

Late Season Frost Damage to Soybean

Above ground soybean plant tissue can be damaged if exposed to frost, and the whole plant can be killed when temperatures drop below 30°F for an extended period of time.

The impact of a late-season frost on a soybean crop depends upon the growth stage when frost occurs, the exposure temperature, the time of exposure, and cultural practices. Yield can be reduced when frost occurs at or before the R7 growth stage (Table 1). Frost temperatures that range from 30°F to 32°F can damage the top leaves of soybean plants; however, if air temperatures drop below 30°F, the entire plant may be killed. Generally, soybean plants in a narrow row spacing (15 inches or less) may tolerate a light frost better than plants in wider rows (30 inches and greater). A thicker soybean canopy can hold more soil heat and protect the developing lower pods, which can continue to fill soybeans and develop normally after a frost.¹

Damaged Soybean Plants

If only the upper soybean leaves are damaged, the plants were probably not exposed to killing temperatures for an extended period of time. However, if leaves are damaged throughout the plant and close to the stem, potential yield loss may occur. The growth stage of soybean plants when frost occurred should be determined to estimate the potential yield loss (Table 1). As soybean plants approach maturity, the risk for potential yield loss decreases. Seeds in the upper canopy are usually impacted to a greater degree, than those lower in the canopy.

Management

Severe problems may arise when soybean plants are killed before reaching maturity, such as some or all of the beans being green, lower quality seeds and yield potential, and variable moisture content. Frost damaged soybean seed are generally considered salvageable as long as the plants reached the R6 growth stage at the time of the frost-killing event. An early frost prior to maturity may slow field dry down. If soybean plants need to be harvested with moisture levels higher than desirable, placing the harvested seeds in an on-farm bin with steady aeration for two to four weeks should be considered. This process can help reduce moisture levels and may begin to turn some of the green seeds to a normal mature color. Soybean seeds in on-farm storage should be checked regularly for spoilage. Soybean seeds can be dried in a grain dryer at 130°F or lower temperatures.

Table 1. Soybean growth stages and predicted yield loss after a frost.²

Growth Stage	Yield Loss
Beginning Seed (R5)	65%
Full Seed (R6)	37%
Beginning Maturity (R7)	11%
Full Maturity (R8)	0%

Sources: ¹ Berglund, D. Assessing frost damage in soybeans. North Dakota State University Extension. <http://www.ag.ndsu.edu>; ² Staggenborg, S., Dhuyvetter, K., Fjell, D., and Vanderlip, R. 1996. Fall freeze damage in summer grain crops. Kansas State University Extension. MF-2234. <http://www.bookstore.ksre.ksu.edu>; Staton, M. 2013. How to manage frost-damaged soybeans. Michigan State University Extension. <http://msue.anr.msu.edu>. Web sources verified 8/24/18.

Performance may vary, from location to location and from year to year, as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible and should consider the impacts of these conditions on the grower's fields. 130903023036 090518MW