



Early Season Frost & Low Temperature Damage to Corn and Soybean

[R.L. \(Bob\) Nielsen](#) and Ellsworth Christmas
Agronomy Dept., Purdue Univ.
West Lafayette, IN 47907-1150
Email address: rnielsen@purdue.edu

- Lethal cold temperatures are more damaging than “simple” frost.
- Leaf injury or death does not guarantee plant death or yield loss.
- Patience is a virtue when waiting for crops to indicate their recovery.

Almost every year, late spring frosts damage corn or soybean somewhere in the state. Almost every year farmers and consultants wonder whether the damage will be severe enough to warrant replanting parts of fields injured by frost. So, almost every year we publish the following information about early season frost injury to corn and soybean.

When contemplating the effects of frost injury to corn and soybean, it is important to recognize that the extent of crop injury depends quite a bit on whether the field experienced lethal cold temperatures or “simple” frost. Lethal cold temperatures for corn and soybean are those at or below 28° F. Our definition of “simple” frost is that which occurs at temperatures warmer than 28° F.

At young developmental stages, soybean is more susceptible than corn to aboveground damage by frost or lethal cold temperatures because its growing points are exposed above ground as soon as the crop emerges. Soybean axillary buds develop at each leaf axil of a soybean plant, including the cotyledons. Recovery from frost damage is possible if any of these buds remain alive. Frost or freeze damage extending below the cotyledons translates to complete death of the seedling.

The growing point region of a corn plant remains below ground until about the 5-leaf collar stage and, thus, is reasonably protected from the effects of aboveground frost. Consequently, the effects of “simple” frost damage to corn are usually minor and limited to death of aboveground plant parts. Corn can easily recover from this type of damage early in its development and suffer no yield loss whatsoever.

When air temperatures actually drop to lethal levels (28° F or less) for more than a few hours, the growing point region of a young corn plant can be injured or killed even if it is still below the soil surface. Consequently, one of the key factors that determine whether corn will recover from frost damage is whether lethal cold temperatures accompany the frost. This distinction between damage by frost and lethal temperatures is the reason why your experience with frost damage in the past may differ from your neighbor’s or our experiences.

The key requirement for assessing frost damage to either corn or soybean is to be patient and allow the plants to show you whether they are capable of recovering. While corn and soybean leaves may blacken and wither within a day after frost occurs, the true extent of plant damage may not yet be discernible.



[[Examples of Frost Injury From April 2001](#)]

The bottom line on diagnosing the severity of frost or low temperature injury to corn or soybean is that you generally need to wait three to five days after the weather event before you can accurately assess the extent of damage or recovery. Recognize that cool days following a frost event may slow the plants’ recovery and delay your ability to assess their health.

These three to five days will be better spent continuing to plant the remainder of your crop acres, assuming that most growers are not yet finished with corn and soybean planting. After that period of time, recovery of the surviving plants should be evident while those plants that are truly dead will not exhibit signs of recovery.

After three to five days, surviving corn plants should be showing new leaf tissue expanding from the whorls, while dead corn plants will still look dead. Surviving soybean plants will show new leaves emerging from one or more of the uppermost undamaged nodes, while dead plants will still look dead.

Yield loss to early season frost damage in corn and soybean is related primarily to the degree of stand loss, not to the degree of leaf damage. The dead tissue of the damaged part of the whorl may restrict this leaf extension for a while, but in most cases will not restrict it completely. Mowing of frost-damaged corn to encourage its recovery is rarely justified.

If recovery is evident after three to five days, then replanting is not justified. If a significant proportion of the population is obviously dead after this same period of time, then replanting may be justified.

Other Online References:

- Carter, Paul and Daniel Wiersma. 2000. Early Season Frost Damage to Corn [Online]. Crop Insights, Vol. 10 No. 14. Pioneer Hi-Bred Int'l, Inc. http://www.pioneer.com/usa/crop_management/corn/early_frost_damage.htm [URL verified 5/19/02].
- Elmore, Roger and Ben Doupnik, Jr.. 1995. Corn Recovery from Early-Season Frost [Online]. Univ. of Nebraska. <http://screc.unl.edu/Hotline/Frost/frost.htm> [URL verified 5/19/02].
- Hicks, Dale and Seth Naeve. 2000. Corn and Soybean Regrowth After Frost Injury [Online]. Univ. of Minnesota. <http://www.extension.umn.edu/administrative/disasterresponse/components/hicks.html> [URL verified 5/19/02].
- Nafziger, Emerson. 2001. Cold Weather and Crops. Univ. of Illinois. [Online] <http://www.ag.uiuc.edu/cespubs/pest/articles/200104k.html> [URL verified 5/19/02].



For other information about corn, take a look at the Corn Growers Guidebook on the World Wide Web at

<http://www.kingcorn.org>

It is the policy of the [Purdue Agronomy Department](#) that all persons shall have equal opportunity and access to its programs and facilities without regard to race, color, sex, religion, national origin, age, or disability. [Purdue University](#) is an Affirmative Action employer. This material may be available in alternative formats.

© 2002, Purdue University

End of document