Section III
Biological and Cultural Controls

DEVELOPMENT OF AN INTEGRATED PEST MANAGEMENT PROGRAM FOR THE CEREAL LEAF BEETLE (*Oulema melanopus*) IN OREGON.

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The cereal leaf beetle (*Oulema melanopus*) is a serious new pest of cereal grains and other grass-host species in Oregon and the Pacific Northwest region. Cereal leaf beetle (CLB) was first identified in Oregon in 1999. In the absence of natural predators, the pest continues to rapidly expand its range and population levels throughout Oregon and the region. Adult and larvae feeding damage to host crop plant foliage results in crop yield loss and increased production costs. Currently, insecticide application provides the only effective means of control available to growers.

In the absence of quantifiable regional information on crop yield impacts and threshold levels, insecticide usage for CLB control increased significantly in Oregon during the short period of time since its introduction. Insecticides are often applied to cereal crops when adults, larvae, or damage are first observed. In some cases, early-season prophylactic insecticide treatments are included in herbicide tank mixtures in order to avoid additional costs of later applications. Such applications do not always provide adequate CLB control and require follow-up insecticide application to mitigate further damage. In Oregon, no acres were treated for CLB control prior to 2000. In 2004, approximately 64,000 acres were treated with an insecticide at an estimated cost of $770,000 to Oregon growers. CLB establishment in areas of major grass seed production cause concern due to observations of damage to grass seed crops during the last two years.

In response to the CLB threat, a series of research and biological control projects have been conducted during the last three years in an effort to develop an integrated CLB management program (ICLBMP). The goal of the ICLBMP is to develop economic yield threshold levels for winter and spring wheat varieties typically grown in the PNW, reduce production costs through

judicious insecticide use, reduce the potential for development of CLB insecticide resistance, and enhance the establishment of CLB bio-control agents. Data and knowledge gained from this effort will benefit growers and bio-control agent establishment efforts in Oregon and the PNW. Projects to date include:

Winter and Spring Wheat Yield Impact/Economic Threshold:
In spring of 2004, a field study was initiated in Union County, OR to determine wheat yield loss due to cereal leaf beetle damage. Cereal leaf beetle infestation levels will be correlated with yield loss for the development an economic threshold which will improve the insecticide application decision-making process. The 2004 study was conducted in 3 soft white winter, 3 soft white spring, and 1 dark northern spring wheat commercial production fields. Treatments were replicated 3 times and included: 1) insecticide application; and 2) no inspective. Replicated treatment plots were 1/3 of an acre in size. Cereal leaf beetle egg and larvae populations were collected immediately prior to insecticide applications. Wheat flag and F-1 leaf samples were collected when approximately 90% of the larvae population entered the pupation stage. Leaf samples were laminated for later foliage damage assessment. Yield data was collected using commercial combines and a weigh wagon. The study will be continued in 2005.

Host Range of Cereal Leaf Beetle:
A 2-year study was conducted near LaGrande, OR in Union County to examine the response of over-wintering and late summer adults to fall and spring planted grasses in the presence of oats and triticale. Grass species included in the study were perennial ryegrass, annual ryegrass, orchardgrass, Kentucky bluegrass, fine fescue, and tall fescue. The experiment was a randomized complete block design with 3 replications. Weekly observations were made on the number of adults, eggs, and larvae in 1-ft row samples from the end of April till the first week in July.

Aggregation Pheremone:
A CLB aggregation pheremone identified, isolated, and synthesized by Cosse et al. was evaluated for the development of a monitoring tool for use in a CLB management program. A dose response and trapping mechanism study was conducted for two years in collaboration with Allard Cosse and Robert Bartelt (USDA-ARS, Peoria, IL), and with Pherotech, a commercial pheremone-lure manufacturing company (British Columbia). The study determined that a 5 mg pheremone dose added to rubber septa and attached to an inverted-T sticky trap was most effective in capturing and retaining adult CLB. The next step is to develop a marketable product for use in monitoring programs conducted by federal/state agencies responsible for invasive species monitoring, researchers, and field consultants.

Biological Control:
In cooperation with the USDA-APHIS and the Eastern Oregon Agricultural Research Center in Union, OR, a field insectary was established in 2002 to facilitate the rearing of *Tetrastichus julis*,

a parasitoid wasp which attacks CLB larvae, in a protected area. The 12-acre field is arranged in a series of winter and spring grain plantings to provide adequate habitat for the development of both pest and parasitoid wasp. Three years after establishing the insectary, surveys conducted by USDA-APHIS reported 77% parasitism rate of CLB larvae collected from a commercial wheat field located 10 miles away.

Tri-State CLB Working Group:

Since the CLB poses a threat to the PNW region, a Tri-State CLB Working Group was organized by Diana Roberts, WSU Extension, in September 2004. The group is made up of several members representing the state departments of agriculture, land grant universities, and USDA-APHIS in Oregon, Washington, and Idaho. The goal of this working group is to coordinate biological control, research, and education efforts in the PNW region. To date, the group has identified and demonstrated the biological control needs in each state, sought formal assistance at the federal level to continue support for rearing CLB parasitoids, and obtained cooperative support from the Colorado State Department of Agriculture, Pallisades Laboratory, and the USDA-PPQ, Mission, TX, as a source for the CLB egg parasitoid, *Anaphes flavipes*.

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