Cereal leaf beetle: host range and field evaluation of aggregation pheromone

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The cereal leaf beetle (CLB), *Oulema melanopus* (L.) (Coleoptera: Chrysomelidae), is a new exotic pest in the PNW. In 1999 it was reported from two counties in Oregon, and within 3 years, it was detected in 17 out of 36 counties in the state. The adults disperse rapidly and new county records are added each year.

CLB is known as a pest in grains, but it is also reported feeding on native and cultivated grasses such as orchard grass. At present there is little information on its impacts on other cultivated grasses raised extensively in the PNW. Oregon is the grass seed capital and over 500,000 acres are under grass seed production in that state. There are therefore major concerns about the impact of CLB on grass seed production in the state. In the past 2 years, heavy infestation by adult CLB was observed in a new planting of tall fescue in a field near Portland and in Kentucky bluegrass in LaGrande in eastern Oregon. These are the first reports of CLB infestation and damage in grass seed crops in the PNW.

There are additional impacts due to quarantine restrictions on transport of hay, straw and grass seed from infested counties in Oregon and Washington into neighboring states and Canada, necessitating implementation of labor intensive surveys in all counties in these two states on an annual basis. A sensitive survey tactic for adults, such as a pheromone trap, will greatly facilitate CLB detection surveys necessary for CLB-free counties to export material without fumigating.

We are currently studying the impact of CLB on grasses raised for seed in the PNW, and evaluating a pheromone trap for monitoring CLB adults moving from overwintering sites to grain fields in spring.

Host range: A 2 year study, initiated in 2003, was conducted in LaGrande, OR. The following were planted: fall planted grasses (perennial rye grass, annual rye grass, orchard grass, Kentucky bluegrass, fine fescue, tall fescue), spring planted oats, triticale, plus spring planting of all 6 grasses listed above. The objective was to examine the response of overwintering and late summer adult CLB to fall and spring planted grasses in the presence of oats and triticale. Weekly observations were made on the number of adults, eggs and larvae.

Data from the first year indicate that, in the presence of spring planted oats and triticale, spring planted grasses did not attract overwintering CLB adults. However, in summer, adults that emerged were attracted to all grasses though fine fescue had few adults. Damage to grasses ranged from low to medium (Table 1).

In contrast, overwintering adults were observed to feed and lay eggs on fall planted grasses such as perennial rye grass, annual rye grass, tall fescue and orchard grass, but damage was not significant. Narrow leaved grasses such as Kentucky bluegrass and fine fescue attracted few adults in comparison.

Table 1. Mean CLB in cereals and grasses in 1 foot row samples in a field plot in LaGrande, Oregon. SP = spring planted; FP = fall planted

Host plant	4-28-03	5-13-03	6-9-03	6-9-03	7-14-03	7-14-03
	Adults	Eggs	Larvae	Damage	Adults	Damage
Oats	0.2	8.1	6.7	High	5.0	High
Triticale	0.1	4.3	1.0	Medium	24.3	High
Annual ryegrass (SP)	0.0	0.0	0.0	low	17.4	High
Perennial rye grass (SP)	0.0	0.0	0.0	low	19.7	Medium
Orchard grass (SP)	0.0	0.0	0.0	low	29.3	Medium
Tall fescue (SP)	0.0	0.0	0.0	low	14.7	Medium
Kentucky bluegrass (SP)	0.0	0.0	0.0	none	14.1	Low
Fine fescue (SP)	0.0	0.0	0.0	none	1.9	None
Annual ryegrass (FP)	0.9	10.9	0.1	low	mowed	-
Perennial rye grass (FP)	0.2	7.2	0.2	low	mowed	-
Orchard grass (FP)	1.1	6.6	0.0	low	mowed	-
Tall fescue (FP)	0.3	3.4	0.2	low	mowed	-
Kentucky bluegrass (FP)	0.0	1.4	0.0	none	mowed	-
Fine fescue (FP)	0.0	0.0	0.1	none	mowed	-

This study indicates that spring planted grasses such as annual and perennial rye grass, orchard grass and tall fescue are at risk for damage by adults at the end of summer when the cereals are dry and CLB adults need a food source prior to dispersal to overwintering sites. Overall, the impact of CLB on grass seed appears to be dependent on the presence of cereals in neighboring areas. It is critical that CLB adults are monitored in grass seed fields in late summer to determine whether an insecticide application may be necessary. The risk is greatest for new seedlings, as damage at the early stages of development can have a major impact on plant growth and subsequent grass seed yield.

Pheromone trap: To develop a monitoring tactic for adult CLB, we conducted a field evaluation of the CLB using an aggregation pheromone that was isolated, identified and synthesized by researchers at the USDA-ARS laboratory in Peoria, IL. The pheromone was added to rubber septa that were attached with separate clips on the downwind side of yellow sticky traps attached to bamboo stakes. In 2002 a range (50 to 500 µg per septum) in pheromone (P) doses was tested, and the highest dose was observed to provide the greatest captures (Fig. 1). The pheromone was tested in the presence of a plant compound, hexenyl acetate (HA), which had a synergistic effect in an earlier laboratory assay. However, the compound did not exhibit activity in the field trial. A random sample of adults captured on the traps were sexed revealing an equal number of females and males.

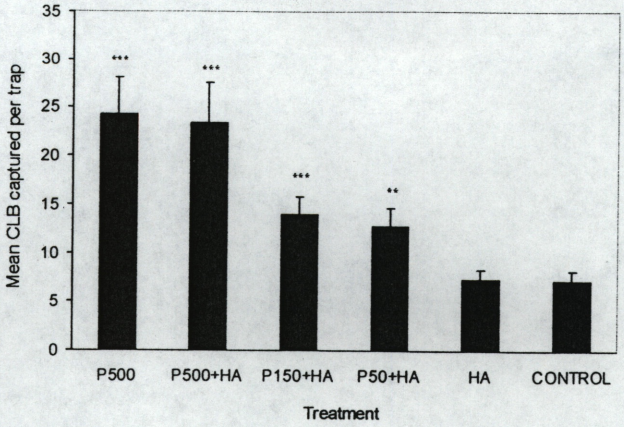

FIG. 1. Mean number (+ SE) of overwintering CLB adults captured on yellow sticky traps baited with synthetic CLB aggregation pheromone (P) and plant-related compound (*Z*)-3-hexenyl acetate (HA). Means significantly different from the control at the α = 0.001 and 0.01 levels denoted by *** and **, respectively (From Rao *et al.* 2003).

The study provided evidence that the synthetic CLB aggregation pheromone is effective in trapping CLB adults in the field, but for large scale field implementation, higher capture rates were required.

The field experiment was repeated in 2003 using higher pheromone doses. In addition, we used an inverted yellow sticky trap as the earlier field trial had indicated that CLB adults often escaped from the yellow sticky trap after capture. The modified trap greatly enhanced the trap captures in 2003. We obtained 3 times the number of adult CLB on the 0.5 mg trap compared to the trap with the same dose (= 500 µg) tested the previous year.

The 2003 field trial indicated that a dose of 5 mg of pheromone is optimal (Fig. 2). The inverted T trap was effective but messy. Further research is needed for development of an efficient trap for retaining CLB captured after attraction to the pheromone.

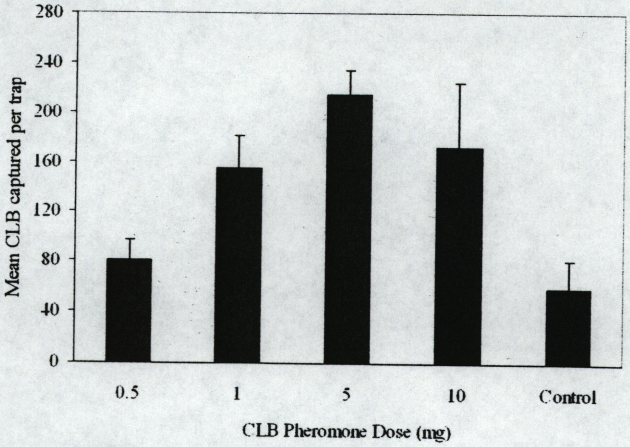

Fig. 2. Dose response of CLB to the synthetic aggregation pheromone. Bars represent mean number (+SE) of overwintering CLB adults captured on inverted T yellow sticky traps baited with pheromone.