

Identifying Soybean Growth Stages

Identifying and understanding soybean growth stages may help guide important management decisions. Minimizing stress, particularly during reproductive stage, can help soybeans achieve full yield potential.

Identifying Growth Stages

Accurately identifying soybean growth stages can help anticipate the effects of frost, hail, moisture stress, diseases, insects, and weeds on yield potential. Growth stages can help guide management decisions, such as when to apply a fungicide or an insecticide. Soybean vegetative (V) growth stages are numbered according to the number of fully developed trifoliate leaves (Figure 1). Reproductive (R) stages begin at flowering and progress through plant maturity. A new growth stage is established when 50% or more of the plants meet the requirements of the growth stage.

Emergence (VE)

Soybean seed begin to germinate after absorbing approximately 50% of the seed's weight in water. Over 5 to 10 days (depending on temperature, moisture, product, and planting depth), the primary root emerges, followed by the stem, and the cotyledons. The first two unifoliate leaves begin to emerge (Figure 2, page 2). Emergence can be stimulated by small amounts of fertilizer placed in a band to the side and slightly below the seed, especially in cool soils. However, this may delay the onset of the nodulation process as the plant uses soil available nitrogen (N) before it allows nitrogen-fixing bacteria to colonize the root system. Effective nodulation occurs with the application of a commercial inoculant to the seed or furrow.

Cotyledon (VC) to First Trifoliate (V1)

Unifoliate leaves are fully expanded and the cotyledons supply all nutrient needs for the first 7 to 10 days after emergence. Loss of one cotyledon during this time has little effect on plant growth. Loss of both cotyledons at or soon after VE reduce yield potential by 8 to 9%.¹

Second Trifoliate (V2)

Active N fixation begins to occur as plants reach 6 to 8 inches tall with three nodes and two unfolded leaflets. When the plants switch from using soil-available N to fixed N, a brief yellowing of the crop may be observed. Adding N at this stage generally inhibits N production by nodules. Since lateral roots are developing rapidly in the top 6 inches of soil, cultivation should be shallow to minimize root pruning.

Third to Fifth Nodes (V3 to V5)

Axillary buds that will develop into flower clusters begin to develop in the top stem. The total number

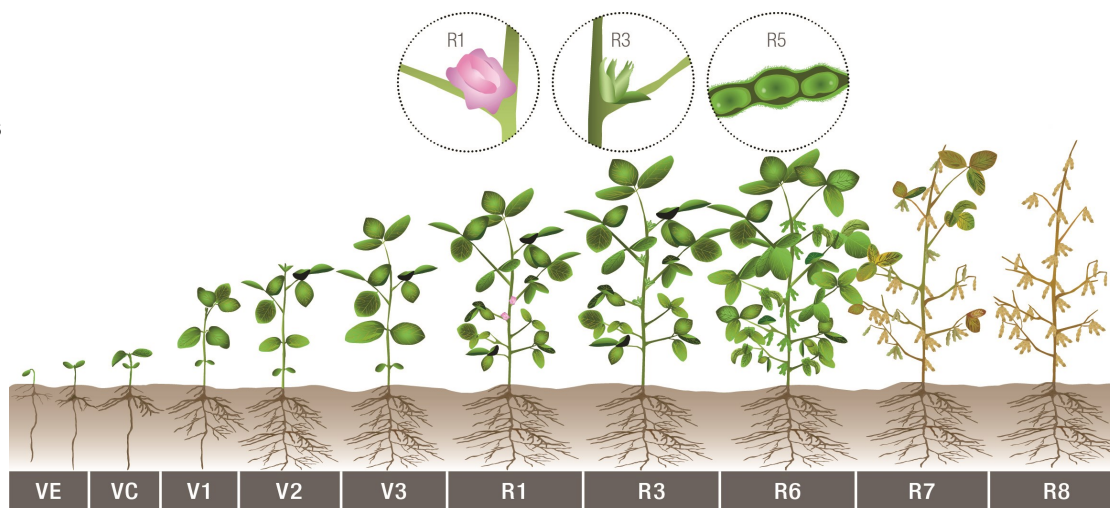


Figure 1. Determining Soybean Growth Stages. Soybeans are indeterminate in growth habit continue vegetative growth after flowering. The rate of development is directly related to temperature and moisture. Picture courtesy of the University of Illinois.

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of nodes the plant can produce is established at V5. Axillary buds that develop on indeterminate soybean plants help the plants to recover from previous bud damage. This is typically the time that iron chlorosis deficiency symptoms become visible in impacted fields.

Sixth Node (V6)

Lateral roots should overlap in rows 30 inches or less. A loss of 50% of the leaves at this stage may reduce yield potential only 3%.

Beginning Bloom (R1)

Plants have at least one flower at any node on the main stem. Soybean flowering begins on third to sixth node, continues up and down the main stem, and eventually moves to the branches. Vertical roots as well as secondary roots and root hairs will develop rapidly until R4 to R5.

Full Bloom (R2)

An open flower develops at one of the top two nodes of the main stem. The plant has accumulated about 25% of its total dry weight and nutrients and about 50% of its mature height. Dry matter, nitrogen, phosphorus, and potassium levels are rapidly accumulating. Roots now may reach across 40-inch rows and lateral roots have turned downward into the soil. Nitrogen fixation by root nodules is increasing rapidly. Up to 50% loss of plant leaves from hail, insects, or disease at this stage may reduce yield potential by 6%.

Beginning Pod (R3)

A pod on the upper four nodes is 3/16 inch long. Heat or moisture stress at this stage can reduce pod numbers, bean number/pod, or seed size, which may reduce yield potential. The ability for soybean plants to recover from temporary stress decreases from R1 to R5.5. Favorable growing conditions during this period may result in greater pod numbers and increased yield potential.

Full Pod (R4)

At this stage pods are growing rapidly and seeds are developing. At least one pod on one of the four upper-most nodes has a 3/4-inch long pod. Stress during this period can cause more reduction in yield potential than at any other growth stage. Rain or irrigation at this time may help reduce the potential for yield loss.

Beginning Seed (R5)

At least one seed in one pod on one of the four upper nodes is at least 1/8-inch long. About half the nutrients required for seed filling come from the plant's vegetative parts and about half from N fixation and nutrient uptake by the roots. Nitrogen fixation peaks and stress at this stage can reduce pod

numbers, the number of beans/pod, seed size, and yield potential. Plants attain maximum height, node number, and leaf area.

Full Seed (R6)

This "green bean" stage marks the beginning of the full seed stage. At least one of the four top nodes of the main stem has a pod with a green seed that fills the pod cavity. Total pod weight peaks. Leaves begin to yellow.

Beginning Maturity (R7)

One pod on the main stem reaches its brown or tan mature color. Seed dry matter begins to peak. Seeds and pods lose all green color. At this stage, soybean plants are safe from a killing frost. Yield potential may be reduced if pods are knocked from plants or seeds are shattered from pods.

Full Maturity (R8)

When 95% of the pods have reached their mature color, the plants are considered fully mature. Typically, 5-10 days of good drying weather after R8 will be needed to reach harvest moisture of less than 15%.

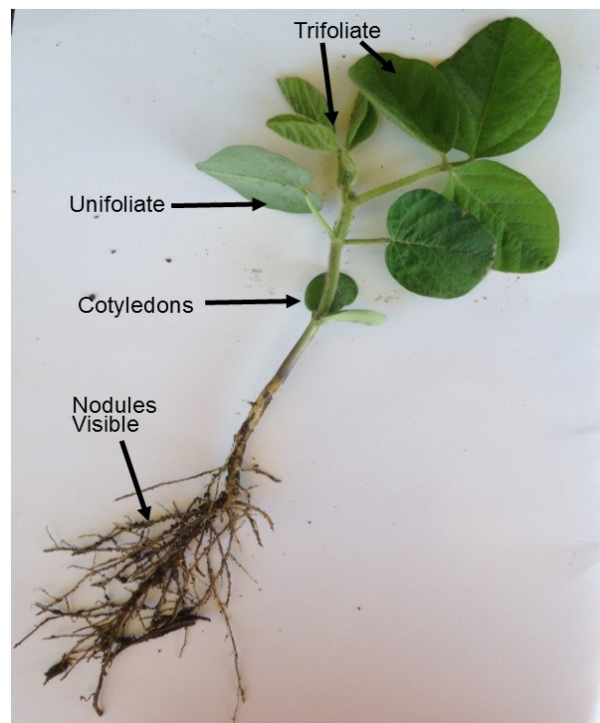


Figure 2. Early soybean plant.

Sources: ¹McWilliams, D.A., Berglund, D.R., and Endres, G.J. 2004. Soybean growth and management quick guide. Publication number A-1174. North Dakota State University Extension. <https://www.ag.ndsu.edu>. Naeve, S. 2005. Growth and development (soybean). University of Minnesota Extension. www.soybeans.umn.edu. Pedersen, P. 2004. Soybean growth and development. PM 1945. Department of Agronomy. Iowa State University Extension. Web sources verified 06/25/2018. 150504124049.

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. 150504124049 071618 RDH .

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