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## KEY POINTS

- Planting corn around 2 inches deep is likely to provide the best odds of success in most environments in the Corn Belt.
- Research has shown that planting corn at least 2 inches deep can improve uniformity of emergence by placing seeds into a more consistent seedbed and improving seed-to-soil contact.
- Corn planted less than 1.5 inches deep is susceptible to less-uniform emergence and poor nodal root development.

## COMMON PLANTING DEPTH RECOMMENDATIONS

- University Extension guidelines in the U.S. Corn Belt commonly recommend planting corn 1.5 to 2.5 inches deep.
- Specific seeding depth recommendations within the 1.5- to 2.5-inch zone are often based on soil texture and moisture conditions, with shallower planting recommended for poorly drained, finer-textured soils and deeper planting recommended for well-drained, coarser-textured soils.



## RISKS WITH PLANTING TOO SHALLOW

- Planting corn too shallow can hamper nodal root development by placing the crown too close to the soil surface.
  - Plants with poor root development are less able to take up water and nutrients and can suffer dramatically during periods of summer drought.
  - In severe cases, corn can develop a condition called “rootless corn syndrome” in which plants will fall over due to the lack of nodal root development in dry soil near the surface.
- Shallow planting can expose corn seedlings to herbicide residues, increasing the potential for herbicide injury.
- Emergence may be less uniform due to a greater variability in moisture and temperature conditions in the seed bed and poorer seed-to-soil contact.



**Figure 2.** Rootless corn syndrome caused by shallow planting followed by dry soil conditions.

## RISKS WITH PLANTING TOO DEEP

- Planting too deep can be problematic when soils are cool and wet following planting, potentially resulting in uneven emergence and reduced stand establishment.
- Planting deeper can also place corn at a greater risk of emergence problems resulting from surface crusting if the field experiences a heavy rainfall event after planting.
  - Crusting can affect corn planted at any depth, but deeper-planted corn can be at a slightly greater risk due to the slightly longer time it takes for seedlings to reach the surface and emerge.
  - Crusting risk is greatest in finely textured soils, low organic matter soils, and fields with poor soil structure and minimal residue.

**Figure 1.** Corn plant at V1 that was seeded two inches deep, with growing point  $\frac{3}{4}$  of an inch below the soil surface. Correct planting depth is important for normal root development.

## KEY FINDINGS FROM RECENT RESEARCH

### Ohio State Study (Lindsey and Thomison, 2020)

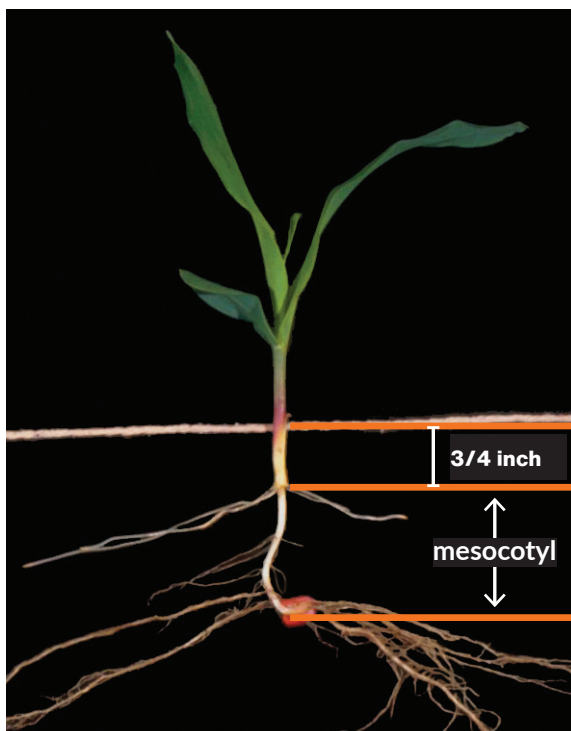
- Shallow planting (~1 inch) shortened the time to the start of corn emergence, but lengthened the duration of emergence resulting in a less uniform stand.
- Soil moisture was lower and more variable closer to the soil surface, which likely contributed to the less-uniform emergence with shallower planting.
- Planting depth affected yield in a higher organic matter field, but had no effect in a lower organic matter field.

### Univ. of Missouri Study (Kitchen et al., 2021a,b)

- Planting corn at the deeper end of the recommended range (2.5 to 3.0 inches) was advantageous for corn emergence in both coarse- and fine-textured soils.
- Planting deeper usually resulted in greater emergence uniformity and similar or improved corn emergence rates.
- Deeper planting (2.5-3.0 inches) was favorable for emergence rate and uniformity when temperatures after planting were warm, but was unfavorable in one year of the study when temperatures were colder.

## HOW TO MEASURE CORN PLANTING DEPTH

- Planting depth can easily be determined after seedling emergence.
- The nodal root area (crown or growing point) typically develops about  $\frac{3}{4}$  of an inch beneath the soil surface regardless of the seeding depth.
- Measure the mesocotyl length (the area between the seed and crown or growing point), then add  $\frac{3}{4}$  inch to determine the planting depth.



**Figure 3.** Corn seedling showing how to assess depth of seed placement after planting by measuring from the seed to the nodal roots.

## CORN PLANTING DEPTH RECOMMENDATIONS

- Research has generally shown that, within the standard recommended planting depth range (1.5 to 2.5 inches), there is more risk associated with planting too shallow than too deep.
- Corn should never be planted less than 1.5 inches deep.
- A target planting depth of around 2 inches is likely to provide the best odds of success in most situations in the Corn Belt.
- Deeper planting (2.5-3.0 inches) may be necessary in lighter, sandier soils in order to place seeds into consistent soil moisture.



## BEST PRACTICES FOR UNIFORM PLANTING DEPTH

- Set the planting depth in the field, with the planter being pulled at full operating speed.
- Check for good seed-soil contact; strive for firm seedbeds that promote uniform emergence and stronger root systems.
- Maintain slower planting speeds, between 4 to 5 mph, to achieve more uniform planting depths.
- Utilize in-row residue managers where needed, especially in corn-following-corn rotations.
- Utilize a planter down force control system.

## REFERENCES

- Kitchen, N., S. Stewart, L. Conway, M. Yost, and P. Carter. 2021a. How Planting Depth and Soil Texture Affect Corn Emergence. Pioneer Agronomy Research Update 11:5.
- Kitchen, N., S. Stewart, L. Conway, M. Yost, and P. Carter. 2021b. Planting Depth and Landscape Position Effects on Corn Emergence. Pioneer Agronomy Research Update 11:6.
- Lindsey, A., and P. Thomison. 2020. Corn Planting Depth: Soil Temperature and Moisture Flux in the Furrow. Pioneer Agronomy Research Update 10:3.

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