

Title            Detection of insects inside wheat kernels by NIR imaging  
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### **Abstract**

The research reported here forms the basis to extend the capabilities of a newly-developed grain contaminant inspection system to include detection of kernels infested internally with insects. It was found that wheat kernels infested internally with larvae of *Sitophilus granaries* (grain weevil) had markedly different appearances from uninfested kernels (controls) when imaged at certain wavelengths in the NIR. Imaging at the single wavelength 1202 nm highlighted consistent differences between all 10 infested kernels and all 10 controls in the sample. Infested kernels exhibited light patches which covered a large proportion of the surface. Uninfested kernels appeared uniformly dark. At this wavelength, possible interference from dark mould on the germ of the kernel (black point) was also removed. Imaging at two wavelengths with subtraction (1202-1300 nm) appeared to give further enhancement of differences between infested and control kernels. However, one infested kernel remained indistinguishable from the controls which may have been due to poor lighting or signal-to-noise. The findings are consistent with previous spectroscopic studies which indicated that similar wavelengths had potential to resolve the insect from the kernel. Although the infested kernels were seen by the naked eye to be slightly different to the control kernels, these visible differences were not obvious or consistent. It is unlikely that reliable classification of kernels by visual inspection would prove possible. This study suggests that imaging in the NIR region improves differences in appearance to a point where reliable and rapid classification is possible. The next step will be to test this approach on unknown samples and obtain accuracy in classification.