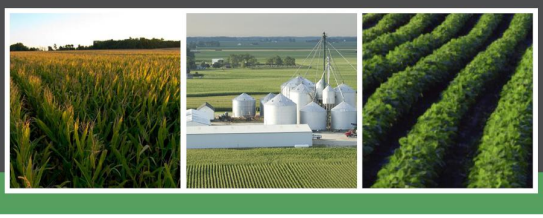

Agronomic Spotlight

Soybean Planting Conditions and Seed Placement

- For optimal emergence and stand establishment, soybean seed should be planted when soil temperatures are warm enough for germination.
- Planting depth, row spacing, and planting population are important for stand establishment and plant development.
- Farmers can determine when and how to plant their crop; therefore, controlling many management factors that may improve soybean yield potential.

Optimal Soil Temperatures

Soybean seeds can germinate when soil temperatures reach at least 54° F, but a temperature of 60° F is optimal.[1] When soil temperatures are too cool, seeds stay dormant and become more vulnerable to diseases, insects, and animal predators. Soybean seed should be planted when soils have had time to warm and within the target dates for a region. Planting into cold and/ or wet soils can lead to numerous problems.

Saturated and Flooded Soils

Soybean seed should only be planted when adequate soil moisture is available and high soil oxygen concentrations are favorable for germination and plant growth. Saturated soils, which may include flooded or ponded soils, can have a negative impact on emergence. The main side effects include plant growth restriction and decreased oxygen availability to the plant. Saturated soils can inhibit root growth, leaf area expansion, and the photosynthetic process. When soils become saturated, young plants may develop yellow leaves due to slowing of photosynthesis and plant growth. A prolonged period of saturated soil can reduce germination and emergence due to lack of oxygen. In addition, portions of roots may die as a result of no oxygen. However, there is still a chance for survival unless the growing point is damaged.

The longer an area remains saturated, the higher the risk of plant death, and warm air temperatures during soil saturation can shorten plant survival.[2] For soybeans, yield losses are not typically noted in fields flooded for two days or less. Flooding for four days or more can stress the crop, delay plant growth, and cause shorter plants with fewer nodes. Six days of flooding can cause significant soybean yield loss, and flooding for a week or more can result in entire loss of the stand.

Soil Compaction

Soil compaction takes place when soil particles are pressed together resulting in decreased pore space and increased soil density. Compaction can result in yield reductions due to decreases in seed germination, root and plant growth, and nutrient uptake (Figure 1). The majority of soil compaction is created from equipment passing over a field. Research indicates that approximately 80% of soil compaction happens on the first pass, while subsequent passes cause additional, but progressively less, compaction.[3] The way to manage compaction is prevention. That means staying out of the field until conditions for field work have improved. If mud sticks to the tires and ruts are deeper than an inch, it is too wet to be in the field.

Figure 1. Effect of compaction on soybean growth and nutrient uptake.

Soil Crusting

As wet soils dry, a crust layer can form on the surface. The crust layer can delay or prevent seedlings from emerging. In addition, soybean hypocotyls can easily be broken when trying to push through the crust. Crusting may be more common in fields with fine textured soils, low organic matter, and little surface residue.[4] A rotary hoe can break up the crust and aid in seedling emergence. Timing is essential, and breaking the crust as soon as possible is most beneficial to the young plants. Cooler soils allow seedlings infected with disease to survive longer when trying to break through the crust.

Planting

Soybean seed should never be planted too deep. Generally, soybean seed should be planted 1 to 1.75 inches deep and no deeper than 2 inches.[5] Soybean plants emerge as the hypocotyl straightens and carries the cotyledons to the surface. The plant requires a lot of energy to complete this process. Therefore, planting too deep can burn energy that could be used later by the plant. In addition, planting too deep can inhibit emergence in stressful situations, such as soil crusting and compaction.

Soybean Planting Conditions and Seed Placement

Row Spacing and Plant Population

Soybean population recommendations will vary by soil type and geography. Generally, there should be 100,000 healthy and uniformly distributed soybean plants per acre to produce a good crop.[6] A general recommendation rate between 120,000 and 150,000 seeds per acre for 15– or 30-inch rows will be necessary to obtain a desirable population. The lower rate can be used with high germination seed (>90%), optimal soil conditions, or when using a vacuum planter. The higher rate may be necessary with extremely early planting, low germination seed (<90%), wet soils or high residue situations, or very late planting dates.

The right row spacing can vary by planting date, soil type, weather, and the soybean product. Rows narrower than 30 inches, down to 20– or 15-inch rows, can potentially produce higher yields.[7] Narrow rows can provide a yield advantage because the soybean canopy develops quicker and intercepts more light throughout the growing season.[8] Drilled soybeans have the potential to perform better, but because the seed does not tend to be uniform in depth when drilling, any potential gains are usually offset by the inconsistent planting depth.[7] Planting with gravity flow drills also require a higher seeding rate.

Improved planter technology and increased seed quality have resulted in more accurate plant populations and stand establishment. Split-row planters, newer precision drills and narrow-row planters offer improved seed placement, which can help reduce the need for high seeding rates. Precision Planting® vSet® vacuum meter can work with any seed size for more accurate seed placement, reducing the number of skips and doubles.

Summary

Planting when soil temperature and conditions are favorable, at the proper depth, seeding rate, and row configuration is very important to give the crop the best chance for emergence and stand establishment. Waiting for warm soil temperatures and conditions may help seedlings avoid diseases, reduced oxygen situations, and other plant growth restrictions. Although it is important to plant within the acceptable planting window, rushing to plant in cold, wet conditions can lead to yield-reducing problems later in the season.

Sources

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