

How soybeans build yield

Soybeans fall into maturity groups ranging from 000 in the north to VIII in the Gulf Coast states. Initiation of soybean flowering depends on maturity group, planting date, daylength and temperature. Summer days are longer in more northern geographies, and early-maturity varieties adapted to those areas are bred to flower during longer daylight periods (shorter dark periods) than later-maturity varieties. Planting a variety north of its adapted maturity range will delay flowering and maturity. Planting this variety farther south will cause earlier flowering. Here's how a soybean variety develops through vegetative (V) and reproduction (R) stages under normal conditions.

VE stage: Emergence

Soybeans germinate when the seed absorbs half its weight in water. The radical (primary root) emerges first. The hypocotyl (stem) follows soon, growing upward and pulling the cotyledons ("seed leaves") with it. The hypocotyl extends and the cotyledons open and begin to turn green. Emergence occurs 5 to 10 days after planting, depending on field conditions. Lateral roots begin to grow and absorb water and nutrients.

VC stage: Cotyledon stage

The VC stage begins when the unifoliate leaves unroll (leaves no longer have edges touching). The cotyledons supply nutrients to the plant for 7 to 10 days. If both leaves are lost, yields can suffer by 8 to 9 percent.

V1 stage: First trifoliate

After one set of single leaves emerges, all new emerging leaves are trifoliates — compound leaves with three parts or leaflets. The V1 stage occurs with the full opening of the first trifoliate (leaf has unrolled and edges no longer touch). Every three to five days, new leaves appear through the V5 stage. Then trifoliates emerge every two or three days to the R5 stage. The V stages are defined by the number of trifoliate leaves that have developed (unrolled) on the main stem, not the branches. At V2 (usually 6 to 8 inches tall), active nitrogen fixation starts. Most root nodules are within 10 inches of the surface. Each nodule contains millions of bacteria. Pink or red insides show active fixation. White, brown or green nodes aren't fixing enough nitrogen.

V5 stage: Fifth trifoliate

When five trifoliate leaves have developed, the plant is at V5. Lateral branches may grow to compensate to some degree for low plant populations or wide row spacings. However, they can't compensate fully for underseeding. At V5, plants reach 10 to 12 inches. In the top stem, axillary buds develop; they'll grow into flower clusters (racemes). The total number of nodes the plant can produce is set. If something damages the growing point, the axillary buds will branch off and grow profusely. If the plant breaks off below the cotyledon node, the plant will die. It's now about a week until flowering begins.

R1 stage: Beginning bloom

At least one flower appears on the plant on any node on the main stem. This is beginning bloom. The plant is at the V7 to V10 stage and typically is 15 to 18 inches tall. Flowering always begins on the third to sixth node, depending on vegetative stage. Flowering progresses up the plant and the branches. In each raceme, the pods closest to the base are the most mature. Primary racemes (flower clusters) develop ahead of secondary racemes. Vertical roots grow rapidly and continue to R4 or R5. Secondary roots and root hairs also continue to grow. At the R2 stage, the plant is beginning full bloom. The appearance of flowers begins to slow. Nitrogen (N) fixation increases rapidly.

R3 stage: Beginning pod development

When one pod on one of the four upper nodes reaches three-sixteenth inch long, the plant is at R3. This usually occurs between V11 and V17. Plants are 23 to 32 inches tall. Typically, 60 to 75 percent of flowers abort, but stress can increase the loss. Temperature or moisture stress can limit pod numbers, beans per pod or bean size. Because of its long flowering period, the plant can compensate some for losses, but its ability to make up ground dwindles as it approaches R5. At R4, the plant reaches the full pod stage, pod growth is rapid and seed development begins. This is the most crucial stage for seed yield.

In hot, dry conditions, consider irrigation if available.

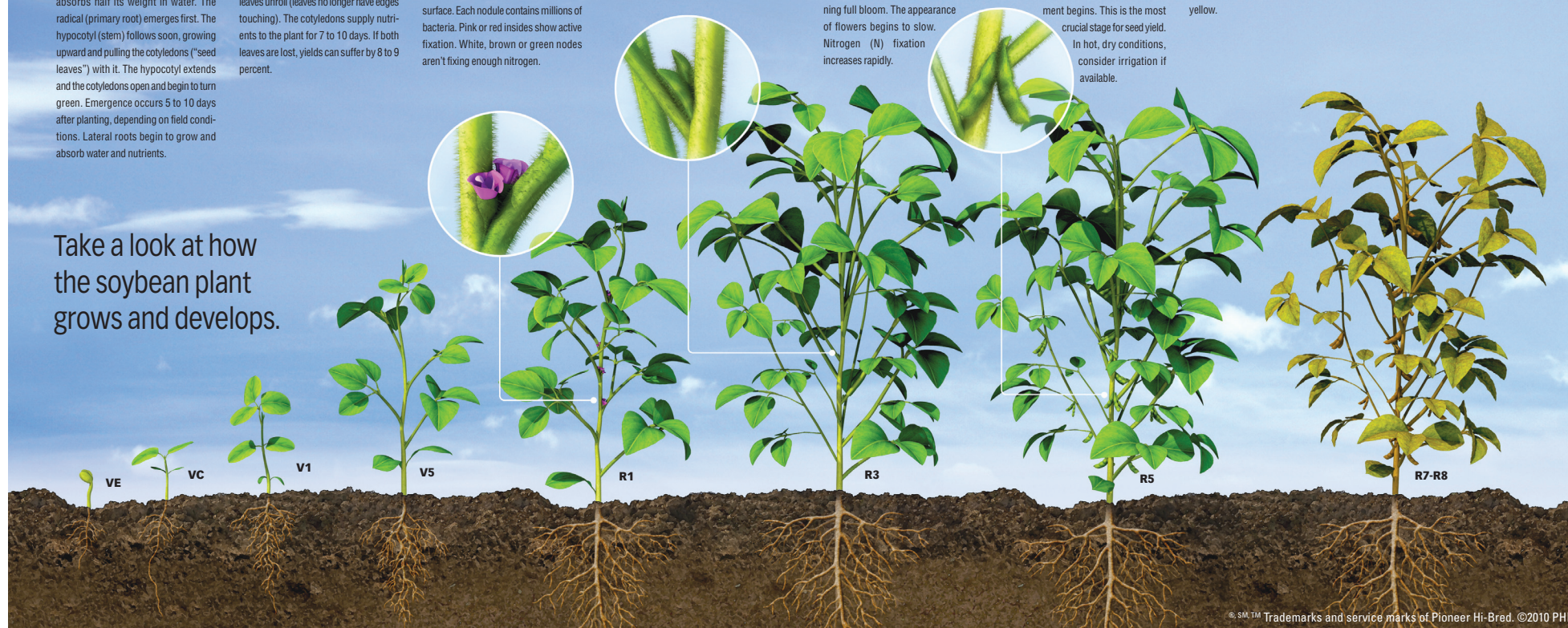
R5 stage: Full seed

Seed filling requires water and nutrients. The plant redistributes nutrients to provide about half the nitrogen, potassium and phosphorus needs. The rest comes from N fixation and root uptake. At R5, the plant is less able to compensate for stresses. The seed is at least one-eighth inch long in one of the pods on the upper four nodes. Halfway through this stage, the plant reaches its maximum height, number of nodes and leaf area. N fixation peaks. Seeds accumulate dry weight. By R6, the "green bean" stage, total pod weight peaks. Seed growth is rapid. Leaves on the lowest nodes will start to yellow.

R7-R8 stages: Beginning maturity to full maturity

R7 begins when one normal pod on the main stem is mature in color (brown or tan). Dry matter is peaking in seeds. Green is disappearing, and both seeds and pods appear yellow. The seeds are 60 percent moisture at physical maturity. Stress has little effect unless pods are shattered or fall to the ground. At R8 (full maturity), 95 percent of the pods are mature in color. From this stage, it takes only 5 to 20 days of good drying weather to get soybeans below 15 percent moisture, ideal for harvest. Growers should harvest soon to avoid losses.

Take a look at how the soybean plant grows and develops.



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