Drought Effects on Pod Fill in Soybean

KEY POINTS

- Heat and drought stress during soybean flowering can result in decreased yield potential.
- Soybean yield potential is most at risk from drought stress during the 2nd to 4th week of seed fill.

Drought Effects on Soybean

Because flowering occurs over a wider window of time, as compared to corn, soybean plants can typically withstand drought stress reasonably well. However, plants are most sensitive to intense and prolonged stress during the flowering and early pod fill growth stages.

Drought stress can cause floral abortion, reduced pod number, fewer seeds per pod, and reduced seed size. A moderate drought stress can significantly reduce or stop nitrogen fixation, disrupting seed development. Drought stress during R4 through R6 (full pod through full seed) can have a devastating effect on yield potential because flowering stops and plants cannot compensate for lost pods. Specifically, early drought stress during seed fill can reduce the number of seeds per pod. Later drought stress can reduce seed weight.

Heat Effects on Soybean

It can be difficult to separate effects of high temperature from the effects of water stress on soybean plants. Often these stresses occur together and magnify the effects of each other. Extension Soybean Specialist Jim Dunphy, North Carolina State University, indicated that “when temperatures get above about 95°F, soybean plants simply cannot pump enough water to keep up with transpiration and evaporation. The plants close the stomata in their leaves and water cannot get out. That also means carbon dioxide (CO₂) can’t get in and plants can no longer get the carbon they use to make the sugars that fuel everything that goes on inside the plant.”

Soybean Management

As mentioned earlier, effects from drought are expected to be less on soybean plants than on corn plants. If soybean plants are stressed to the point of losing leaves, it is time to decide whether to leave the plants in the field and hope for the best or cut them for hay. This decision depends on the stage of growth and condition of the plant.

Plants with 30 percent of the leaves still attached, may be considered for hay. These plants can produce 0.75 to 1.25 tons dry matter per acre with 13 percent protein and 48 percent in-vitro dry matter digestibility. If adequate rainfall occurs and photosynthate is available after R5, the plant may compensate for earlier losses by producing larger seeds (within its genetic capacity). Once the plant reaches R6, pods are not normally aborted. Managing stress from insect, disease, or nutrient sources can also help reduce the overall stress load on the plant and potentially limit yield losses.

Summary

Soybean plants are most sensitive to drought during flowering and early pod fill growth stages. Floral abortion, reduced pod number, fewer seeds, and reduced seed size occur during water stress. When leaves begin to curl and drop, it is time for a management decision, which should be based on the stage of growth and condition of the stressed plants.


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. ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. 140716020902 090418JMG