



Impact of Frost on Soybeans

Temperatures of 0°C for an extended period of time will cause damage to top growth in soybeans and temperatures of -2.2°C or colder can kill soybean plants entirely.

Other factors can also impact the degree of frost:

- Canopy thickness (narrow, thick rows will maintain heat longer)
- Soil moisture (moisture in the soil will maintain heat)
- Cloud cover (cloudy is better)
- Wind speed (windy is better)

It is a good idea to assess your field prior to a potential frost to understand the staging and maturity of your soybeans beforehand, and to understand the potential impact a frost may have.

What Will Happen to Soybeans if There is a Frost?

A light frost (0 to -1°C) may kill top leaf growth but will not penetrate the canopy. Soybean plants should continue to mature but will take longer and there may be some green seed in pods where leaves were killed. Frost killed leaves will remain attached to the plant.

A hard frost (<-1°C) will cause damage to green stems, pods, and seeds, reducing yield and quality and may kill the entire plant. When entire plants are killed, seed fill stops because photosynthate can no longer be translocated. Beans that were green and immature (R-5 to R-6) will shrivel and remain green. This is worst case scenario. Beans that were green-yellow (R-6.5) will have a mixture of green seed that will not mature and yellow seed that will mature. Mature, yellow beans (R-7) will continue to dry down slowly with minimal yield and quality loss.



Stage	R-6 Full Seed	R-6.5 Halfway through seed fill	R-7 Physiological maturity	R-8 Full Maturity
Description	Field is green. Plant material is green; seed fills pod on one of top four nodes.	Yellow visible in field with some leaf drop. Full seed on top four nodes, starting to drop bottom leaves. Pod color is green/yellow.	Field is yellow. Pods are yellow (membrane around the seed is completely absorbed) and at least one pod on main stem is brown.	Field is tan-brown. 95% of pods are brown, seeds will rattle in pod and all leaves will be dropped.
Days to	25-30 days	10-15 days	8-10 days	5-10 days to harvest
% Yield Loss	Up to 50%	Up to 30%	Safe <10%	0

References:

¹Nadler, Andrew. 2007. An agroclimatic risk assessment of crop production on the Canadian Prairies. MSc. Thesis. University of Manitoba.

²Fehr W. R. and C. E. Caviness. 1977. Stages of soybean development. Spec. Rep. 80 Iowa State Univ. Coop. Ext. Serv., Ames.

³Saliba M. R., L. E. Schrader, S. S. Hirano, and C. D. Upper. 1982, Effects of freezing field-grown soybean plants at various stages of podfill on yield and seed quality. Crop Sci. 22: 73-78.