

AGRONOMIC

ALERT



Loss of Soil Nitrogen along with Nubbin and Zipper Ears in Corn

Rain and warm weather have caused loss of soil nitrogen (N) this season. In addition, nubbin ear and zipper ear have been spotted in the same fields. These ear abnormalities may be caused by stresses such as drought or nutrient deficiencies. These occurrences appear to be caused by different environmental conditions; however, periods of excessive rain followed by hot, humid and dry conditions, have resulted in a loss of soil N and made nubbin ears, and zipper ears a concern this season.

Loss of Soil Nitrogen

Soil N that has been converted to nitrate (NO_3^-), can be lost from the soil in two ways. First, NO_3^- can be leached through the soil profile by rain and second, denitrification may take place. Denitrification occurs when microbes convert NO_3^- into nitrogen gas (N_2), which is released into the air. Although there are many factors that can affect denitrification, this season two factors that have increased denitrification are increased soil moisture and soil temperature.

As one of the macronutrients, N is vital to plant growth. Insufficient N availability can affect development at each growth stage and may decrease yield potential. Corn plants exhibiting N deficiency may appear to be stunted, spindly plants with a yellowish green color. The older, lower leaves will have a v-shaped yellowing that starts at the leaf tip. Plants that have an inadequate supply of N can be less vigorous and may put all of their energy into producing grain. This can create weak stalks that are vulnerable to stalk rot and may lead to stalk lodging. The largest reduction in potential yield can occur due to stress during silking and can continue through the dough stage. Nitrogen and phosphorus uptake are rapid at this time. Nutrient concentrations in the plant are highly correlated with final grain yield and response to previously applied fertilizer can be seen. Nutrient deficiencies at this time can result in unfilled kernels or chaffy ears.

Nubbin and Zipper Ears

Nubbin ears are small and misshapen with poor kernel set, especially at the ear tip (Figure 1). Nubbin ears can be caused by N deficiency or severe drought starting somewhere in the mid-vegetative growth stages through early to mid grain fill. A more common occurrence this season has been zipper ear.

Corn ears exhibiting symptoms of zipper ear may have an entire or partial row of corn kernels missing on one side of the ear (Figure 2). Due to differential kernel formation along the ear, zipper ears may also have a bend like a banana. Consequently, zipper ear may also be known as banana ear. The zippering effect is often associated with drought stress during grain fill or defoliation injury following pollination. Hybrids vary in the degree of zippering that can occur. Ohio State provides possible explanations as to why the zippering effect appears to be consistently on the outside of the ear:

▼ Figure 1. Nubbin ears in corn (2 ears on right), normal corn ear (far left), along with tip die back ears (2nd and 3rd from the left). Picture courtesy of Dr. Peter Thomison, Ohio State University.



▲ Figure 2. Zipper Ears in corn. Picture Courtesy of Dr. Peter Thomison, Ohio State University.

- Silks associated with the missing kernels were covered up by other silks and did not get pollinated or were pollinated late and were therefore more prone to abortion.
- Corn rootworm beetles are below the ear during the daytime. Therefore, it is possible the beetles preferentially clip silks of kernels with an orientation closer to them.
- Under drought stress silk emergence may be slower than pollen shed. It is possible that the silks on the outside or underside of the ear emerge more slowly than those facing the stalk. Consequently, those silks may be pollinated later or emerge after pollen shed is complete. If the kernels are pollinated late, they may lose the competition for limited photosynthates to other larger kernels that are further along in development.
- If the corn plant has small and/ or short ear shanks, under drought conditions, they may collapse or pinch which could impair the vascular tissue which transports nutrients to the kernel rows on the outside or underside of the ear.

Sources: Camberato, J. et al. 2008. Nitrogen Loss in Wet and Wetter Fields. Purdue University. Corn News Network Article. June 13, 2008.; Holder, B. 2004. Wet Soils and Denitrification. University of Minnesota. Northwest Research and Outreach Center. Cropping Issues in Northwest Minnesota. Volume 1, Issue 2, May 28, 2004; McWilliams, D.A., Berglund, D.R. 1999. Corn Growth and Management Quick Guide. North Dakota State University and University of Minnesota. Publication no. A-1173, June 1999. Nielsen, R. 1988. Stalk Lodging in Corn: Guidelines for Preventative Management. Purdue University Extension. Agronomy Guide. Publication no. AY-262; Thomison, P. 2007. Tip Back and Zipper Ears in Corn. Ohio State. C.O.R.N. Newsletter 2007-30. September 11-September 17, 2007; Thomison, P. and Geyer, A. 2008. Troubleshoooting Abnormal Corn Ears and Related Disorders. Ohio State Extension. Agronomic Crops Network; Tisdale, S.L. et al. 1993. Soil Fertility and Fertilizers. Fifth Edition. MacMillan Publishing Company.

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