

A Specific Virus Disease for Control of the European Pine Sawfly, *Neodiprion sertifer* (Geoff.)¹

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A specific virus disease for the biological control of the European pine sawfly, *Neodiprion sertifer* (Geoff.), has been introduced into Indiana. This polyhedral virus disease affecting the European pine sawfly was originally obtained from diseased sawfly larvae in Sweden and cultured by the Canadian Laboratory of Insect Pathology, Saulte Ste. Marie, Ontario. The Forest Service of the United States Department of Agriculture subsequently obtained some of the virus material and the writer working with the latter department first experimented with the virus disease at Bristol, Indiana, in 1953.

The European pine sawfly *Neodiprion sertifer* (Geoff.) is probably the most severe pest of pine trees in Indiana. It is a foreign pest which was accidentally introduced into New Jersey about 1925. The sawfly has gradually spread westward and reached Indiana about 1950. This sawfly occurs in the northern half of the state and the infestation is particularly heavy near the Michigan state line in the vicinities of LaPorte, Elkhart and Bristol, Indiana.

The larval or "worm" stage attacks practically every species of pine grown in the state, but is most injurious to red and Scotch pines, the two pine species most popular for reforestation and Christmas tree production. The sawfly larvae feed from late April until mid-June and heavy populations strip the trees of all of their old needles. When the new growth candle breaks and the new needles are produced, after the larvae have pupated, the individual branches have a tufted or "mule-tailed" appearance. The thin, sparsely leafed trees are worthless for Christmas trees or windbreaks and if defoliation is repeated for two or three years, tree mortality follows.

Because of the seriousness of the sawfly infestation, various methods of controlling the insect were tried including the application of DDT insecticides. DDT was very effective against the sawfly, but had to be applied each year. (The use of DDT on other crops had caused a mite problem following its use.)

No virus disease had been found in American infestations of the European pine sawfly (2).

Since 1953 the polyhedral virus has been applied to over 600 acres of sawfly infested pine plantings in Elkhart, Steuben and LaPorte counties and appears to be the answer for controlling this sawfly in pine plantings. The advantages of the virus disease over the application of DDT to pines are: 1)—The virus disease does not need to be applied every year. When applied properly, mortality is about 89 percent. This

¹Purdue University, Agricultural Experiment Station, Journal Paper No. 1050.

allows sufficient survival so that the disease is carried over from one season to the next indigenous in the sawfly population. Epizootics keep the population so low that no economic damage occurs. The virus is transmitted from one generation to the next via the eggs of the diseased females. Little or no virus persists on the foliage. (4) 2)—The virus disease does not affect other pest populations and is harmless to man and other animals. 3)—Once the disease is established in an area, the grower can prepare his own inoculum. To obtain an adequate amount of inoculum usually 1000 diseased larvae are collected. These are macerated and placed in a liter of chlorine free water to rot until the following spring. The diluted aqueous suspensions of the body fluid of virus killed sawflies thus serve as inoculum to infest new areas with the disease (6). The virus suspension can be applied by airplane mist blower or compressed air sprayer (2). The stock solution made from diseased larvae is diluted so that one milliliter, containing one million polyhedra, is applied per acre. It is applied as a fine mist; for example, one gallon of diluted material is applied to one acre by airplane. It is not necessary to drench the trees for this actually wastes material. Two pounds of powdered milk is sometimes added to each 40 gallons of suspension for airplane application. This material serves to stick the virus particles on the foliage and, by increasing the density of the sprays, increases penetration of the spray into dense foliage (5).

The virus should be applied either early in the morning or late in the evening when there is no wind. The ideal time for application is between May 1st and May 14th. This early application, when the sawfly larvae are small, prevents serious defoliation. Mortality from the virus disease becomes evident in about ten days after the spray is applied (3). The diseased sawfly larvae turn black and may be seen hanging head downward from the foliage. The body contents become liquified so that the dead larvae become essentially a sack of virus particles suspended in the body fluids. In about another week, the dead larvae dry up into black mummies.

As a result of introducing the virus in Indiana, the immediate threat to Indiana pine plantings from the European pine sawfly has been reduced. Adequate control is maintained for several years by recurring virus epizootics once the disease is established.

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