

# AGRONOMIC ALERT



## Late-Season Frost Damage to Soybeans

The effect of late-season frost on a soybean crop depends upon the growth stage of the soybean plants. Yield losses due to frost are uncommon after soybeans have reached full maturity, the R8 growth stage. Temperatures that range from 30°F to 32°F can easily damage the top leaves on a soybean plant. When air temperatures drop lower than 30°F, the entire soybean plant can be killed. Fields with narrow-spaced rows (6 to 15 inches) seem to survive frost damage better than wide-spaced rows (30 to 38 inches) because of the limited air movement within the canopy of narrow-spaced rows.

### Plant Damage

If frost damage occurs to the top or upper leaves only, then the soybean plants were probably not exposed to cold temperatures for a long period of time. However, if leaves are damaged throughout the plant and close to the stem, yield losses may be seen.

In order to determine the loss in yield potential, the growth stage of the soybean crop must be determined. Table 1 can be used to help predict average yield loss. A frost can cause severe damage (65% yield loss) to a soybean crop at the beginning seed stage or R5, while a frost after soybeans have reached full maturity or R8 should not harm yields. As soybean plants reach maturity, the risk for potential yield loss decreases.



Figure 1. Frost damaged these soybean plants, causing the leaves and stems to turn brown.

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

Growth Stage	Yield Loss
<b>Beginning Seed (R5)</b> Seed is 1/8 of an inch inside the pod located on the main stem at one of the four upper most nodes.	65%
<b>Full Seed (R6)</b> A green seed fills the pod cavity on 1 of the top 4 nodes on the main stem.	37%
<b>Beginning Maturity (R7)</b> One pod on the plant has reached its mature color.	11%
<b>Full Maturity (R8)</b> Mature color is reached by 95% of the pods.	0%

Source: Saliba, et al. *Crop Science* 22:73-78. As published in *Fall Freeze Damage in Summer Grain Crops*. Kansas State Univ. Ext. MF-2234. Aug 1996.

### Effects of Frost Damage

Severe problems may arise when soybean plants are killed before reaching maturity such as: some or all of the grain being green, lower quality seeds, lower yield potential, and variable moisture content.

An early frost may cause slow field drydown. If soybeans need to be harvested with moisture levels higher than desirable, consider putting the harvested soybeans in an on-farm bin with steady aeration for 2 to 4 weeks. This process can help reduce moisture levels, and may begin to turn some of the green soybeans to a normal mature color. Soybeans in on-farm storage should be checked regularly for spoilage. Soybeans can be dried in a grain dryer, but at temperatures 130°F or lower.

Sources: Berglund, D. *Assessing Frost Damage in Soybeans*. North Dakota State University Extension.

Iowa State University Extension. *Frost Damage to Corn and Soybeans*. October 1995. PM1635.

Purdue University. *Corn & Soybean Field Guide*. 2007.

Staggenborg, S., Dhuyvetter, K., Fjell, D. and Vanderlip, R. *Fall Freeze Damage in Summer Grain Crops*. Kansas State Univ. Ext. August 1996. MF-2234.

Wiser, R. *Handling and Marketing Frost-Damaged Crops*. Iowa State Univ. Ext.. Sept. 1993.

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