

Corkscrewed Corn Seedlings

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- Deformed, corkscrewed, curved development of a corn plant's mesocotyl or coleoptile can be caused by several factors.

Emergence of corn occurs by the elongation of the mesocotyl that elevates the coleoptile (or “spike”) to the soil surface. The mesocotyl is that white stem-like plant part located between the kernel and the crown of the coleoptile.

Mesocotyl elongation of early-planted corn occasionally veers from its usual upwardly mobile path and instead corkscrews below ground. The end result of such spiraling sub-surface seedlings is either underground leaf emergence or eventual death of the seedling. The good news is that the extent of the problem is usually limited to a few fields each year and a small number of plants (several thousand or less per acre) within an affected field.

As is usual with crop problems, several possible causes of corkscrewed seedlings exist. The challenge is to identify which is the most likely cause for any given situation.

Restricted Emergence: Corkscrewed mesocotyl/coleoptile development can result when the coleoptile encounters resistance as the mesocotyl elongates. Severe soil crusting or otherwise dense soil surface and cloddy soil surfaces can cause such resistance. A combination of severe sidewall compaction plus press wheel compaction over the furrow can also restrict coleoptile emergence.

Kernel Position in Furrow: The position of the kernel in the furrow with respect to the embryo face directly influences the initial location where the coleoptile emerges. The coleoptile, the protective covering for the plumule leaves, emerges from the embryo side of the kernel and moves toward the dent end of the kernel by virtue of the elongation of the mesocotyl. If the kernel lands with the embryo face down in the furrow, the coleoptile emerges on the bottom side of the kernel, elongates horizontally until the mesocotyl 'clears' the end of the kernel, then finally begins its upward ascent. Such an “upside-down” beginning might contribute to a seedling’s susceptibility to other corkscrewing causal factors.

Herbicide Injury: Certain herbicides, notably cell growth inhibitors, can affect seedling shoot development especially if weather or soil conditions are not conducive for rapid growth. Quite often when herbicide is part of the blame, cool soils and significant soil crusting are also contributing factors.

Temperature Response: Some years ago, I came across an article from Rhodesia (Buckle & Grant. 1974. Rhod. J. Agric. Res. 12: 149-161) that described the same phenomenon and attributed it to large fluctuations between day and night soil temperatures. In their research, abnormal mesocotyl and/or coleoptile development occurred most frequently when soil temperatures fluctuated from daytime highs of about 80 degrees F to nighttime lows of about 55 degrees F. The data also suggested that extended periods of cold temperatures stunted and distorted seedling growth.

Reports of corkscrewed seedlings in Indiana are usually few and far between, but occasionally correspond to situations when unusually cool soil temperatures or a dramatic fluctuation in soil temperatures occur in fields prior to seedling emergence. Some might ask how often do such dramatic fluctuations occur during the germination/emergence period? I don't have an answer for that, but can document that such a fluctuation occurred in the past several weeks. Over a six day period, beginning April 11, soil temperatures at the Purdue Agronomy Farm ranged from a daily high of 67F to a daily low of 38F three days later to a daily high of 79F three days after that.

Oh, by the way, I've also received my first report of corkscrewed seedlings from an early April planted field of corn in central Indiana....

Don't forget, this and other timely information about corn can be viewed at the Chat 'n Chew Café on the Web at <http://www.kingcorn.org/cafe>. For other information about corn, take a look at the Corn Growers' Guidebook on the Web at <http://www.kingcorn.org>.

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