious disorders may be more prone to attack by infectious diseases. For example, soybean plants stressed by herbicide injury may be more prone to root rot diseases. Problems may occur in combination, so when diagnosing a problem all possible causes or combinations of causes must be carefully considered.

[corn ear damaged by hail may be at increased risk for disease (page 76, Corn Field Guide)]
There are many different noninfectious disorders in corn and soybean. These injuries range from chemical caused to weather related. The symptoms of some may be confused with symptoms of infectious crop diseases.

Proper identification of noninfectious disorders is important in making informed management decisions – herbicides, fungicides, and insecticides will not help when dealing with these disorders. Some types of crop injury cannot be prevented such as hail damage, but some, such as nitrogen deficiency, can be figured into management decisions for coming years.

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