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Early Frost & Immature Corn Grain

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Temperatures overnight dipped below 30F in parts of central and northern Indiana, approaching lethal levels for live corn plant tissue that could truly mark the end of the growing season for some fields whose grain was not yet mature. As of Monday's USDA crop progress report (Indiana Ag Statistics, 9/29/03), nearly 40 % of Indiana's corn crop was not yet mature (kernel black layer) although virtually the entire crop was estimated to be at least to the dent stage of kernel development. What potential yield losses might occur in immature fields that suffered lethal cold temperatures?

Yield loss due to frost/freeze injury to immature healthy corn depends on 1) the stage of kernel development when the frost/freeze occurred and 2) the severity of the frost/freeze injury to the plants. The more immature the grain, obviously the more potential yield loss when frost/freeze injury occurs. Potential yield loss is also more severe when the whole plant is killed versus only leaf tissue.

Estimates of potential yield loss due to frost/freeze injury at several kernel development stages are (Carter & Hesterman, 1990):

- Soft dough stage …55 % if whole plants killed … 35 % if only leaves killed
- Full dent stage … 41 % if whole plants killed … 27 % if only leaves killed
- Late dent … 12 % if whole plants killed … 6 % if only leaves killed
  (late dent is essentially equal to kernel milkline halfway down the kernel face)

These yield loss estimates can be tempered with the fact that overall plant health in many late-planted fields is not great to begin with. Late season leaf diseases, nitrogen deficiency, stalk rots, and European corn borer damage in particular have already compromised plant health in many fields and, consequently, yield potential. In other words, some yield loss has already occurred due to the leaf and stalk damage caused by these non-frost stresses. Further damage by frost/freeze injury to these stressed fields probably won't cause as much additional yield loss as it would to otherwise healthy plants.

Additionally, much of the state's immature corn crop acreage is located in southern Indiana where planting was so dramatically delayed by spring rains. Temperatures in southern Indiana this morning were more commonly in the low to mid 30's; not cold enough to cause major plant injury.

Related References

Carter, P.R. and O.B. Hesterman. 1990. **Handling Corn Damaged by Autumn Frost (NCH-57).** Purdue Univ. Extension Service. Available online at http://www.agcom.purdue.edu/AgCom/Pubs/NCH/NCH-57.html [URL verified 10/2/03].

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.