TOLERANCE TO INSECT DEFOLIATION: BIOCENOTIC ASPECTS

ANDREY A. PLESHANOV, VICTOR I. VORONIN, ELENA S. KHLIMANKOVA, and VALENTINA I. EPOVA

Siberian Institute of Plant Physiology and Biochemistry
Siberian Branch of the U.S.S.R. Academy of Sciences
Irkutsk 664033 U.S.S.R.

INTRODUCTION

Woody plant resistance to insect damage is of great importance in forest protection, and tree tolerance is an important element of this resistance.

The compensating mechanisms responsible for tolerance are nonspecific as a rule and develop after damage has been caused by phytophagous animals or other unfavorable effects. Beyond that, plant tolerance depends on duration, repetition, and phenological periods of the damage effects, and on environmental conditions. We have studied of radial increment patterns in trees as a measure of their physiological state.

This approach may be tested in areas infested by various dendrophagous species and is especially useful if the outbreak areas are vast, similar dynamics prevail in different forest site conditions, and the damage inflicted generally does not cause tree mortality. In these respects, the areas infested by *Zeiraphera griseana* Hbn., *Dasychira abietis* Schiff., *Pygaera anastomosis* L., and *Leucoma salicis* L. represent potentially significant conditions for estimation of the defoliation tolerance of larch, pine, and aspen trees, respectively, in Eastern Siberia.

TREE GROWTH RESPONSES TO DEFOLIATION

Fig. 1 shows the dynamics of radial increment of *Larix sibirica* in two biotopes that contrast in heat and water supply. The first curve shows the decrease in the increment caused by *Zeiraphera griseana* Hbn. defoliation in central larch taiga forests. Tree damage in 1953 and 1971 resulted in increment decline for the next 5 to 7 years. The second curve shows that *Zeiraphera griseana* outbreaks were more frequent in larch forests in the forest-steppe zone: in 1930, 1943, 1949, 1953, 1959, 1963, 1967, 1971, 1975, 1981, and 1987 (Fig. 1, curve 2). However, the increment decline following each defoliation was recorded over only 1 to 2 years. The same stand was also damaged by *Erannis jacobsoni* Djak. in 1964 and 1971. The consequences of that insect defoliation were registered over 5 years. This comparative geobotanical approach appears to be useful for mapping differential forest tolerance to phyllophagous insects.

The practical importance of such maps is evident given the importance of wood increment decrease as an indicator of the economic significance of phytophage outbreaks and the efficiency of the

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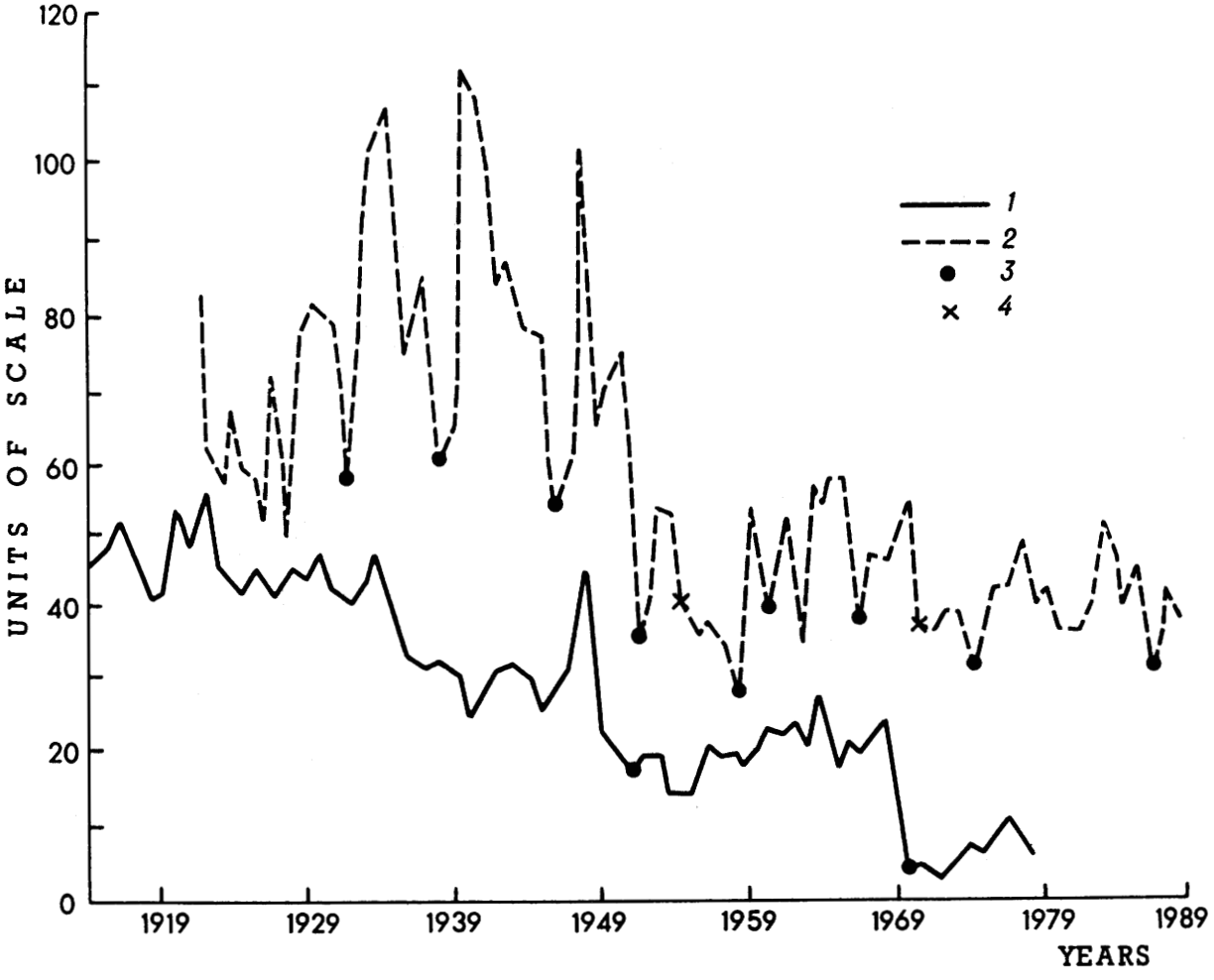

Figure 1. Fragment of dendrograms of *Larix sibirica* from different biotopes; 1. larch forests in the forest-steppe zone; 2. larch forests in the central taiga zone among herbs; 3. years of defoliation by larch bud moth; 4. years of defoliation by *Erannis jacobsoni* Djak.

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proposed forest protection measures. In addition, tolerance is directly related to the possibility of further tree damage by insects. The depression of physiological processes caused by defoliation results in temporary (passive) immunization of trees to a number of pests. Knowledge about the length of the immunization period--readily acquired through study of radial increment in damaged trees--would also contribute to better planning of forest protection measures.

Moreover, identification of the areas having high outbreak frequency is necessary for organization of forest pathological monitoring. Dendrochronological data may be used also for retrospective analysis of insect outbreaks.