Cornell Hemp

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Abiotic vs. Biotic Issues in Hemp Fields

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Take home message:

Understanding and managing both abiotic and biotic issues is crucial for successful hemp cultivation. Regular monitoring, proper soil management, and timely intervention are key strategies for optimizing yields.

Figure 1. Abiotic issues typically have a pattern of injury where more than one plant is affected. Here, the hemp is lodging as a result of standing water in the field.

Plant biotic disease: A change in the structure or function of a plant caused by living organisms including fungi, bacteria, viruses, and nematodes. They can be transmitted by insects.

Abiotic disorder: Caused by non-living things including nutrient deficiencies, weather, and water stress.

Abiotic disorders are caused by non-living factors

- **Soil pH Imbalance:** Hemp thrives in a slightly acidic to neutral soil pH. A sub-optimal pH can cause leaf chlorosis and necrosis that can mimic nutrient deficiencies or disease.
- **Water Stress:** Hemp requires well-drained soil but also consistent moisture levels for optimal growth. Wilting, leaf curling, and lodging are signs of water stress (Figure 1).
- **Temperature Extremes:** Frost or heatwaves can negatively impact hemp's physiological processes. Leaf curling and scorching are common symptoms associated with high heat.
- **Nutrient Deficiencies or Excess:** Imbalances in essential nutrients such as nitrogen, phosphorus, zinc and potassium can lead to nutrient deficiencies (Figure 3A). Chlorosis of entire leaves and discoloration along leaf veins are common.
- **Wind and Physical Damage:** Strong winds can physically damage hemp plants, leading to breakage or uprooting. Leaves may have holes and stems could snap.

Figure 2: A: Only one plant in this row seems to have a problem and the distribution is random, indicative of a biotic issue. **B:** Upon further inspection of the affected plant's roots from image A, we see signs of fusarium root rot which manifests as pink-colored roots.

Figure 3: A: The orange-brown spots that elongate with the leaf veins are caused by a zinc deficiency. The yellow leaf underneath it has signs of a nitrogen deficiency. **B:** Two-toned leaves are likely the result of genetic chimerism, a mixture of two or more genetically distinct cells. These should not be mistaken for signs of a nutritional deficiency which typically affects most leaves on the plant.

Abiotic Cues

- **Distribution:** There is often a pattern of injury in the field for abiotic issues. Symptoms caused by a pathogen (biotic disorder) tend to have an irregular distribution. Regular scouting and recordkeeping are important.
- **Age:** Abiotic issues will typically affect one age of plant tissue. New growth on the plant should appear normal, assuming that the abiotic factor is corrected.
- **Timing:** Abiotic issues arise quickly, while biotic issues build up gradually. Monitor environmental conditions, such as temperature, humidity, and sunlight.
- **Other crops:** Nearby crops will have the same symptoms as the affected hemp. Biotic diseases are typically hemp-specific.

Biotic Cues

- Insect-damage will manifest as eggs, webbing, cast skins, frass, and the presence of the pest itself.
- There is often a "sign" of the pathogen, including spores, mycelium, and overwintering structures.
- Check for pathogen signs when an issue is observed. It is important to look at all plant parts (flowers, leaves, stems and roots).
- Viruses can manifest as leaf curling, spotting, and stunted growth.

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