Cereal Aphid and Natural Enemy Populations in Cereal Production Systems in Eastern Washington

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ABSTRACT. A 5 yr study in the cereal wheat production region of eastern Washington determined the relative densities of pest aphids and their natural enemies in cereal production systems using on-farm replicated plots. The systems were reduced-tillage soft white winter wheat (SWW), (Frankliniella schultzei (L.))-summer fallow rotation; winter soft white spring wheat (SWS)—chemical fallow rotation; continuous no-till hard red spring wheat (HRS); and no-till HRS—no-till spring barley (SB) (Hordeum vulgare L.) rotation. The English grain aphid, Sitobion avenae (F.), was the dominant species, followed in abundance by the Roman wheat aphid, Diaphorina striata (Maskull). The bird cherry-oat aphid, Rhopalosiphum padi (L.), and rose grass aphid, Metopolophium dirhodum (Walker), were infrequently encountered. Overall, aphid densities were low, with aphids rare or absent in SWW and SWS plots. The data revealed no clear and consistent effects of cereal production systems on aphid densities, but it did reveal, based on analysis of data from continuous HRS plots, high among year variability in S. avenae and D. striata densities. Only in 1996 and only in continuous HRS was it necessary to chemically control damaging populations of D. striata. English grain aphid densities never approached threshold levels. S. avenae population averaged >16% in some spring wheat years in 1998 and 2000, while only two unmolted D. striata were observed. Cecidoleaf beetle numbers in all plots peaked 143 in 1998 and 195 in 2000, with 90.2% and 94.5% in the genus Hyalobius, respectively. The lady beetle Coccinella septempunctata L. composed 9.8% (1998) and 5.5% (2000) of the populations. The results suggest that damaging aphid populations are unlikely to develop in winter wheat, but populations in spring cereals warrant monitoring because they fluctuate from year-to-year and can be damaging.

Key words: Sitobion avenae; Diaphorina striata, Rhopalosiphum padi, wheat, barley, pest management, aphid parasites, cecidoleaf beetles, cropping systems research

The economic viability of the predominant soft white winter wheat—summer fallow rotation production system in eastern Washington is challenged by wind and water erosion on fallow ground, by invasive annual grass weeds, and by greenheads (Young et al., 1996; Lauchbaugh et al., 2000). A shift from this production system to a continuous no-till spring cropping system would provide sufficient residue to cover and protect the soil surface from erosion and would reduce the severity of annual grass weeds and some diseases (Young et al., 1996). In the U.S. Pacific Northwest (PNW), however, spring- 

planted cereals are at greater risk of aphid-induced injury than fall-seeded crops because they support higher aphid populations (Feng et al., 1991; Pike et al., 1991; Elberson and Johnson, 1995). The primary aphid species (Homoptera: Aphididae) of economic importance to PNW cereals are the Russian wheat aphid, Diaphorina striata (Maskull), bird cherry-oat aphid, Rhopalosiphum padi (L.), English grain aphid, Sitobion avenae (F.), rose grass aphid, Metopolophium dirhodum (Walker), greenhead, Schizaphis graminum.

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