2002 PROJECT REPORT
PROJECT NO.: 5339

TITLE: INSECTICIDE CONTROL OF CEREAL LEAF BEETLE

Researcher: Keith S. Pike, Entomologist, WSU-Prosser
24106 N Bunn Rd, Prosser, WA 99350; ph 509/786-9269; kpike@tricity.wsu.edu
Michael Gould, Research Assist., WSU-Pullman
Dept. of Entomology, WSU, Pullman WA 99164; ph 509/332-0597; mcgould2@wsu.edu
Cooperators: Cutler Farms, Niles Mile Falls, WA
Mark Hitchcox & Mike Klaus, Entomologists -- WSDA-Yakima
Lab Services Division, Yakima, WA 98902; mhitchcox@agr.wa.gov

OVERALL PROJECT GOAL: Establish the optimal insecticide seasonal application time to safeguard spring wheat from yield loss due to cereal leaf beetle (CLB).

PROBLEM: CLB is a destructive leaf feeder of wheat and other small grains and grasses. It is an Old World pest now in 14 counties in Washington; it was first detected in the state in 1999 in Spokane County. Biological controls (CLB-attacking parasitic wasps), in all likelihood, will take care of the pest without grower assistance in time. But until the biocontrols are established and well distributed in the state, CLB could prove troublesome. The short-term solution will be chemical treatment.

ACCOMPLISHMENTS AND RESULTS

- *Spring Wheat Field Trial.* The planned 2002 field research was completed. Warrior insecticide, a labeled product for CLB, was the product used to evaluate CLB control based on application timing. Single, dual, and multiple treatments, applied at different points through the spring-summer season were assessed for performance; Table 1 lists the treatment specifics. The study was conducted on commercially grown spring wheat (var. Alpowa, planted 8-April-2002) at Nine Mile Falls, Washington – a location with prominent natural populations of CLB. Treated and untreated plots were arranged in a randomized complete block, 5 replicates/treatment, with plots bordered on each side with untreated wheat to ensure uniform pest presence around each plot. Plots were 11.5 m^2 each. Pest populations (adults, eggs, and larvae) were sampled regularly from late-May to mid-July to determine control based on application timing. Results were statistically analyzed for significance.

- *CLB Field Populations*. Some overwintering adults were active in April, but the bulk of the population was not encountered until mid-May to early June. The appearance and population development in 2002 was much the same as in 2000 and 2001. Figs. 2-4 illustrate the levels of CLB encountered relative to the treatments (pooled averages shown where treatments were comparable).

- *Treatment Timing, CLB Control.* Treatments involving 2 or more applications, together with the "mid-single" treatments (single application made sometime during the first 2 ½ weeks of June), provided the most consistent level of larval control (Fig. 2), and consequently the lowest damage (Fig. 1, Table 1). Although both adults and larvae feed, the latter is the most destructive, and the most important to control. In the future, the appropriate timing for

optimal control of larvae will likely be early to mid-June. It is possible that weather could delay or advance the development of the beetle. For optimal single treatment control, some larvae should be present in the field prior to application.

At the time of treatment, Warrior is highly toxic to adults but it does not restrict them from moving into treated plots from untreated areas. The trial was surround by heavily infested untreated wheat, and thus, treated plots were subject to reinvasion of beetles, and reinfestation within a few days of treatment. Because adult densities were similar across plots (Fig. 3), egg counts were also similar (Fig. 4). It should be noted, however, that if an entire field were treated, few adult beetles would be left to reinfest the field.

- Summary / Discussion. The long-term solution for controlling CLB will be biological control. However, it may take ten years, possibly longer, before the desired natural agents are established and effectively holding the pest in check. In the interim, chemical control will be required (the state's first commercial treatment for CLB occurred in 2002). A well timed, single application should adequately safeguard a crop. Crops vulnerable to economic injury (reduced grain yields) by CLB are the spring grains – spring-planted wheat, barley, and oats. The small grains planted in late summer or fall, although subject to some CLB invasion in the spring, are not expected to be economically damaged. Likewise, corn, blue grass, fescue, and timothy, though hosts for the beetle, are not expected to be economically damaged by the pest.

PUBLICATIONS:

Pike, K., M. Gould, and M. Hitchcox. 2002. Cereal leaf beetle occurrence and impact on spring grain. Wheat Life 45(5): 20-21.

Hitchcox, M. E., S. Miller, K. Pike, and M. Gould. 2002. Cereal leaf beetle survey and biocontrol activities in Washington State, 2002. Wash. State Dept. Agric. Publ. 077.

Miller, R. H., and K. S. Pike. 2002. Insects in wheat-based systems. *In* B. Curtis, World Wheat Review. FAO, Rome.

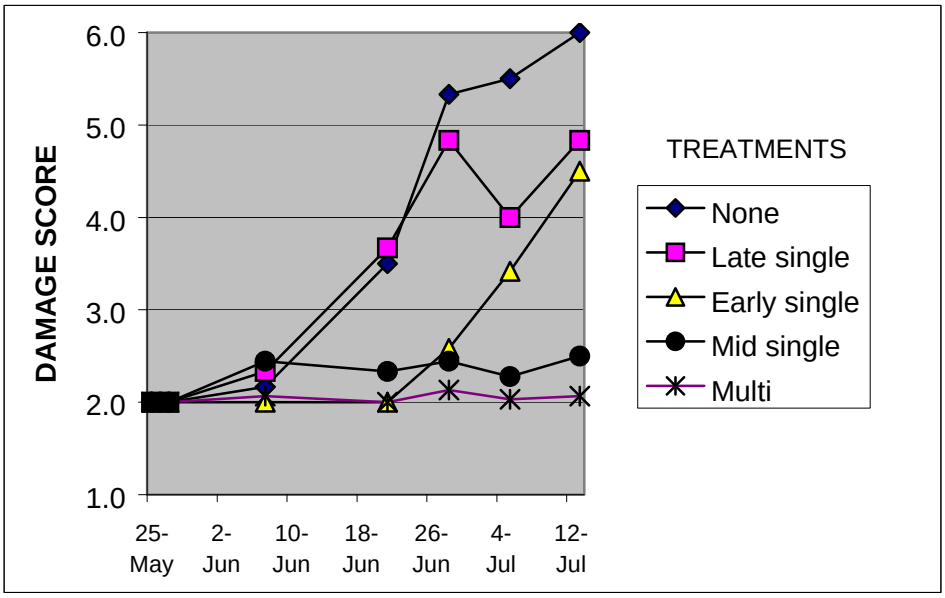

Fig. 1. Extent of leaf feeding damage by cereal leaf beetle on Alpowa wheat, Nine Mile Falls, WA, 2002. Damage score: 1= no damage, 6 = severe. Warrior insecticide treatment times: Late-single, 25-June; Early-single, 21-28 May;
Mid-single, 4-18 Jun; Multi, two or more treatments with at least one applied between 4-18 June.

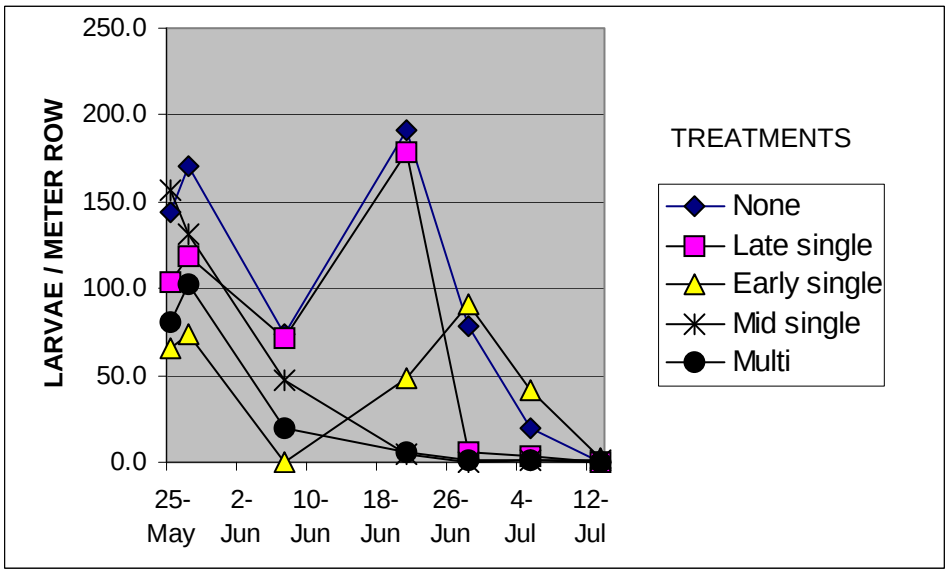

Fig. 2. Larval population densities of cereal leaf beetle on Alpowa wheat, Nine Mile Falls, WA, 2002. [See Fig. 1 caption for treatment explanation].

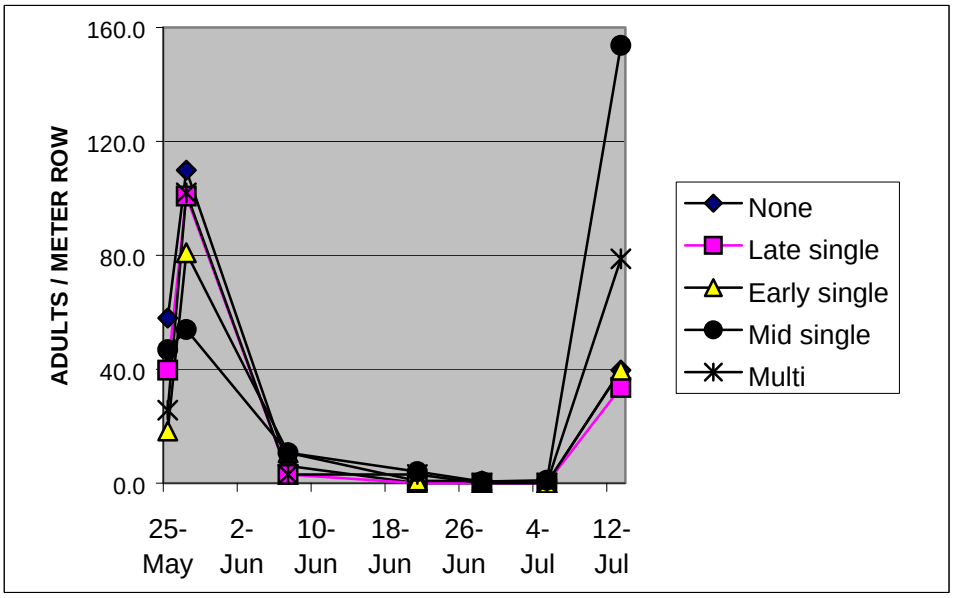

Fig. 3. Adult population densities of cereal leaf beetle on Alpowa wheat , Nine Mile Falls, WA, 2002. [See Fig. 1 caption for treatment explanation].

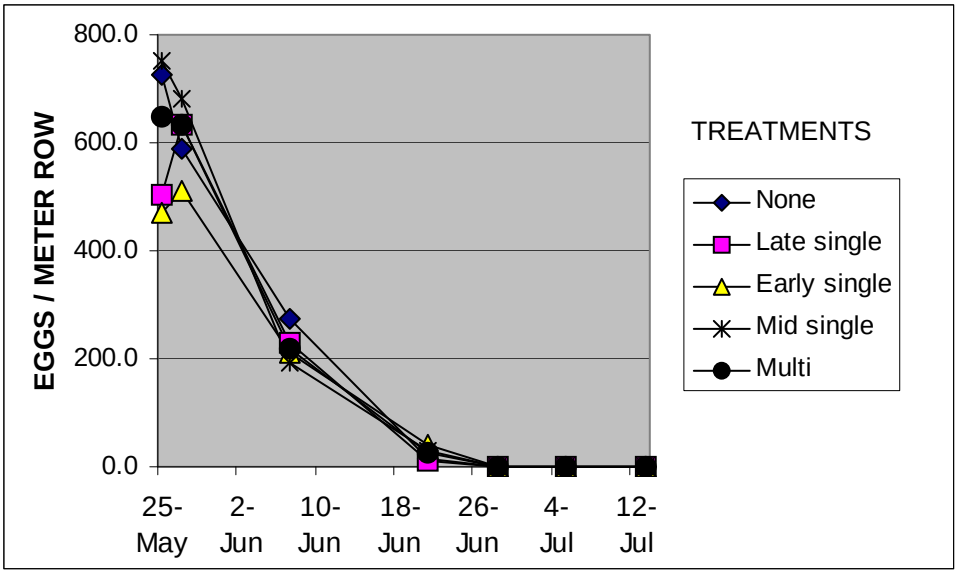

Fig. 4. Egg population densities of cereal leaf beetle on Alpowa wheat, Nine Mile Falls, WA, 2002. [See Fig. 1 caption for treatment explanation].

Table 1. Effects on spring wheat of controlling cereal leaf beetle with differently timed insecticide (Warrior) applications, field trial, Nine Mile Falls, Washington, 2002[a].

Treatment[b] and application date(s)	Application type	Damage score[c] May		Jun		Jul		Height (inches)		% Protein		Yield (bu/acre)	
Warrior dual applic, 4-Jun + 18Jun	Multi	2	a	2.0	c	2.0	e	31.0	a	12.0	a	60.0	a
Warrior dual applic, 28-May + 11-Jun	Multi	2	a	2.0	c	2.0	e	30.3	ab	12.1	a	57.1	ab
Warrior dual applic, 21-May + 4-Jun	Multi	2	a	2.0	c	2.2	e	30.0	ab	12.3	a	57.0	ab
Warrior multi applications[d]	Multi	2	a	2.0	c	2.0	e	31.0	a	12.3	a	56.5	ab
Warrior dual applic, 11-Jun + 25-Jun	Multi	2	a	2.0	c	2.2	e	29.8	ab	12.6	a	53.2	abc
Warrior, single applic, 4-Jun	Mid-single	2	a	2.0	c	2.3	de	30.5	ab	12.5	a	56.9	ab
Warrior, single applic, 11-Jun	Mid-single	2	a	2.0	c	2.3	de	30.6	ab	12.4	a	56.8	ab
Warrior, single applic, 18Jun	Mid-single	2	a	3.0	b	2.8	de	29.0	bc	12.5	a	53.2	abc
Warrior, single applic, 28-May	Early-single	2	a	2.0	c	3.7	de	30.4	ab	12.0	a	50.3	bc
Warrior, single applic, 21-May	Early-single	2	a	2.0	c	5.3	ab	30.4	ab	12.1	a	48.2	bc
Untreated Check	None	2	a	3.5	a	6.0	a	29.6	ab	12.2	a	47.8	bc
Warrior single applic, 25-Jun	Late-single	2	a	3.7	a	4.8	b	27.7	c	12.6	a	44.1	c
F=				49.7		35.5		3.2		1.1		2.9	

Column means followed by the same letter are not significantly different (SAS 6.04, General Linear Model Procedure, and Duncan's Multiple Range Test P=0.05)

[a]Field statistics: (1) wheat variety, Alpowa, planted, 9-April-2002, (3) collaborating growers, Kit and Rob Cutler.
[b]Warrior insecticide application rate: 0.025 lbs ai/acre
[c]Damage score: 1=no damage, 6=severe damage.
[d]Multiple treatments applied: 8-May, 21-May, 4-June, 18--June, 2-July-2002.