

Landscape structure affects aphid parasitism of aphids in winter crops

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Wheat and canola are the primary winter crops in Oklahoma and are typically planted in late September and harvested in June. Several crop-specific aphid species sporadically infest fields and are occasionally economically important. For three growing seasons, we documented the guilds of parasitoids attacking aphids in each crop and sought to determine whether landscape structure, at a spatial scales roughly corresponding to the dispersal capabilities of aphid parasitoids, had an influence on parasitism levels. To that end, we determined how composition and configuration of the landscape was related to aphid density and parasitism. Parasitism was estimated using aphid infested sentinel plants in fields. Landscape context for each field was quantified for circular areas centered on sample locations with a radius of 1.5 km. Landcover data were extracted from the USDA NASS Cropland Data Layer for each year. Two parasitoids, *Diaeretiella rapae* (M'Intosh) and *Aphelinus nigritus* Howard, were found in canola, whereas three parasitoid species, *Lysiphlebus testaceipes* (Cresson), *D. rapae*, and *A. nigritus* were found in wheat. In canola, partial redundancy analysis demonstrated that *D. rapae* abundance was positively related to landcover of wetlands and to decreasing patch size (high patch density). *Aphelinus nigritus* abundance in canola was positively related to the abundance of grasslands and woodlands. In wheat, five landscape variables with consistent correlations to parasitoid abundance were used in partial redundancy analysis (PRDA) to investigate relationships of parasitoid abundance to landscape structure. *Lysiphlebus testaceipes* and *A. nigritus* abundance in autumn was most strongly and positively associated with the coverage of summer crops and with Shannon's landscape diversity index in the 1.5 km radius circular land area centered on the sampling location. Abundance of both species was negatively associated with coverage of wheat and with contagion. Consistent findings relating biological control services with specific diverse agricultural landscapes, could allow for integration of these effects into holistic IPM programs.

Key words: aphids, parasitoids, landscape effects, winter crops.