

Sidewall Compaction and Corn Seedlings

- The fibrous root system of corn has difficulty growing through compacted soil.
- Restrictions that affect the early growth of nodal roots can lead to stunting of corn seedlings, which can have a lasting impact on yield potential.
- Sidewall compaction, caused by furrow openers and press wheels at planting, is a problem that can be avoided with proper planter adjustment and planting only when soil conditions are fit.

Soil Compaction

Soil compaction can occur when heavy equipment operates over susceptible soils. The degree of compaction is dependent on the weight of the equipment transferred to the soil and the amount of soil moisture present at the time of the field operation. Water in the soil acts as a lubricant between soil aggregates, allowing them to become tightly packed together. Coarse textured soils and those with high levels of organic matter are less prone to compaction. Medium and fine textured soils typically have a greater moisture holding capacity, are slower to dry, and are more vulnerable to compaction.

Soils are generally considered fit for field operations when soil taken from a 3- to 4-inch depth is formed into a ball that will fracture easily when dropped, or will not form a ball at all. Another technique is to press soil between your thumb and fingers in an attempt to form a soil ribbon. Fit soil will crumble and will not form a ribbon of any significant length.

How Sidewall Compaction Occurs

Sidewall compaction occurs when planting operations take place on wet soils.¹ Furrow openers can smear the soil on the sidewall of the furrow and effectively seal it, making it a barrier to seedling root growth. When the seed slot is properly closed, the sidewalls should be fractured around the seed, providing good seed-to-soil contact. Press wheels set with too much down-pressure to close the seed slot tend to over-pack the soil. If the seed placement is too shallow relative to the press wheel positioning, this packing occurs below the seed, again causing difficulty for root penetration.

Potential Problems from Sidewall Compaction

Sidewall compaction can cause poor seed-to-soil contact. Often, shallow placement of the seed is an outcome of sidewall compaction. Consequences can include reduced germination and poor stands, uneven emergence and growth, restricted root growth, and stunted seedlings (Figures 2 and 3). Plants with restricted root growth often show symptoms of nutrient deficiencies as the roots are not able to intercept enough nutrients. Nutrient deficiency symptoms may become most pronounced around the V3 growth stage as the kernel reserves are depleted and the plant must rely on its root system for nutrients to sustain its development. Often, the seed furrow is not completely closed when sidewall compaction occurs. If dry conditions develop after planting, the germinating seedling and its early roots may suffer from inadequate

amounts of moisture. Longer-term effects on yield potential may be possible in corn plants subjected to sidewall compaction. Floppy corn syndrome is often associated with sidewall compaction and shallow planting because the roots are unable to grow deep enough to anchor the plant.³



Figure 1. Checking corn seedlings for signs of sidewall compaction.

Diagnosing Sidewall Compaction

To confirm possible sidewall compaction, use a spade to carefully remove one side of the seed slot to a depth of about 3 to 4 inches. Corn roots will be found following the seed furrow down the row (Figure 1). Signs of sidewall compaction are flattened roots with a proliferation of secondary roots growing horizontally along the planter trench. Also, evidence of the furrow opener smearing the soil on the sidewall and sealing it may often be found.



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Avoiding or Reducing Sidewall Compaction

Many factors may contribute to sidewall compaction. Planting when the soil is too wet is the most common reason. Planting at a depth that is too shallow may also be a factor.⁴ Depth gauge wheels set with too much down-pressure may compact the soil beyond what the closing wheels can fracture. Applying too much down-pressure on seed furrow closers to get the seed slot to close may also contribute to unnecessary compaction. Down-pressure on both the row unit's depth gauge wheels and the press wheels should be reduced if planting into wet soil conditions. If the seed has good seed-to-soil contact and the seed slot remains open, there are other devices that can be used aside from standard closing devices or press wheels. Some examples are coulters, intermeshing row cleaners, and numerous types of closing wheels. In heavy, wet soils, seed slot "pinch" from angled closing wheels can also be a problem. This happens when the soil in the seed slot dries, shrinks, and opens up the slot to expose the seed. A suggestion is to remount the wheels one ahead of the other, allowing the second wheel to move soil over the first wheel's path.



Figure 2. Corn root growth hindered by sidewall compaction.



Figure 3. Corn root growth hindered by sidewall compaction.

Tips for Reducing Sidewall Compaction⁵

- If possible, wait for fit soils or drier conditions before planting
- Reduce row unit down-pressure in wet conditions
- Evaluate seed-to-soil contact at the seed depth
- Resist the urge to increase down-pressure to close the seed furrow
- Leave residue over the row to reduce drying and soil shrinking in the seed furrow
- Level the planter or operate slightly tail-down to improve seed-to-soil contact and seed furrow closing
- Consider a tilling attachment for loosening soil for closing the seed furrow
- Consider a spoked closing wheel to fracture the sidewall
- Consider one spoked and one standard closing wheel
- Stagger the closing wheels (spoked in the lead)

Sources

- ¹ Thelen, K. 2007. Exercise patience in deciding when to resume field operations. Michigan State University Extension. <http://www.ipm.msu.edu>
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- ³ Nielsen, R.L. 2013. Root development in young corn. Purdue Cooperative Extension Service. <http://www.extension.entm.purdue.edu>
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- ⁵ Jasa, P. April 16, 2010. Tips to reduce sidewall compaction. University of Nebraska-Lincoln CropWatch. <http://cropwatch.unl.edu>
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