Yield Components of Soybean R1 to R4 Growth Stages

- Soybean reproductive stages begin at flowering (R1 to R2) and include pod development (R3 to R4), seed development (R5 to R6), and plant maturity (R7 to R8).
- The effects of frost, hail, moisture stress, insects, or diseases on yield potential can be estimated by determining the soybean growth stage when the event occurs.
- Timing of pesticide application can be determined based on assessing current soybean growth stage.

Beginning Flowering (R1)
Soybean is a short day plant, which means it requires a night longer than a specific length to initiate flowering. As nights begin to lengthen after June 20, plants from each maturity group will begin to flower when their specific maturity group’s night length is reached.

Beginning flowering (R1) is a time of rapid growth. During this reproductive growth stage, at least one flower is located on the main stem (Figure 1). Plants are 15 to 18 inches tall and are at a vegetative stage between V7 (seven fully developed tri-lobed leaf nodes) and V10. Flowering always initiates on the third to sixth node of the main stem. Flowering will continue up and down the main stem and then eventually move to the branches. Soybean flowers are called racemes and are found in leaf axils. Every axil has several flowers that may develop into a pod containing seeds. Each raceme will develop from the base to the tip. Consequently, the pods at the base of the plant are usually more mature than those at the tips. Primary racemes dominate secondary racemes. Secondary racemes can develop just to the side of primary racemes on the same axil. The vertical roots are rapidly growing along with secondary roots and root hairs. This root growth will continue until R4 to R5. Stress, such as defoliation or root damage, that occurs during the early reproductive stages (R1 to R5.5) can affect growth rate and may have an impact on yield potential.

Full Flower (R2)
Full flower (R2), also known as full bloom, is distinguished by an open flower at one of the two uppermost nodes on the main stem (Figure 2). One or more of these upper nodes has a fully developed leaf and approximately 50% of the total number of nodes has developed. New flower development slows down between R2.5 to R3 with completion typically taking place by R5. At the beginning of full flower, soybean plants are in the V8 to V12 vegetative growth stage and are usually 17 to 22 inches tall. Major lateral roots have turned downward in the soil and nitrogen (N) fixation by root nodules is increasing quickly. Rapid accumulation of dry matter along with N, phosphorus (P), and potassium (K) is occurring and will take place until shortly after R6. During R2 growth stage the soybean plant will accumulate 25% of its total dry weight and nutrients and about 50% of its mature height. The largest yield reducing stress during full flower is defoliation, which can occur from various sources including insect damage, disease, or hail. Fifty percent defoliation at this stage can reduce yield by 6%.1,2

Beginning Pod (R3)
At the beginning pod (R3) growth stage, one of the four uppermost nodes has a pod that is 3/16 inch long (Figure 3). Stress during this growth stage may affect yield potential by decreasing total pod number, seed number per pod, or seed size. Typically, soybean plants can compensate, at least partially, for temporary stress. One reason for the ability to compensate is the long flowering period; however, the soybean plant loses this ability as it matures from R1 to

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R5.5. Typically, 60 to 75% of the flowers will abort and as many as 50% of the formed pods may abort. Stress during this reproductive stage may increase those abortion rates thus decreasing yield potential. Conversely, favorable conditions may increase pod number per plant and increase yield potential. At this time, soybean plants can be 23 to 32 inches tall and may be at the V11 to V17 vegetative growth stage.

Full Pod (R4)

At the beginning of the full pod (R4) growth stage, one of the four uppermost nodes will have a pod that is ¾ inch long (Figure 4). At first, rapid pod growth and seed development take place, followed by finalization of pod number. Pod dry weight increases from R4 to R5 (beginning seed). This stage marks the beginning of the critical period for determining seed yield potential. Stress during R4 to R6 can cause more reduction in yield potential than at any other growth stage.¹ The most critical time during pod formation is late R4.5 to early seed fill at R5.5. Reductions in yield potential can occur from fewer pods. If needed, irrigation during this critical time may help reduce potential yield loss.

Management Considerations

Insecticides are an important part of integrated management of bean leaf beetle (BLB) and soybean aphid (SBA) (Figures 5 & 6). The first and second generations of BLB can occur in July and August. Insecticide applications during the R3 to R6 stages of soybean growth can be beneficial to reduce defoliation, pod feeding, and transmission of bean pod mottle virus (BPMV). BPMV symptoms include mottled or crinkled leaves and stunted plants (Figure 7). Multi-state research has shown that well-timed insecticide applications for SBA are most beneficial during the R1 to R5 stages of soybean growth.²

Fungicide applications for late season diseases during the reproductive stages of growth can be beneficial. The optimum time of application is dependent on the disease being treated, but typically an application during the R2 to R5 stages of growth can help prevent leaf loss and potential yield reduction.

Insect and disease situations are highly variable each season. Treatment thresholds and recommendations vary by state. Consult local experts to determine management options prior to taking action.

Sources:


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

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