CONTINUING INVESTIGATIONS INTO THE RELATIONSHIPS AMONG LEAFHOPPERS, GLANDULAR-HAIRED ALFALFA, AND TIMING OF INSECTICIDE APPLICATION

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Introduction

The potato leafhopper (PLH) is the most serious insect pest of alfalfa in Wisconsin and the Upper Midwest. PLH injury to alfalfa can result in leaf yellowing ("hopperburn"), plant stunting, loss of yield and forage quality, and reduced alfalfa stand persistence. Leafhopper populations are a perennial problem in new alfalfa seedings, and they frequently increase to damaging levels on the second and subsequent crops in established alfalfa stands. Until recently, crop scouting and insecticide application when warranted was the only effective means of PLH management. However, development and eventual release of glandular haired (GH) alfalfa varieties in 1997 may be changing the way we manage this pest and may ultimately alter its pest status in alfalfa. On the other hand, leafhopper resistance exhibited by the GH varieties has so far proved to be less than complete, and thus scouting is still necessary for effective PLH management.

The purpose of this study was to investigate several issues surrounding PLH management. First, to evaluate the extent to which treatment thresholds currently recommended in Wisconsin for PLH management in alfalfa may need to be adjusted for glandular haired alfalfa cultivars with resistance to PLH. Second, to assess the effectiveness in controlling PLH of reduced versus full rates of the synthetic pyrethroid insecticide Warrior. The latter objective was motivated by the fact that many of the insecticides recommended in Wisconsin for PLH control in alfalfa are organophosphates and carbamates, which are or will be targeted for reduction or elimination under the federal Food Quality Protection Act. We thus sought to explore the effectiveness of substituting reduced rates of the more expensive pyrethroids for PLH control.

Materials and Methods

This study began in 2000 at the UW Arlington Agricultural Research Station and was continued into 2001. The experiment included three factors: two PLH treatment thresholds - the conventional threshold (1X) recommended by UW Extension (which increases with crop height) and twice the conventional threshold (2X); three insecticide treatments - Warrior at the recommended rate, Warrior at a reduced (approximately half) rate, and no insecticide; and three alfalfa varieties - Pioneer 5454 (no PLH resistance), DK131HG (53% resistant plants), and Evergreen (79% resistant plants). The experimental design was a strip-split-split plot with 4 replications, and individual plots

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were 18' by 18'. Plots were direct seeded on April 26, 2000. During 2000, the 1X and 2X plots were sprayed on June 23 and June 27, respectively. The plots were cut for the first time on July 19 and in early September. During 2001, the 1X and 2X plots were sprayed on July 11 and August 1, respectively (both on third crop). The plots were cut on May 27, July 3, and August 11. During both years data recorded included weekly or biweekly PLH counts and crop heights, hopperburn ratings as warranted, and dry matter yields.

Results and Discussion

Overall we saw a greater response to our treatments in 2000 than in 2001. This probably occurred because 1) the PLH population at the Arlington station was substantially higher in 2000 than in 2001, and 2) in 2000 we were dealing with a new alfalfa seeding which was more susceptible to PLH population increase and crop injury than was the established stand in 2001.

2000: Insecticide treatment was statistically significant for all response variables measured up to first cut: PLH numbers, crop height, hopperburn and yield, and the reduced rate Warrior treatment was found to be as effective in controlling PLH as the full rate Warrior treatment. Within the unsprayed plots, alfalfa variety was statistically significant for all response variables measured up to first cut: PLH numbers, crop height, hopperburn and yield, and for all variables except yield the responses were best (fewest PLH, tallest plants and least hopperburn) for Evergreen, worst for Pioneer 5454, and intermediate for DK131HG. In the case of yield, Evergreen and DK131HG were not statistically different, but both were statistically greater than Pioneer 5454. Within each variety, insecticide treatment was statistically significant for yield. In other words, all three varieties had a significant yield loss when not protected from PLH injury. No statistical differences were detected between the two threshold levels (conventional vs. twice conventional) in any of the response variables.

PLH numbers were very low in the regrowth following the July 19 cutting, never approaching the treatment threshold. Nonetheless, a significant carryover effect from PLH injury during first crop was detected in second crop yield of Pioneer 5454. No carryover effect in second crop yield was detected for either DK 131HG or Evergreen.

2001: No carryover effect of PLH injury during 2000 was detectable for any of the varieties in the 2001 first crop yield. PLH numbers in the second crop growth did not exceed the 1X threshold until the week prior to harvest, and we decided not to spray; no statistical differences among varieties in second crop yield was found. PLH numbers in third crop growth quickly exceeded the 1X threshold and those plots were treated; unfortunately, the 2X plots were not treated in a timely way due to weather and competing projects. PLH populations in third crop were consistently higher in Pioneer 5454 than in either of the glandular haired varieties. Nonetheless, insecticide treatment was not statistically significant for third crop yield. However, the lack of a significant yield effect in the case of Pioneer 5454 may have been due to large weed densities and

relatively sparse alfalfa plants in the unsprayed 5454 plots. Yield data are being adjusted for weed biomass and will be re-analyzed.

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