Identifying Weed Infestations with Optical Data at Harvest

Abstract

Kochia (*Kochia scoparia* L.), Russian thistle (*Salsola* ssp.), and prickly lettuce (*Lactuca serriola*) are economically important weeds infesting dryland wheat (*Triticum aestivum* L.) production systems in the western United States. Their late maturing nature means that they may still be green and growing well after the wheat crop is physiologically mature. When the crop is harvested, the weedy plant matter that does not separate will be contained in the grain stream. The objectives of this study were to determine the ability of optical, near infrared (NIR) sensing for detecting green plant matter in flowing grain and assess the potential usefulness of this information for mapping weeds at harvest. An in-line optical sensor with sensitivity in the visible and NIR wavelengths (500-1100 nm) was mounted on the clean grain filling auger of a combine harvester. Spectra of the grain stream were recorded continuously at a rate of 0.33 Hz during harvest of an 18 ac wheat field. All readings were georeferenced using a GPS receiver with 1 m positional accuracy. Chlorophyll of green plant matter was detectable in the red (670 nm) waveband. A map of the chlorophyll signal showed a good relationship (78% agreement on average) with the reference map constructed prior to harvest of the three green weed species. This information on weed distributions at harvest is useful to optimize the post-harvest control of these species by using site-specific herbicide applications. Kochia, Russian thistle, and prickly lettuce produce most of their seeds post-harvest, their control at that time reduces the amount of seeds that, otherwise, would become part of the seed bank.