

K-State Research and Extension

Abnormal Corn Ears

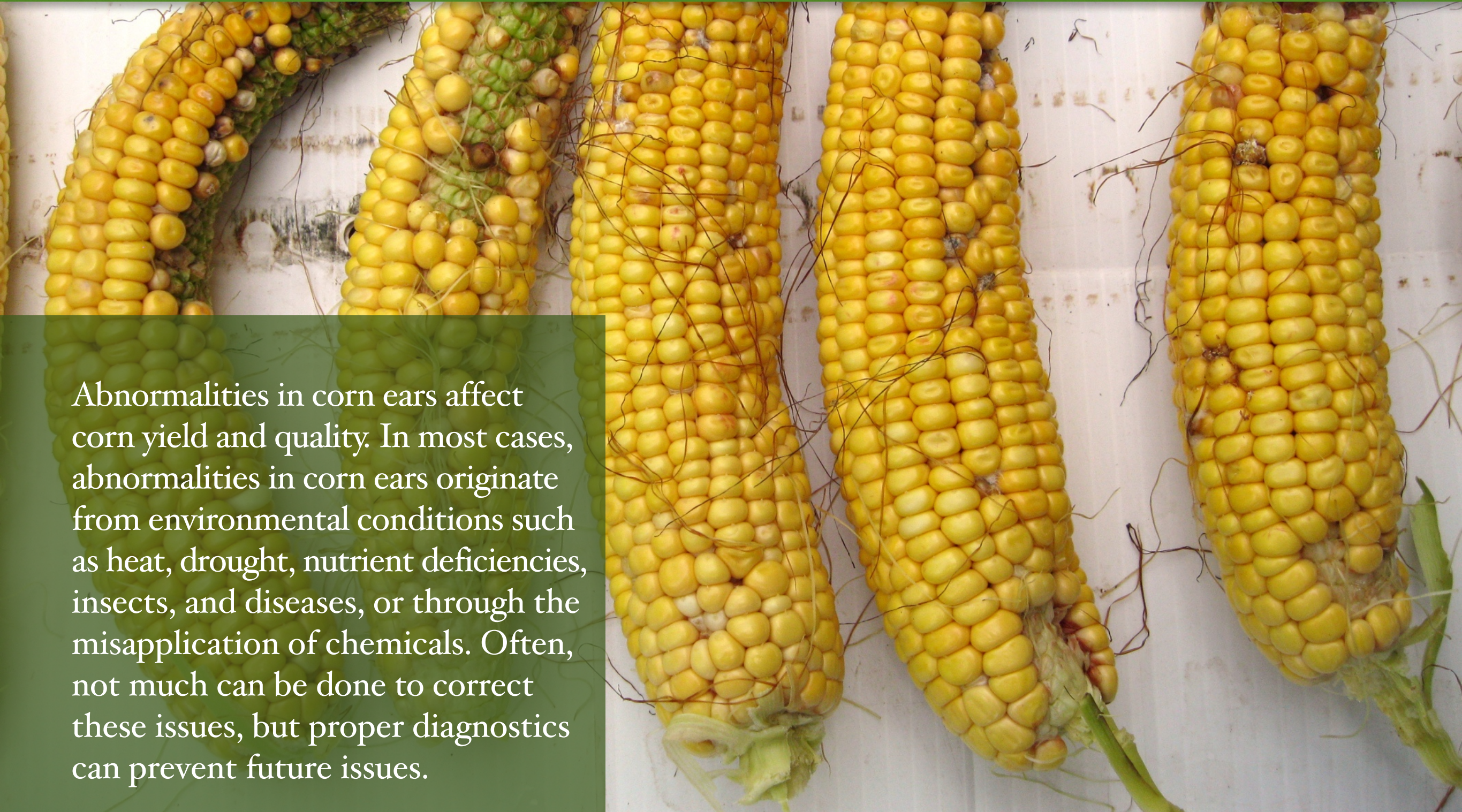


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Research and Extension



Abnormal Corn Ears

Kansas State University Agricultural Experiment Station and Cooperative Extension Service



Abnormalities in corn ears affect corn yield and quality. In most cases, abnormalities in corn ears originate from environmental conditions such as heat, drought, nutrient deficiencies, insects, and diseases, or through the misapplication of chemicals. Often, not much can be done to correct these issues, but proper diagnostics can prevent future issues.

Introduction to Abnormal Corn Ears

Over the last decade, several factors have been identified as being responsible for these ear abnormalities. The answer for each specific situation is yet to be determined. This document provides guidance regarding the potential causes for these issues and how to identify the abnormalities.

Potential factors affecting ear development

Some of the factors described by previous studies are:

1. Application of herbicides (some weeks before flowering),
2. Application of fungicides,
3. Environmental conditions around silking time (heat, drought, and nutrient deficiencies, among several other factors),
4. Insect damage in exposed ears,
5. Disease pressure, and
6. Hail damage, flooding, or other miscellaneous biotic or abiotic factors.

If the problem is associated with the weather, there is not much farmers can do to fix the problem. The environment influences ear development well before the silking period (R₁ stage, flowering). In corn plants, the ear shoot is initiated by about V₅ or V₆ (five or six leaf stages), and final row and kernel numbers, two main critical components for corn yield, are ultimately determined when the potential number of kernels is finalized by around V₁₅ (around 2 weeks before silking, depending on the environment, hybrid, and management practices).

Final ear size is a critical component in the determination of the final number of kernels in corn plants. These factors can be influenced by the environmental conditions from the V₅ to V₁₅ vegetative growth stages.

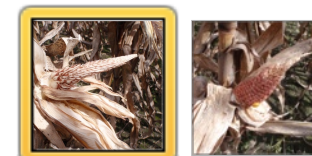
Arrested Ears

This symptom is associated with an unknown problem that occurs before the silking stage. Silk development is interrupted; thus ovules are not receptive for pollination and kernels do not form. The main causes related to this issue are unknown but can be associated with a condition that took place before flowering, around V₁₀-V₁₅. The response differs among hybrids.

Illustration 1 Examples of arrested ears.



Arrested corn ear at physiological maturity stage (end of the growing season). The ear is not presenting kernels due to a problem during the pollination process, silk development was impaired and ovules were not receptive.



Section 2

Banana-shaped Ears

Banana-shaped ears develop when entire or partial kernel rows are aborted. The ears bend, taking the shape of a banana because of an uneven kernel number on the different sides of the ears. The causes are not clearly known, but could be associated with severe weather, herbicide misapplication, heat and drought stresses, and conditions before or at pollination.

Illustration 2 Examples of banana-shaped ears.



In these pictures, the abnormality was related to several causes: abiotic stresses (drought and heat) around pollination and misapplication of a herbicide.



Section 3

Bouquet Ears

This condition is characterized by the presence of several ears on the same node of the plant. The causes are not yet clearly identified, but can be related to heat stress during the early ear formation and development (V₅-V₁₅ growth stages), and pre-silking misapplication of herbicides, fungicides, or insecticides.

A solution is to avoid misapplications of herbicides, fungicides, or insecticides during the late-vegetative period for corn (V₁₀ – VT). Some genotypes are more sensitive than others. A hypothesis previously suggested by Roger Elmore and Lori Abendroth (Iowa State University) is that the apical dominance of the main ear is lost, allowing the presence of multiple ears on the same node.

Illustration 3 Example of bouquet ears.



Bouquet or multiple corn ears in the same ear shank. Kernels within the ears fail to develop due to the asynchrony between pollen shed and silking.



Section 4

Disease Problems in Corn Ears

When ears are exposed from the husks, different disease problems can be evident. Some of the most common diseases are: diplodia ear rot, aspergillus ear and kernel rot, fusarium ear and kernel rot, gibberella ear rot, and blue-eye mold, among several other diseases.

Illustration 4 Examples of disease problems in corn ears.



A pink to reddish mold that starts forming at the tip of the ear is symptomatic of Gibberella ear rot. Gibberella is capable of producing vomitoxin, also known as deoxynivalenol (DON).



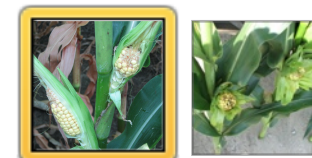
Ear Stunting

Ear stunting is also referred as “beer can ears” or “blunt ear syndrome.” Ear size is abnormally limited, which offers a physical restriction for the final number of kernels, affecting primarily the total number of kernels per row. The occurrence of this abnormality may be related to the misapplication of chemicals, but the primary cause is still unknown. Ear size is defined before flowering, so any stress (biotic or abiotic) conditions affecting the crop during the mid- to late-vegetative stages could influence the size of the ear.

Illustration 5 Examples of ear stunting.



Ear stunting is characterized by a smaller than “normal” corn ear. The final number of kernels per row is more affected than the number of rows per ear, which can be the same as a normal ear.



Section 6

Exposed Ears

Exposed ears occur when the ear keeps elongating beyond the end of the husks. When this happens, the upper part of the ear is partially or completely exposed, which makes the ear more susceptible to any biotic or abiotic stresses (weather and pests in general). The cause of this, as suggested by Robert Nielsen, Purdue University, seems to be primarily related to the weather before or at pollination (heat and/or drought stresses) combined with a reprieve of those conditions after flowering. The combination of heat and drought early this season, followed by an unusually cool and wet pattern, has been the cause of exposed ears in Kansas.

Illustration 6 Examples of exposed ears.



Exposed corn ears (pictures taken sometime after silking stage). Characterized when the ear keeps elongating beyond the husks. This phenomenon makes the ear more susceptible to any biotic (e.g. diseases and insects) or abiotic stresses (heat and drought).



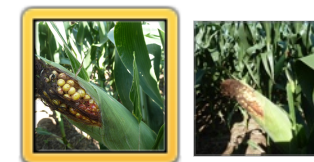
Kernel Red Streak

Ears with kernel red streak have red pigment present in the kernels close to the tip section of the ear. This symptom appears when the wheat curl mite (*Aceria tulipae*) secretes “salivary phytotoxins” during the feeding process. This specific mite is a pest for wheat and carries wheat streak mosaic virus. As related to management practices, some corn genotypes tend to be more susceptible than others. In this particular case, the streaking does not affect the nutritional value of the corn. The discoloration can reduce the price obtained when the corn is sold for specific uses (e.g. food-grade corn).

Illustration 7 Examples of kernel red streak.



Kernel red streak in corn (taken sometime after silking stage) is usually located on the kernels close to the tip of the ear. The main cause of this phenomenon is the toxin secreted in the feeding process of the wheat curl mite (*Aceria tulipae*).



Poor Kernel Set

Poor kernel set relates to a lack of pollination, fertilization failures, or abortion after the ovules are fertilized, among other factors. The degree of severity ranges from just a few missing kernels to an ear showing mostly the cob with just a few kernels visible. Poor pollination or fertilization failure (due to pollen tube failure, desiccated and nonfunctional silks, nonviable pollen) can be primarily related to warm temperatures and insufficient water supply during flowering. Other factors also can cause a similar pattern in corn ears, such as herbicides, nutrient deficiency (nitrogen and phosphorus), and insect feeding. Any biotic or abiotic factor that affects pollen shed or silk development and extrusion from the husks will interfere with the timing of pollen shed and silk development, which will cause fertilization problems and affect kernel set.

Illustration 8 Examples of poor kernel set.



Poor or incomplete kernel set can be related to several factors, including warm temperatures, insufficient water supply, lack of complete pollination, and asynchrony between pollen shed and the silking process.



Tassel Ears

Tassel ears occur when the tassel and the ear are present within the same structure. The tassel ears tend to appear at the top of the plant. The physiological explanation of this syndrome is not firmly known but seems to be related to the environment. This phenomenon seems to be more frequent in tillers, in plants close to the borders of the field, and under very low plant density levels with more isolated corn plants. The husks are absent, so the ear is not protected, and will be subjected to the influence of the weather, insects, and diseases.

Illustration 9 Examples of tassel ears.



Tassel corn ears (taken sometime after silking stage). This phenomenon takes place when the ear appears in the same organ as the tassel and they are produced in the terminal position of the stalk.



Tip Dieback

Tip dieback symptoms becomes evident after pollination and are related to a failure in kernel set at the tip of the ear. The physiological explanation for these types of ears is related to poor pollination of fertile ovules, nonfertilized ovules where pollen is shed when silks were not yet extruded from the husks, and kernel abortion in the weeks after pollination until milk stage, R3. Any biotic (corn rootworm, Japanese beetles, foliar diseases, among several other factors) or abiotic (heat or drought stresses and nutrient deficiencies — specifically with nitrogen) stress can promote asynchrony between tasseling and flowering, which prevents undeveloped or late-developed ovules and silks from being pollinated. In addition, conditions before flowering can affect the kernels at the tip of the ear. These kernels are the most sensitive to stress conditions.

Illustration 10 Examples of tip dieback.



Tip dieback in corn ears. This phenomenon takes place when the ear appears with poor kernel set on the ear tip. Kernel abortion at the tip of the ear is common in the field, and it is related to late abortion during the grain filling period.



For More Information

Links for more information related to corn abnormal ears:

Kansas State University

<http://www.ksre.ksu.edu/bookstore/pubs/S54.pdf>

Purdue University

<http://www.agry.purdue.edu/ext/corn/news/timeless/EarHusks.html>

<http://www.agry.purdue.edu/ext/corn/news/articles.07/ArrestedEars-0904.html>

<http://www.agry.purdue.edu/ext/corn/news/timeless/TasselEars.html>

<http://www.agry.purdue.edu/ext/corn/news/timeless/KernelRedStreak.html>

Iowa State University

<http://www.agronext.iastate.edu/corn/production/management/hybrid/multiple.html>

Ohio State University

<http://agcrops.osu.edu/specialists/corn/specialist-announcements/ear-abnormalities>

<http://corn.osu.edu/newsletters/2012/2012-29/corn-ear-abnormalities-2012tip-dieback201d-and-201czippering201d>

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Funding for the production of this publication was provided by the Kansas Corn Commission.

July 2014

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