

Spruce Spider Mite

Oligonychus ununguis (Jacobi)

Acari: Tetranychidae

Shrewsbury, P. M.; Hardin, M. R. 2004. Beat sampling accuracy in estimating spruce spider mite (Acari: Tetranychidae) populations and injury on juniper. *Journal of Economic Entomology* 97: 1444-1449.

Objectives: To relate a method of subsampling *O. ununguis* to its absolute population density; to relate *O. ununguis* feeding injury to estimated population density.

Abstract: The spruce spider mite, *Oligonychus ununguis* (Jacobi), can be a significant pest of field, nursery, and greenhouse-grown plants. Coniferous hosts include Fraser fir [*Abies fraseri* (Pursh)], several spruces (*Picea* spp.), and in the case of the current study, juniper (*Juniperus chinensis* A. Henry). In the field, risk of mite damage is especially high during periods of drought and high temperatures. Under these conditions, mite populations build quickly and can cause serious damage. Infested needles are stippled and covered with webbing; eventually they turn brown and fall prematurely from infested trees.

A beat sampling method for estimating *O. ununguis* populations on *Juniperus chinensis* was related to an absolute population measure as well as feeding injury on its host. The log of spruce spider mite density estimated from the beat sample was related positively to the log of total *O. ununguis* density ($r^2 = 0.80$) and to plant injury level ($r^2 = 0.43$). These findings may allow managers to predict total mite density and feeding injury on infested trees using simple beat counts. These findings may apply to *O. ununguis* populations on other plants with growth patterns similar to juniper. Moreover, knowledge of total mite density from a subsample may facilitate evaluation of biological control success and allow managers to better adjust predator release rates according to mite population density.

Sampling Procedure: Randomly select an appropriate number of trees to sample in the area of concern. Use a 0.5 m (1.6 ft.) wooden dowel to beat a 3,540 cm³ (0.13 ft.³) area of foliage in the lower, outer crown of each juniper sampled. Always select the sample area at the same location of each tree sampled. Place a 10 x 14 cm (4 x 5.5 in.) sheet of graph paper on a clipboard beneath the foliage. Rap the foliage sample unit with the dowel 10 times to dislodge mites onto the paper. Count all mites present on the paper.

To estimate total mite density, enter the total number of mites sampled using the beat method into the equation:

$$X = (\text{Log}_{10} \text{ sum of mites} + 0.12)/0.798$$

then calculate the antilog of X to obtain the estimated total number of mites as the authors calculated the regression equation using log₁₀ transformed data.

To estimate percent plant injury, enter counts obtained from the beat method into the equation:

$$\text{Percent plant injury} = 5.37 + 0.0007X$$

where X = sum of mites in beat sample.

Notes: The standard error of each regression, which was not presented, would give a range of total density and percent plant injury to expect for a given mite count obtained through beat sampling. This estimate of standard error would allow users to determine if the range of total mite density and/or percent plant injury level included their specific damage or action threshold for *O. ununguis*. The authors cautioned that beat sampling underestimates the density of mites, which must be considered when considering the release of predatory mites for control of *O. ununguis*.