Cottonwood Leaf Beetle

Chrysomela scripta Fabricius
Coleoptera: Chrysomelidae

Fang, Y.; Pedigo, L. P.; Colletti, J. P.; Hart, E. R. 2002. Economic injury level for second-generation cottonwood leaf beetle (Coleoptera: Chrysomelidae) in two-year-old *Populus*. Journal of Economic Entomology 95: 313-316.

Objective: To develop an economic injury level (EIL) for the poplar hybrid, *Populus deltoides* Bartr. ex. Marsh *x Populus nigra* L. (*Populus* var. 'Eugenei'), based on the relationship between the density of *C. scripta* egg masses and subsequent defoliation by larvae.

Abstract: Cottonwood leaf beetle, *Chrysomela scripta* Fabricius, is an important pest of poplar in North America. Larvae prefer to feed on young cottonwood leaves, causing significant defoliation in the absence of insecticide use. The second generation of *C. scripta* has fewer natural enemies and is less susceptible to abiotic mortality factors, therefore it is more damaging than the first or third generations. *Populus* grown in plantations as a short-rotation woody crop is particularly susceptible to damage by *C. scripta* during the first 3 years, when the trees produce abundant new growth. Reichenbacker et al. (1996) reported that defoliation levels approaching 75% of Leaf Plastochron Index 0–8 of actively growing terminals in 2-year-old *Populus* reduced the above ground, root, and total biomass by approximately 33%.

Fang and Hart (2000) found that increasing numbers of egg masses per terminal shoot (X) was related positively to the percent defoliation (Y) ($Y = 68.13X + 6.31$, $r^2 = 0.89$) produced by second-generation *C. scripta* attacking 2-year-old poplars. This equation, along with the findings of Reichenbacker et al. (1996) and calculations of market value and management costs per hectare, was used to develop EIL values for second-generation *C. scripta* on hybrid poplar in central Iowa. Resulting EIL values varied from 0.2 to 0.9 egg masses per actively growing terminal shoot, depending on market value and management costs per hectare. Prior to this publication, no EIL existed for *C. scripta* and managers applied pesticides whenever they felt populations required control measures.

Sampling Procedure: Determine the market value per kg of the crop. The market value of *Populus* may differ depending on if the crop is grown for pulp or fuel biomass. Determine the management costs of the crop per hectare (cost of insecticide and the application method used). Use Table 1 to determine the number of egg masses per actively growing terminal representing the EIL for second-generation *C. scripta* with regard to market value and management costs.

During peak oviposition by first generation females (late June-early July in central Iowa), randomly select 30 trees with actively growing terminals (Fang and Hart 2000). Actively growing terminals should have healthy new growth classified as 0–8 on the Leaf Plastrochron Index (LPI). For *Populus* spp., designate the terminal, expanding

leaf with a blade length nearest to 3 cm as LPI = 0. Designate the next leaf counted consecutively down the stem from apex to base as LPI = 1. Continue to number the leaves in this manner until a total of 8 progressively older leaves have been selected. Determine the mean number of second-generation *C. scripta* egg masses per actively growing terminal (Fang and Hart 2000; see our review in this volume). Control measures are warranted if the average egg mass density per actively growing terminal exceeds the chosen EIL value from Table 1.

Notes: The economic threshold was set as equal to the EIL in this study, therefore control measures should be applied as soon as the average egg mass density per actively growing terminal exceeds the chosen EIL value. The EIL values listed here were determined specifically for 2-year old *Populus* var. 'Eugenei' grown in Iowa. These EIL values may not be suitable for different species or hybrids of *Populus*, for different age classes, or for *Populus* var. 'Eugenei' grown in other regions. Further research is needed to determine EIL values for older stands of this hybrid and for other generations of *C. scripta*. Close monitoring of the *C. scripta* population is needed to ensure that only the second generation is sampled, and not the first or third generations.

References:

Fang, Y.; Hart, E. R. 2000. Effect of cottonwood leaf beetle (Coleoptera: Chrysomelidae) larval population levels on *Populus* terminal damage. Environmental Entomology 29: 43-46.

Reichenbacker, R. R.; Schultz, R. C.; Hart, E. R. 1996. Artificial defoliation effect on *Populus* growth, biomass production, and total nonstructural carbohydrate concentration. Environmental Entomology 25: 632-642.

Table

Table 1. Economic injury level (egg masses per actively growing terminal) for the cottonwood leaf beetle, second generation, in 2-yr-old *Populus* var. Eugenei.

Market Value, $/kg	Management cost $/ha					
	25	26	27	28	29	30
0.02	0.8	0.8	0.8	0.9	0.9	0.9
0.03	0.5	0.5	0.6	0.6	0.6	0.6
0.04	0.4	0.4	0.4	0.4	0.5	0.5
0.05	0.3	0.3	0.3	0.4	0.4	0.4
0.06	0.3	0.3	0.3	0.3	0.3	0.3
0.07	0.2	0.2	0.3	0.3	0.3	0.3