

## **NIRS method for precise identification of *Fusarium* damaged wheat kernels**

Peiris, K.H.S, M. O. Pumphrey, Yanhong Dong and F.E. Dowell

Development of scab resistant wheat varieties may be enhanced by non-destructive evaluation of kernels for *Fusarium* damaged kernels (FDKs) and deoxynivalenol (DON) levels. *Fusarium* infection generally affects kernel appearance, but insect damage and other fungi can cause similar symptoms. Also, some kernels may have high DON levels but appear asymptomatic.

We are developing technology to correctly identify FDKs using an automated single-kernel NIR (SKNIR) system. A calibration developed to select sound kernels from scabby kernels had an accuracy of more than 99%, but the fraction sorted as FDKs contain kernels which are not totally scabby or sound (“grey kernels”). Comparison of NIR spectra of sound and FDKs (both tombstones and grey kernels) showed distinguishable NIR absorption patterns at 960-985, 1110-1180, 1210-1230 and 1310-1350 nm wavebands. These differences may be due to changes in food (carbohydrates and proteins) reserves and/or DON levels. Additional research is ongoing to determine DON levels of grey kernels and to assess the accuracy of sorting FDKs.

We are also developing a calibration to estimate DON levels of single wheat kernels. Kernels from artificially inoculated and control wheat spikes were used for the collection of spectra in order to get a concentration gradient of DON for calibration and validation samples. Analysis of single kernel DON by wet chemical methods will also yield additional information regarding the changes in DON levels in kernels above and below the point of infection.

The findings of these studies will be helpful to develop a rapid and automated single kernel evaluation technology to correctly identify sound and FDKs in wheat samples and/or to sort wheat kernels based on DON level. This will facilitate quick evaluation of a large number of breeding lines for scab resistance to identify better scab resistant varieties or parent materials for crossing. Further this technique may be extended as a cost-effective and environmentally friendly technique for analysis of DON in wheat samples for grading commercial grain lots by replacing the time consuming and expensive methods that use various other chemicals for extraction of DON. This technique may also be extended to other grains such as barley