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**Spectral Sensing of Aphid (Hemiptera: Aphididae) Density Using Field
Spectrometry and Radiometry**


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Abstract: The greenbug, *Schizaphis graminum* (Rondani), and bird cherry-oat aphid, *Rhopalosiphum padi* L., are aphid pests of wheat (*Triticum aestivum* L.), barley (*Hordeum vulgare* L.), sorghum (*Sorghum bicolor* L.), oat (*Avena sativa* L.), and other cereals worldwide. Greenbug and bird cherry-oat aphid infestation in crops is unpredictable over space and time. From these 2 aphids, greenbug infestation causes significant reduction in yield, and consequently large amounts of insecticides are used to control greenbug populations. Therefore, a repeatable and rapid method is necessary for monitoring aphid populations. Remote sensing appears promising for the monitoring of aphid density in crops. The present research examined the potential use of spectral data to quantify aphid density (greenbug and bird cherry-oat aphid) in 3 winter wheat field experiments and 1 greenhouse experiment. A multispectral ground radiometer and a hyperspectral hand-held spectrometer were used to record reflectance data. In order to quantify the relationship between reflectance data and aphid density, 2 spectral indices were used in regression. The coefficients of determination (r^2) ranged from 0.48 to 0.76 for the hyperspectral-derived index and from 0.43 to 0.67 for the multispectral-derived index. The results indicate that multispectral and hyperspectral remote sensing appears functional to monitor aphid population density in production winter wheat fields.

Key Words: Remote sensing, spectral indices, multispectral radiometry, hyperspectral spectrometry, greenbug (*Schizaphis graminum* Rondani), wheat (*Triticum aestivum* L.)

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