Elm Leaf Beetle

Pyrrhalta (=*Xanthogaleruca*) *luteola* (Müller)
Coleoptera: Chrysomelidae

Dreistadt, S. H.; Dahlsten, D. L. 1989. Density-damage relationship and presence-absence sampling of elm leaf beetle (Coleoptera: Chrysomelidae) in northern California. Environmental Entomology 18: 849-853.

Objective: To develop a presence-absence sampling method for *P. luteola* in order to predict late season defoliation based on early season beetle density.

Abstract: The elm leaf beetle, *Pyrrhalta* (=*Xanthogaleruca*) *luteola* (Müller), is one of the most important pests of urban elms, *Ulmus* spp., in the U.S. and Canada. Larvae injure the host tree by skeletonizing leaves. A presence-absence sampling method was developed that could forecast late season defoliation of English elm, *Ulmus procera* Salisb., from the density of first generation eggs.

The proportion of 30 cm-long branch terminals (X) infested with at least one *P. luteola* egg was related positively to cumulative apparent damage (Y) of English elm (Y = 0.97 + 17.42X; r^2 = 0.86). The number of 30 cm-long branch terminals needed to estimate the proportion of terminals infested with at least one *P. luteola* egg at the 0.3 and 0.5 levels of fixed precision is given in Fig. 2. If the actual infestation level is 40% of terminals infested with at least one egg, then 20 and 4 branch terminals need to be sampled to meet the 0.3 and 0.5 levels of fixed precision, respectively.

Sampling Procedure: During the oviposition period of the first generation, randomly select 30-cm branch terminals from the lower third of the canopy on English elms. Take five inner and five outer samples from each aspect for a total of 40 branch samples per tree. Calculate the proportion of terminals infested with at least one *P. luteola* egg and compare to Fig. 2. If the proportion of samples infested exceeds the selected line representing the desired level of fixed precision, sampling can be stopped. Otherwise, continue sampling branch terminals and adjusting the proportion of terminals infested until the appropriate line is crossed. This proportion (X) can then be used in the equation, Y = 0.97 + 17.42X, to predict the cumulative apparent damage (Y) of English elm later in the season.

Notes: The authors do not specify a minimum number of trees to sample, but sufficient trees should be sampled to get an average estimate of infestation levels before referencing Fig. 2. While no qualitative aesthetic injury has been set for *P. luteola*, >25% defoliation on English elm was chosen as a goal in northern California. This sampling method was not as effective on Siberian elm, *Ulmus pumila* L., possibly because Siberian elms tend to abscise partially defoliated leaves and produce new foliage.

The line representing C = 0.1 in the original Fig. 2 was removed to reduce scaling effects. The line for this higher level of precision can be calculated with the formula:

$$n = P_o / (P_i \times C^2)$$

where n = number of samples needed, P_o = proportion samples uninfested, P_i = proportion samples infested, and C = desired level of precision of estimate. There may not be sufficient trees to sample in an area of concern if *P. luteola* densities are low and a higher level of precision of the estimate is needed (Fig. 2). A manager might run out of trees to sample before sampling should stop.

A later study (Dahlsten et al. 1998) presents action thresholds and a refined sampling technique for *P. luteola* (see our summary in this volume).

Reference:

* Dahlsten, D. L.; Rowney, D. L.; Lawson, A. B. 1998. IPM helps control elm leaf beetle. California Agriculture 52: 17-23.

Figure

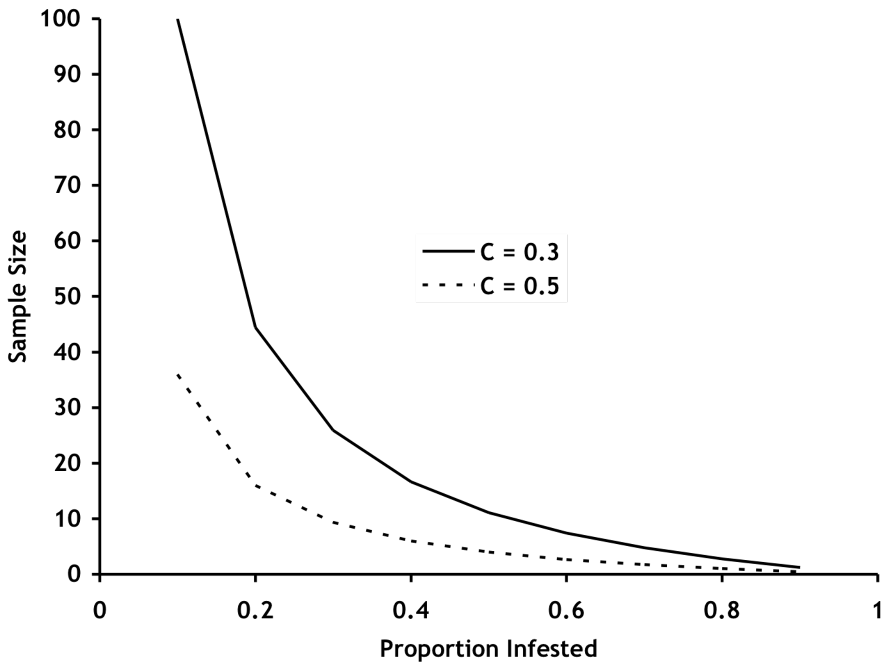

Fig. 2. Sample sizes needed at two levels of precision (C) to estimate the proportion of 30-cm branch terminals infested with eggs.