

# IMPACT OF APHID SPECIES AND BARLEY YELLOW DWARF VIRUS ON SOFT RED WINTER WHEAT

Christopher M. Zwiener

Professor S. P. Conely, Thesis Supervisor

## ABSTRACT

Barley yellow dwarf virus is one of the most widespread viral diseases of wheat. Yield reductions up to 70% have resulted from barley yellow dwarf virus (BYDV) infection. Several aphid spp. transmit BYDV. In Missouri, the four common aphids that transmit BYDV are: *Rhopalosiphum padi* (L.), *Schizaphis graminum* (Rondani), *Sitobion avenae* (F.), and *Rhopalosiphum maidis* (L.). Warm winters have increased the incidence of BYD, triggering producer interest in controlling the aphid vectors. In addition, a species shift in cereal aphids in Missouri has caused previous thresholds to become outdated. For this reason yield loss in soft red winter wheat caused by aphid transmission of barley yellow dwarf virus was measured over a two-year period in central Missouri. The experimental design was a randomized complete block factorial with four replications. The plot factors were variety, seed treatment, and foliar insecticide treatment timings. The four wheat varieties utilized were: 'Truman', 'Ernie', 'Roane', and 'Pioneer 25R37'. The seed treatment was the presence or absence of imidacloprid (0.94 g [AI]/ha). The foliar insecticide treatment included: no application, fall only, fall followed by spring or an application of lambda-cyhalothrin (75.6 g [AI]/ha) every 28 days. Aphid and beneficial species were identified and counted on ten randomly chosen plants per plot every three weeks from crop emergence to physiological maturity. Leaf samples were pulled from each plot at heading and enzyme-linked immunosorbent assay (ELISA) was

run to determine the percentage of plots infected with BYDV. The bird-cherry oat aphid was the most common and economically important species, accounting for > 90% of the total aphids. *S. graminum* , *S. avenae*, and *R. maidis* comprised the remainder of the aphids. Aphid numbers peaked at wheat jointing in 2003 with 771 bird-cherry oat aphids per meter-row. In the 2003-2004 growing season aphid numbers averaged 7 aphids per meter-row in the fall and peaked at 246 aphids per meter-row at jointing. Wheat grain yield was reduced 17 and 13% in 2003 and 2004 respectively. Thousand kernel weights were reduced 10 and 5% in the untreated plots when compared to the treated control in 2003, 2004 respectively. PAV, a strain of BYDV, accounted for 84 and 81% of the symptomatic plots that tested positive for BYDV in 2003 and 2004, respectively. Our results indicate that economic thresholds for bird-cherry oat aphid are 16 aphids per meter-row in the fall and 164 aphids per meter-row at jointing.