



Agronomic Spotlight

Soybean Green Stem Syndrome and Pod Shatter

- Green stem syndrome occurs when soybean pods and seeds mature while stems remain green, which may cause challenges during harvest.
- Exact cause is not known but several factors may contribute to green stem syndrome.
- Some fields may experience drought induced soybean pod shatter; thus, options should be considered when making decisions regarding harvest timing.

Green Stem Syndrome

As normal soybean plants mature and near harvest, leaves drop and stems lose their green color. In some fields stems retain green color although pods and seeds are mature. This phenomenon is known as green stem syndrome, which can prevent normal plant drydown (Figures 1-2).

Many of these fields are difficult to harvest because combines must handle dry and wet plant material at the same time. Seed moisture content from normal plants and plants with green stem can differ, which can further complicate harvest. At times, combines can gum up from the green tissue.

Contributing Factors

An exact cause for green stem syndrome is not known. Factors that may influence green stem syndrome include environmental conditions, viruses, insects (i.e. spider mites, soybean aphids, thrips, stink bugs), and the soybean product.

Under very warm and dry environmental conditions, pods and/or seeds may have aborted. When pods and/or seeds are aborted, the plant redistributes sugars and nutrients or photosynthate. This redistribution may increase the concentration of photosynthate in the stem causing it to retain green color longer.

According to a study conducted by the University of Kentucky, when 25 to 50% of pods were removed from a soybean plant, pod maturation was not delayed, but stem maturation was delayed from as few as four days to a month or longer. Additionally, green stem symptom was more pronounced when a higher percentage of pods were removed.

Soybean viruses and insect pressure can also result in green stem symptoms. Stress caused by bean pod mottle virus, soybean mosaic virus, tobacco ringspot virus, bean leaf beetle and green stink bug can increase the occurrence of green stem. Symptoms may occur in isolated or irregular shaped patches. These viruses may also produce discolored and distorted seed, which can be diagnosed at harvest.



Figure 1. Plants with mature pods and dry stems (left) and plants with green stems (right) in the same field.



Figure 2. Soybean plant with mature soybean pods and green stems common with green stem syndrome.

Fall drydown conditions could also be contributing to green stem. In some regions, low humidity coupled with warm temperatures may speed up grain drydown but not give stems enough time to dry, due to a potential increase in photosynthate.

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Any number of pod reducing stresses may be responsible for green stem at harvest. It may be assumed that high-yielding seed products may be more prone to late-season pod abortion, as these plants would produce a higher number of pods early in the season.



Figure 3. Pre-harvest soybean pod shatter. Image K4389-11, USDA ARS. <http://www.ars.usda.gov>.

Pod Shatter

Another issue some farmers may observe at harvest is drought induced soybean pod shatter (Figure 3). This issue seems to be more common in earlier maturity soybean products. Drought conditions during pod development can result in weak pod structure. When pods rehydrate after they have dried, they may open more easily. Soybean plants that were mature prior to the late rains would not have added any more weight. Instead, the seeds may have swelled, causing pods to shatter.

Spider mite infestations is another factor that may contribute to pre-harvest shatter (Figure 4). Drought conditions favor spider mite populations. If left untreated, spider mite feeding can reduce leaf area resulting in reduced pod set, fewer seeds, and smaller seeds. Late season spider mite infestations can lead to premature senescence and increased pod shattering during harvest.

Pre-harvest soybean pod shatter can significantly affect yield potential, especially if it begins while plants are still green. In general, a loss of four seeds per square foot equals one bushel per acre.

Harvest Considerations

Harvesting soybean plants with symptoms of green stem syndrome may be a challenge. Green stems are difficult to cut and are known to plug up combines. When harvesting soybean plants with green stems, the combine should be in good operating condition, properly adjusted with sharpened cutting knife sections, and operated at slower speeds. Always refer to the manufacturer's manual before performing any maintenance.

Waiting to harvest until after a killing frost may be necessary, depending on the severity of the green stem problem and the condition of the seeds and pods. However, waiting for a frost or for the stems to drydown may increase the risk of yield loss from pods shattering in the field or during harvest. Fields should be monitored and harvested according to moisture content and combine settings should be adjusted accordingly.

One option growers may want to consider, if waiting on frost is not a viable option, is the use of some herbicides that are labeled for harvest aids in soybean.

Two important things to take into account if considering using a chemical harvest aid is the cost and the variability of maturity in your fields. It is imperative to closely monitor your fields as yield may be diminished if your fields are not as mature as required by the label.

Summary

Green stem syndrome is a disorder that prevents soybean stems from proper drydown prior to harvest. Stems stay green while pods and seeds are mature and ready to harvest. Although the exact cause is unknown, drought conditions, viruses, insect pressure, and product maturity can contribute to soybean stem syndrome. Proper timing of harvest operations, management decisions, and making adjustments to combine settings are critical to reduce harvest losses.

Sources:

Casteel, S. 2010. Green soybean stems and dry grain. Soybean Station. Purdue University Cooperative Extension. www.soybeanstation.org (verified 8/3/14).
Egli, D.B and W.P Bruening. 2006. Depodding causes green-stem syndrome in soybean. Crop Management. www.plantmanagementnetwork.org (verified 8/4/14).
Holshouser, D. 2009. Green stem syndrome in soybeans. Virginia Cooperative Extension. 2912-1430. <http://www.ext.vt.edu> (verified 8/5/14).
Sprague, C. 2009. Harvest-aid options in soybean. Michigan State University Extension. <http://msue.anr.msu.edu> (verified 8/5/14).



Figure 4. Spider mites on the underside of soybean leaf. Tiny yellow spots on the leaves are symptoms of spider mite feeding.

For additional agronomic information, please contact your local seed representative. Developed in partnership with Technology, Development, & Agronomy by Monsanto.

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