Pre-Emergence Freeze Injury in Corn

CROP BULLETIN

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KEY POINTS:

- Sustained temperatures of 20 to 25°F or below can cause injury or death of corn seedlings prior to emergence.
- Injured tissue will appear darkened due to the destruction of cell membranes and the release of cell contents.
- Seedling survival depends on the stage of development, the severity of coleoptile damage, and whether the growing point was killed.

FREEZE INJURY PRIOR TO EMERGENCE

- Corn that has not yet emerged is less prone to freeze injury than emerged plants due to the insulating effect of the soil.
- However, when freezing conditions penetrate the soil enough to damage the coleoptile, mesocotyl, or the growing point, plant death can occur in seedlings that haven't yet emerged.
- Sustained temperatures of 20 to 25°F or below are required for this type of injury.

SEEDLING DAMAGE SYMPTOMS

- Within the first 24 to 48 hours after the occurrence of freezing temperatures, corn plant tissue takes on a darkened appearance due to the destruction of cell membranes and the release of cell contents.
- The mesocotyl region just below the coleoptile also appears liquid-filled. Normal tissue color is initially maintained by plant parts not damaged (Figure 1).

Figure 1. Corn plant with coleoptile damaged by cold temperatures. Note the soft, brown appearance of the coleoptile tip.

INJURY DIAGNOSIS

- Seedling survival depends on the stage of development, the severity of coleoptile damage, and whether the growing point was killed.
- Coleoptile and mesocotyl softening and browning indicates dying tissue.
- Even though the leaves within the coleoptile may have survived, the probability that they will emerge is low because the coleoptile is no longer able to protect them as they push towards the soil surface.
- In most instances when the tips of the coleoptiles turn brown, they rupture prematurely.
- The plant response to this is often leafing out underground (Figure 2). In other cases the leaves become stuck in the coleoptile tip.
- If the growing point tissue is obviously damaged, plants will not recover.
- Injured plants have reduced levels of resistance to secondary pathogens invading damaged tissues, and are more likely to sustain herbicide damage.

Figure 2. Seedlings showing symptoms of cold injury

POST-FREEZE CROP MANAGEMENT

- Wait 3 to 5 days with daily high temperatures above 70°F, then assess the number of plants per acre that are likely to emerge and produce healthy corn plants.
- If stand damage is substantial, assess the costs and benefits of leaving the stand vs. replanting.