



Timber Talks



Prepared by V. H. Phelps, Forest Research Laboratory, 506 W. Burnside Road, Victoria, B.C.

CAN FERTILIZATION REGULATE INSECT POPULATIONS?

No. 39

Existing uncertainties must be resolved before forest fertilization is fully acceptable as a management practice but, under favourable environmental and forest conditions, the growth rate of trees is accelerated and flowering induced by fertilizer applications. Less is known on the possible role of fertilizers to regulate insect populations.

Insects feed on a variety of foods and require a nutritionally balanced diet for their development and reproduction. It was postulated that if the relative proportions of nutrients within a plant are changed by soil or foliar applications of fertilizers, the development of insect populations might be inhibited. An artificially created unbalanced diet suggests a means of control that would be particularly useful to inhibit the spread of balsam woolly aphid. This insect causes severe damage to true firs and is resistant to the usual operational methods of control.

Greenhouse and field studies were conducted at the University of British Columbia and in the Fraser Valley to investigate the influence of host tree fertilization on balsam woolly aphid populations and the effect of fertilization on the establishment of larvae. Four-year *Amabilis* fir seedlings were potted in mineral soil that was deficient in nitrogen, phosphorous and calcium, and in humic soil with a high content of these nutrients. Bark, infested with larvae and eggs, was attached to each seedling and later the foliage sprayed with urea or ammonium nitrate. Young fir trees were subjected to several weekly foliar applications of ammonium nitrate and then infested in the same manner as the seedlings.

In the greenhouse, aphid populations increased after fertilization, except when the foliage was treated with 1% ammonium nitrate. Ten weeks after fertilization the aphid population had decreased by 23 per cent on seedlings treated with the ammonium nitrate and had increased by 31 per cent on unfertilized trees. The adverse effect was more pronounced on humic soils than on mineral soils. In the field, larval establishment on trees fertilized with ammonium nitrate was 31 to 37 per cent less than on untreated trees.

There was no evidence to indicate that reduction in aphid population was due to a toxic effect of the chemical. The reduction was attributed to a decrease in the number of larvae that became established on the host. It was less pronounced during the last part of the study period, which suggested that the insects may have developed a tolerance for the changed diet. One reason suggested for the inhibition of larval establishment was that the changed nutrient status within the plant tissues from fertilization resulted in unpalatable food.

Further investigation is necessary, but the development of resistance in the host by the addition of nutrients has potential for the regulation of insect population.

REPORT: Nitrogen Fertilization of the Host Tree and Population Growth of the Balsam Woolly Aphid, *Adelges piceae* (Ratz) (Homoptera: Adelgidae).
J. Roderick Carrow and K. Graham. Forest Research Laboratory, Victoria, B.C.