

## UNEVEN CORN STANDS

Uneven corn stands have plants with differing heights and growth stages. Important factors at planting for even corn growth and emergence are adequate soil moisture, optimum soil temperatures, and good seed-to-soil contact. If conditions exist that the emergence of more than half of a corn stand plants is delayed by three weeks or more, yield potential can be reduced and replanting may be justified.

### What causes uneven corn establishment?

**Soil moisture.** Uneven soil moisture throughout the seed zone is a main factor for uneven corn emergence. Soil moisture can vary within a field due to differences in soil characteristics or topography. A 1.5- to 2-inch depth is a good choice for many soil conditions but increasing to 2.5 to 3 inches may be necessary in dry soil conditions. Planting shallower than 1.5 inches may increase the risk of uneven germination and emergence due to drying of surface soils.<sup>2</sup>

**Soil temperature.** Typically, soil takes a longer time than air to warm up. The minimum temperature necessary for corn seed germination is 50°F; below this threshold corn can germinate and emerge slowly and unevenly. When soil is wet or excessively cold, kernels and young seedlings are subjected to longer exposure to damaging factors such as soil-borne seed diseases, insect feeding, imbibitional chilling injury, and injury from pre-plant or pre-emergence herbicides and carryover herbicides from a previous crop.<sup>3,4</sup> Under ideal soil temperature and moisture conditions, corn emergence can occur in about seven days.<sup>2</sup> Variation in seed zone soil temperature can be caused by surface residue, differences in soil texture and color, soil drainage, and uneven seedling depth (Figure 1).

**Seed-to-soil contact.** Corn kernels need to imbibe approximately 30% of their weight in water before



*Figure 1. Uneven corn plants development from variable emergence.*

germination begins. Lesser than optimum absorption of water may slow or stop the germination process.<sup>3</sup> Soil must be firmed around the corn kernel to absorb moisture quickly and uniformly.<sup>2</sup> Poor seed-to-seed contact can be caused by seed being in contact with residue, improper closure of the seed furrow, sidewall compaction, and cloddy soils; all of which may occur when soil is too wet.<sup>5</sup>

In addition to above reasons; soil crusting, insect damage, herbicide injury, and disease may also cause uneven corn emergence and growth.

### What is the impact on yield potential?

Uneven emergence can produce plants of differing growth stages and can reduce yield potential due to later emerging plants not producing a normal ear. The uneven corn stands can produce smaller stalks, smaller and fewer ears, and more barren reducing the yield potential. Uneven stands results in lower yields because the smaller, late-emerging plants cannot capture enough sunlight. In a Minnesota study, grain yield is reduced by about 20% for plants which are one-leaf stage behind earlier-emerged plants in the season, and by 50% for plants which are two-leaf stages behind.<sup>6</sup>

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## How can fields with uneven corn emergence be managed?

Wisconsin and Illinois researchers documented that however late-planting reduced yield, and replanting would not increase yield potential unless more than half of the plants were delayed by three weeks or more. Replanting fields with variable emergence and corn plant heights rarely leads to an increase in yield potential. Although yield potential is compromised in these fields, best decision is to leave the crop as such.<sup>7</sup> To minimize the risk of uneven emergence, avoid working soils and/or planting when fields are too wet. Check periodically for uniform moisture and proper seed-to-soil contact during planting and adjust planter settings as necessary. When dealing with uneven stands throughout the growing season, it is important to use recommended herbicide application rates to avoid injuring corn. Be sure to apply herbicide based on the most advanced leaf stage in the field.<sup>5</sup>

## Sources

- <sup>1</sup> Harbach, C. 2014. Uneven corn emergence and yield potential. University of Illinois at Urbana-Champaign. <https://extension.illinois.edu/blogs/hill-and-furrow/2014-05-19-uneven-corn-emergence-and-yield-potential>
- <sup>2</sup> Nielsen, R.L. 2010. Requirements for uniform germination and emergence of corn. Purdue University. <https://ag.purdue.edu/agry/extension/Pages/default.aspx>.
- <sup>3</sup> Nielsen, R.L. 2010. Visual indicators of germination in corn. Purdue University. <https://www.agry.purdue.edu/ext/corn/news/timeless/GerminationEvents.html>
- <sup>4</sup> Licht, M. 2019. Imbibitional chilling or cold injury. Iowa State University, Extension and Outreach. <https://crops.extension.iastate.edu/blog/mark-licht/imbibitional-chilling-or-cold-injury#:~:text=Imbibitional%20chilling%20occurs%20when%20there,the%20seed%20has%20imbibed%20water>.
- <sup>5</sup> Carter, P.R., Nafziger, E. D., and Lauer, J. G. Uneven emergence in corn. North Central Regional Extension Pub. No. 344. <http://corn.agronomy.wisc.edu/>.
- <sup>6</sup> Coulter, J. 2019. Key factors for evaluating corn stand establishment. <https://blog-crop-news.extension.umn.edu/2019/05/key-factors-for-evaluating-corn-stand.html>
- <sup>7</sup> Elmore, R. and Abendroth, L. 2006. Yield effect of uneven corn heights. Iowa State University Agronomy Extension. <https://crops.extension.iastate.edu/encyclopedia/whats-yield-effect-uneven-corn-heights>.

## Legal Statements

ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. 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.

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