PROTECTION OF URBAN FORESTS THROUGH THE USE OF INSECT DISEASES [1]

by W.A. Smirnoff

Good architecture is as essential to the urban forest as it is in the design of a house. The green covering provided by plants is a solar energy packing-house indispensible to life. In fact, green areas are screens not only for aesthetic and recreation but sanitary purposes as well against pollution; since air has a strong influence on human health. One hectare of conifer forest produces 30 kg of volatile substances hourly, these can be considered as air purifiers.

With this perspective, it is necessary not only to keep architectural design and landscaping to create and construct greenery, but it is also necessary to adequately protect it. For instance, phytophagous insects may ruin or even destroy a forest stand. This changes not only the scenery but also the ecology, bringing about a serious erosion which will modify both flora and fauna.

Norms must be set up so that urban planners will be able to assure the establishment of green areas, by introducing resistant and diversified plant species. Control of noxious phytophagous insects in urban forests must become more sophisticated than those presently used and they must take a different form.

In pre-urban and urban areas where the biological equilibrium is fragile, excessive chemical insecticide sprayings must be severely controlled by environment protection institutions and those working in urban planning.

Applications of chemical insecticides are possible when they are radical, specific, rapidly degradable, nonpolluting, and safe for the environment as a whole. Yet there are few chemical insecticides that have the above described qualities. Also, more important, the long-term impact of these insecticides on the ecosystem is unknown.

The biological control of insect pests comprises the use of parasite, predators, different diseases, woodland and agricultural methods, pheromones, repulsives and attractants. Both biological and chemical methods of control can be integrated and can be applied with chances of success.

Already certain insect diseases are quite efficient and their possible application against insects are real, especially in pre-urban and urban forest stands. These diseases are quite specific, absolutely harmless and nonpolluting for either man or the environment.

Protozoans — Microsporidia

These rather specific microorganisms induce mostly chronic infections in many phytophagous insects and provide a most efficient damper against development of these insect populations to an epidemic level. To date, application of microsporidia is limited. They may be introduced in phytophagous insect populations through either the adult or pupae affected by the disease which is then transmitted to their progeny. In this way the insect population is controlled. Yet, dispersion of microsporidia by means of "spraying" is still experimental.

Insect Viruses

These are extremely specific microorganisms and most efficient from the standpoint of either curative or preventive control. Also, viral infections of insects are transmitted to the progeny and have been used successfully in northeastern Canada against many defoliating insects. Insect viruses can be applied by spraying, at 1 to 0.5 gal/acre, by means of land equipment (mist blower), backpack sprayer, by helicopter or airplane so as to create epizooty centers in insect populations. Commercialization of viruses should be carried out in a near future, as only a few are on the market.

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[1] Presented at the 27th International Society of Arboriculture-Canada in Quebec City in 1976.

Bacillus thuringiensis (Entomopathogenic bacteria)

These are efficient and specific against phytophagous Lepidoptera, in which are found the most dangerous forest defoliators. *B. thuringiensis* is efficient against the insects after its dispersion, but is not transmitted to progeny. This microorganism can be applied by land equipment or backpack sprayer at 10 to 15 gal/acre, but it is usually applied by helicopter or airplane at 1 to 0.5 gal/acre. *B. thuringiensis* is now a commercial product and is part of the means currently used against Lepidoptera.

When considering these facts, it can be stated that the application of insect diseases in the control of phytophagous pests must be realized with success not only as a sophisticated anti-polluting method, but also as a method which is not harmful to useful insects such as bees, ants, parasites. The use of insect diseases will protect the already fragile ecosystem represented by the green architecture of our pre-urban vegetation.

Important forest Lepidoptera and Hymenoptera that can be microbiologically controlled:

Insect	Host plant	Bacillus Thuringiensis	Virus	Microsporidia
LEPIDOPTERA				
Spruce budworm	fir, spruce	+++	+	+
Fall webworm	maple, oak, elm, etc.	+++	++	+
European skipper	prairies, lawn	+++	+++	
Tent caterpillars	aspen, choke cherry	+++	++	+
Spruce spanworm	maple, elm	+++	+++	
Hemlock looper	fir	+++	+	++
Linden looper	linden	+++	+++	+
Gypsy moth	oak	+++	++	
Ugly nest caterpillar	choke cherry	+++	+	+
Large aspen tortrix	aspen	+++	+	+
Tussock moths	elm, fir	+++	++	
HYMENOPTERA				
Jack-Pine sawfly	jack pine	-	+++	+
Red-headed pine sawfly	eastern white pine	-	+++	+
Larch sawfly	larch	-		++
European spruce sawfly	spruce	-	+++	+
Yellow-headed spruce sawfly	spruce	-		+
Balsam-fir sawfly	fir	-	+++	+
Mountain ash sawfly		-	++	+
Poplar sawfly		-	++	+
Striped alder sawfly		-	++	+

Note: +++ Highly efficient in short term or preventive control
++ Preventive control
+ Chronic infection

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