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Spring Frost Damage in Crops

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Generally field crops in South Dakota are exposed to some degree of frost during the spring somewhere in the state. Periodically county agents and specialists alike are flooded with inquiries regarding the susceptibility of various crops to frost damage. One should keep in mind when assessing or determining the potential for frost damage that damage can be quite variable from one locality to another. In turn the degree of damage is often influenced by both the rate or speed temperatures drop and how long the freezing temperatures are maintained, not merely by how low the temperature drops. For example, if temperatures drop to 15°F, crops on wet soils may die whereas crops on moderately dry soils may survive. Drier soils in the spring will warm up thereby modifying to some extent a drop in air temperatures. Wind along with wet soils will likely cause greater damage whereas wind blowing over drier soils may cause the wind to warm up to the extent that frost damage will not be as severe.

I would now like to briefly discuss which freezing temperatures will potentially cause frost damage in various crops:

Small Grains. In most cases small grain seedlings will survive temperatures as low as 20°F. If soils are moderately dry the seedlings may survive air temperatures as low as 16°F depending to what extent soil temperatures may have modified the colder air temperatures. In both cases seedling leaves will likely suffer extensive damage. As long as the main shoot remains a good white color the plant will likely survive. Should the growing point on the main stems or tillers turn off-white to brownish then the plants will likely die.

Generally as small grains approach the jointing stage or later growth stages the developing seed head may be damaged or killed. In some cases the leaves may remain green while the seed head has been killed. New tillers, however, may develop from crown tissue even though the seedhead on older tillers has been damaged or killed. This second flush of growth from new tillers is usually later and much lower in yield potential compared to the growth obtained from undamaged tillers.

Flax. Seedlings are somewhat sensitive to frost as they emerge from the soil, but can tolerate air temperatures as low as 24 to 20°F depending on the soil and wind conditions.

Corn. Corn seedlings will survive extensive frost damage if the frost hits them before they attain a knee-high height or about 8 to 10 inches. At this stage the growing point protected by surrounding leaves is just below the soil line. Usually at this stage there are about 8 to 10 visible leaves if none have died or been broken off. After this stage the growing point will soon emerge above the soil surface and the risk of extensive frost damage to the crop increases. At that point damage can only be determined by examining both the growing point and young stalk. Again as in small grains, if the growing point is not whitish but is turning off-white to brown the seedling will likely die. In turn if the young stalk is split and the tissue appears dark and water soaked the seedling will likely die.

Soybeans. Seedlings normally tolerate temperatures as low as 28 to 29°F. At such temperatures seedlings can tolerate complete leaf loss until the third trifoliate leaf is about to unfold providing the buds are not destroyed.

Sorghums, Millets and Sorghum-sudan Hybrids. Generally these crops are seeded late enough in the season that danger from frost is minimal. Should frost occur there would likely be little damage if the crop has not grown beyond the five-leaf stage. Damage estimates can be made by carefully splitting the seedling stalk and inspecting for vigorous white tissue at the growing point compared to dark yellowish- to brown tissue which indicates the plant will likely die or not produce a head.

Sunflower. Seedlings in the cotyledonary stage (seed leaves are visible) may often withstand temperatures as low as 24°F. At the later 2, 4, and 6 true leaf stages seedlings often become more sensitive and an increase in frost damage is likely. Should frost destroy the buds at these stages then the crop is lost; however some damage to the leaves may occur which will likely stunt the crop for a short time.

Alfalfa. In established stands alfalfa shoots and leaves will tolerate temperatures as low as 24°F before significant frost damage will occur. In newly seeded stands the low temperature needed to cause frost damage is variable depending the seedling's growth stage. During the cotyledonary growth stage (seed leaves are visible) when the cotyledons have just emerged through the soil surface the seedlings can withstand a temperature of 20°F for 4 hours. Soon after the cotyledonary stage and as the seedling continues to mature a low temperature of 24°F or less is needed to cause significant frost damage. Frost damage is most often indicated by leaves that appear to be wilted or dried leaves showing some light brown leaf burn.

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