CERTIFIED CROP ADVISER

Stress, Sugar, Test

By Dale Cowan, *CCA-ON*

Harvest conditions this fall have combined with one of many endemic fungal pathogens, Fusarium Graminearum, to produce two concerns. First is stalk quality and its impact on standability, and secondly its effect on grain quality and subsequent toxin production.

Stalk quality is affected by many factors. It is somewhat puzzling to observe how healthy plants can exist beside diseased plants adjacent to them. The main explanation involves how plant growth stress factors start plants down a slippery slope to poor performance. Most varieties exhibit good resistance to fungal infection up to silking time. After silking, the ear development forms the dominate sink for sugar. It is the contest between ear fill, stalk and root demands that can start the decline of stalk quality.

The ability of a hybrid to produce sufficient sugar to meet all plant demands usually influences the final outcome. Hybrids that produce large kernel counts need to produce lots of sugar to fill them. Whether or not variety resistance is the appropriate term that describes hybrid performance there certainly are factors that contribute to hybrid vulnerability. Any factor that decreases photosynthesis and production of plant sugar will impact negatively on stalk quality. Leaf disease, insect feeding, cool cloudy weather and nutrient stresses will likely contribute to stalk rots. It is the combination of stresses, duration and timing in the growing environment that determines the degree of plant susceptibility.

Insufficient sugar production that results in die back of roots and the lower stalk are likely entry points for fungal attack. All plants that have stalk rot have rotted roots which leads researchers to suggest that stalk rot starts in the roots. Living roots produce antifungal chemicals that keep the diseases at bay; dead roots on the other hand are an easily digested food for fungi.

Highlighting one of many factors related to photosynthetic capacity is the nitrogen/potassium balance in plant leaves. High nitrogen applications in a soil low in K or inadequate potash application situation increases the rate of wilting and premature plant death. Leaf potassium of 1.5% to 2% at silking will help with maximum rates of photosynthesis with all other factors being equal. Potassium uptake is a function of soil K levels, application rates, soil moisture, soil temperature, aeration and lack of soil compaction. An N: P: K balance of 2:1:2 usually relates to a reduced level of stress on plants and development of less stalk rot. This past growing season exhibited reasonable levels of soil nitrate. This fall we are also witnessing lower soil test K on some clay loams. This is not a good combination especially when other stresses combine to create an environment that encourages fungal development.

Development of Fusarium Graminearum in the grain takes place through the silks

The silks are highly susceptible for two to six days after emergence and infection of the kernel takes place at the point of silk attachment or through micro cracks in the developing kernel. Rain splash up of spores on silks, birds or insects vector the disease to the grain through their feeding scars. The resulting mold is reddish to pink and tends to start at the tip of the ear and move down.

The major concern is the mold's ability to develop vomitoxin. Vomitoxin is a serious concern for monogastric animals. Consumption of vomitoxin-infected corn greater than 1 ppm, results in feed refusal and poor weight gains. Severe levels can cause vomiting. Generally, final feed rations containing less than 1 ppm of vomitoxin allow for normal animal performance. No definitive body of knowledge exists for all classes of livestock however there is a concern with ruminants that consume high levels over extended periods of time.

The development of vomitoxin in Ontario corn is a normal occurrence. Most years, 70% of the crop has levels less than 1 ppm, 20% in the 1-2 ppm range, with the balance in the 3 to 4 ppm range. The 2006 harvest has 9% in the >6 ppm range indicating that there are areas of high infection levels. The development of quick test screening kits and feed additives that bind toxins are making this a manageable situation. Representative sampling is absolutely vital to obtaining accurate results. Collect samples from a moving stream of grain. It is advisable to test what you are storing. A dried screened sample free of fines will likely be the lowest in toxin levels.

Hand sampling from the field can be very misleading

I had two situations reported to me where hand samples tested 4 ppm of vomitoxin and the combined sample from the same field tested 0.2 ppm. Another field which was hand sampled tested 0.5 ppm and the combined sample was 2.5 ppm. This is a testament to the variability and skewing that can take place with inappropriate sampling techniques.

There is some concern with distiller dried grains (DDG) concentrating the vomitoxin. This may be true, however, there is another issue in testing. Some of the test kits on the market do not do a very good job on acidic materials such as fermented silage and DDG. There is a preparation step that needs to be performed at the lab prior to testing. Have a dialogue with your lab of choice to be assured that proper sample preparation is taking place.

The development of mold in wide geographic areas is most likely weather induced in 2006. However, within these geographic areas there is a wide range of symptoms and toxin levels. This is the time for field observation, hybrid evaluations and management review with your Certified Crop Adviser (CCA). The exercise of sorting out manageable stresses from weather-induced stresses may lead to enlightened management opportunities. Livestock producers may well benefit from widening their management team to include not only their CCA but their vet and feed nutritionist. Feed and animal performance may or may not be related to just toxins or molds. Holistic management approaches always yield better outcomes.

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There are over 500 Certified Crop Advisers (CCA) in Ontario. Each CCA has demonstrated their knowledge about Ontario crop production by passing the required exams. In addition, they have the crop advisory experience, the education, the commitment to continuing education and have signed a comprehensive code of ethics, which places the grower's interests first.

This industry driven program helps ensure that Ontario crop producers are well served by those providing their crop production advice. This article was written by one of those CCA's.