Development of an Integrated Cereal Leaf Beetle (*Oulema melanopus*) Management Program (ICLBMP) in Oregon.

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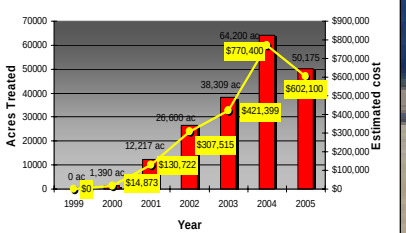
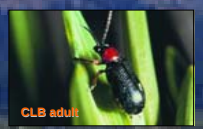
Introduction

The cereal leaf beetle (*Oulema melanopus*) is a new pest of economic importance to small grains and other grass-host crop species in Oregon and the Pacific Northwest region. Cereal leaf beetle (CLB) continues to expand its range and population levels in Oregon in the absence of natural predators. Currently, insecticide application provides the only effective means of CLB control and insecticide use has increased significantly since CLB introduction in 1999 (Figure 1). The PNW region lacks quantifiable information on crop yield impact, economic threshold levels, monitoring tactics, and host-crop preference of CLB.

Figure 1. Oregon pesticide use trend for CLB control.





Objectives

In response to the CLB threat, a series of research, extension, and biological control projects are being conducted to develop an integrated CLB management program (ICLBMP) for implementation in CLB-infested areas of Oregon and the PNW. Projects are designed to generate IPM knowledge for the region:

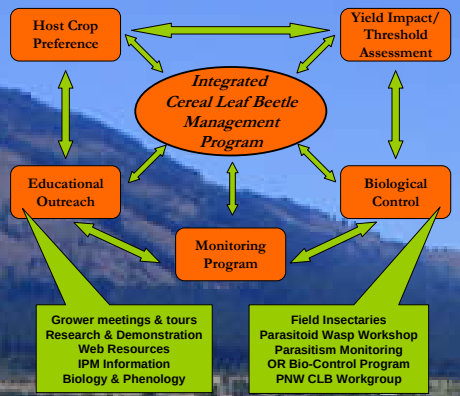
- Host-crop range of CLB (cereals and grasses grown for seed).
- CLB impact on winter and spring wheat grain yield.
- Economic threshold levels for CLB infestations.
- CLB population monitoring tactics.
- CLB biology, phenology, and management educational programs.
- Biological control program for CLB management with parasitoid wasp species *Tetrastichus julis* (larvae parasite) and *Anaphes flavipes* (egg parasite).

Host Crop Preference - Risk Assessment

Spring-planted grasses grown for seed production are more at risk to damage from newly emerged summer adults. Risk from larvae damage is minimal to spring and fall planted grasses, however, risk is much greater for cereal grains.

Table 1. Damage risk level of cereal grains and grass species grown for seed to CLB feeding damage.

Crop (sp = spring planted)	Over-Wintering Adults (April – May)	Larvae (May – June)	Summer Adults (July)
Cereals	Low (fall), Low to Moderate (sp)	Moderate to High	-
Annual Ryegrass (sp)	Low	Low	High
Perennial Ryegrass (sp)	Low	Low	Moderate
Orchardgrass (sp)	Low	Low	Moderate
Tall Fescue (sp)	Low	Low	Moderate
Kentucky bluegrass (sp)	Zero	Zero	Low
Fine Fescue (sp)	Zero	Zero	Low



Yield Impact and Threshold Assessment

Table 2. CLB population and impact on commercial winter and spring soft white wheat yield – Union County, Oregon 2004.

Treatment	Larvae per Tiller	Larvae per Flag Leaf	Flag Leaf Damage	Grain Yield	Test Wt.
	#	#	% leaf area	bu/acre	lb/bu
Winter Wheat					
No Insecticide	0.7	0.4	22	105.3	55.0
Insecticide	0.1	0	6	108.4	54.4
LSD (0.05)				ns	ns
Spring Wheat					
No Insecticide	0.7	0.6	25	78.4	58.6
Insecticide	0.1	0.1	1	90.2	58.9
LSD (0.05)				8.8	ns

Soft white spring wheat tends to be more susceptible to CLB injury than winter wheat (Table 2). Spring wheat grain yield was significantly reduced (13% loss) when control actions were not taken in 2004. CLB impact on winter wheat grain yield was variable and dependent upon overall crop vigor in relation to CLB population. In this study, winter wheat yield loss ranged from 3% to 18%.

In 2005, soft white spring wheat grain yield losses averaged 21% when CLB populations ranged from 0.5 to 1.5 larvae/flag leaf (data not shown). CLB larvae collections from the study sites were found to have 62% and 91% parasitism rates by *Tetrastichus julis (*larvae parasitoid wasp).

Current economic threshold levels, adapted from other CLB-infested regions, recommend control measures when population levels reach an average of 3 eggs and/or larvae per tiller (until cereals reach boot stage of growth) or 1 larva/flag leaf.

Results from this study suggest flag leaf threshold levels may actually be lower than 1 larva/flag leaf for spring wheat and adequate for winter wheat. Attainable spring wheat yield potential is much lower than winter wheat, therefore, allowing less tolerance for additional economic damage caused by CLB.

CLB Population Monitoring

Early spring migration of over-wintering CLB adults tend to seek spring cereals for laying eggs on succulent new foliage, however, egg deposition can occur in seedling stands of grasses grown for seed resulting in larvae feeding damage (Table 1). Planting date influences egg-deposition by adults as the adults tend to prefer younger stands of oats (Figure 2).

Monitoring CLB adult migration in the spring will facilitate early detection. In collaboration with USDA-ARS, Peoria, IL, several trap designs and CLB aggregation pheremone dose response was evaluated in the field.

The "inverted-T sticky trap" with 5 mg of pheremone was most effective for capturing adults (Figure 3). Results suggest the pheremone has potential as a monitoring and management tool during spring migration of over-wintering adults.

Figure 2. CLB egg density in spring oats.

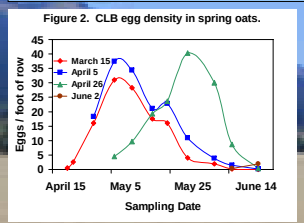
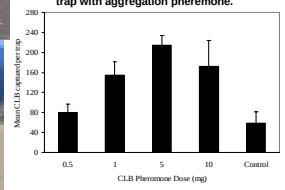


Figure 3. CLB adult capture on inverted-T sticky trap with aggregation pheremone.



Educational Outreach: CLB Management & Bio-Control

Grower meetings, field tours, and workshops highlighting CLB management & biology, research projects, Oregon Bio-control Program, and parasitoid wasp biology

Field insectaries for *A. flavipes* & *T. julis*, in-field refuge areas, monitoring clb/parasitoid wasp spread, and evaluation of bio-control program success. Cooperators include Oregon Department of Agriculture, USDA-APHIS, growers, agricultural service providers, Oregon Hay & Forage Assoc., Oregon Wheat Commission, Oregon Wheat Growers League, and Tim DelCurto at OSU Eastern Or. Ag. Res. Center

Expected Outcomes and Impacts

- Damage potential to susceptible host-grass seed and cereal grain crops.
- Economic threshold levels for cereal crops.
- CLB management guidelines for improved IPM decision-making in OR & PNW
- CLB population monitoring system.
- Improve insecticide-use efficiency and grower economics.
- Establish a successful biological control program in OR & PNW.

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