Soybean Yield Components from Growth Stages R1 to R4

The ability to identify soybean growth stages can be an important part of crop management. Knowing what stage the crop is in and what developmental processes are part of that stage can help guide management decisions for better overall crop health and success. It is also important to understand the impact of stress at each of these stages and ways to avoid or minimize the impact of that stress.

Soybean vegetative growth stages are numbered according to the number of fully developed trifoliate leaves (Figure 1). Vegetative and reproductive growth stages in soybean overlap. Reproductive stages begin at flowering (R1-R2) and include pod development (R3-R4), seed development (R5-R6), and plant maturity (R7-R8). The crop’s growth stage is determined by the point at which 50% or more of the plants are in or beyond a specific stage.

**Beginning Bloom (R1)**

This is a time of rapid growth, with at least one flower on the plant (Figure 2). Soybean flowering begins on the third to sixth node of the main stem. Flowering continues up and down the main stem and eventually moves to branches. Since groups of flowers develop from the base to the tip, pods at the base of the plant are usually more mature than those at the tips. Vertical roots and secondary roots and root hairs are rapidly growing during R1, and continue until R4-R5. Plants are 15 to 18 inches tall and in the vegetative stage V7 to V10. Stresses, such as defoliation or root damage, that occur from R1 to R5 can affect growth rate and yield potential.

**Full Flower (R2)**

An open flower at one of the top two nodes on the main stem establishes full flower or full bloom (Figure 3). One or more of the upper nodes has a fully developed leaf and approximately 50% of the total number of nodes have developed. Plants are in the V8 to V12 vegetative stage and are around 17 to 22 inches tall. Roots can reach across 40-inch rows. Major lateral roots have turned down into the soil and nitrogen fixation by root nodules is increasing. Plant dry matter is accumulating rapidly. Plants will accumulate 25% of total dry weight and nutrients and about 50% of mature height during this stage. The most destructive stress during R2 is defoliation which can result from insect, disease, or hail damage. Defoliation of 50% at this stage can reduce yield by 6%.

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**Key Points**

- Being able to identify soybean crop stage and understand the components of that stage is important to guide management decisions.

- Reproductive growth stages of soybean begin with flowering (R1-R2) and include pod development (R3-R4), seed development (R5-R6), and plant maturity (R7-R8).

- Stress on soybean plants during reproductive stages can impact the ability of plants to reach their full yield potential.

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Figure 1. Soybean plant at V2 showing 2 fully developed trifoliate leaves.

Figure 2. Soybean plant during beginning flowering (R1) growth stage. Photo courtesy of Iowa State University.

Figure 3. Soybean plant during full flower (R2) growth stage. Photo courtesy of Iowa State University.
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Beginning Pod (R3)

One of the four uppermost nodes is 3/16 inch long and small pods, flowers, and flower buds are visible (Figure 4). Plants are 23 to 32 inches tall and in the V11 to V17 vegetative growth stage. Stress during this growth stage may decrease total pod number, beans per pod, or seed size. Because of the long flowering period, soybean plants can typically compensate, at least partially, for temporary stress; however, the plant loses this ability as it matures from R1 to R5.5. During R3, 60 to 75% of the flowers and as many as 50% of the formed pods can abort. Stress during this stage may increase abortion rates and decrease yield potential. Favorable growing conditions may increase pod number per plant and increase yield potential.

Full Pod (R4)

At R4, one of the four upper-most nodes will have a 3/4 inch long pod (Figure 5). This stage marks the beginning of the critical period for determining soybean yield potential. Rapid pod growth and seed development are followed by finalization of pod number. Pod dry weight increases from R4 to R5. Stress during this period can cause more reduction in yield potential than at any other growth stage. Irrigation during this time may help to reduce the potential for yield loss.

Management Considerations

Stress management is one of the biggest obstacles that farmers face in crop production. Stress can occur in the form of weeds, insects, diseases, nematodes, and a whole host of environmental factors. While soybean crops seem to tolerate short periods of stress better than some crops, any extended stress as plants reach reproductive stages impacts the ability of plants to reach their full yield potential.

Because stress factors can vary greatly across different geographies and field environments, the best place to start is to understand the risk factors for your particular farm. Monitor fields for pests and diseases throughout the season and keep track of those that are becoming problematic in surrounding areas. Treatment thresholds and recommendations vary by state. Consult your Channel Seedsman or Agronomist to discuss management options prior to taking action. The period encompassing growth stages R1-R4 can be an effective time to apply insecticides and fungicides for some situations, but be sure to consult individual products for label directions.

Sources:
Web sources verified 04/27/2015.