BIOLOGICAL CONTROL AS IT RELATES TO CONSERVATION

by Fred D. Bennett

The majority of plants whether they are agricultural crops, forest trees, ornamentals or weeds are subject to attack by insects. If the insects feed on weeds they are considered beneficial but if their attention is focused on crops or timber trees they are pests. Therefore insects come under the scrutiny of agriculturists and foresters whose task it is to "compete" with the pests for the crop. They resort to some form of pest management or control; often this means the application of poison (pesticides) to the crop.

Pesticides may give excellent and immediate control of the pest and have been invaluable in increasing crop production, controlling vectors of diseases etc. However, if used indiscriminately in addition to killing the pest they may also have detrimental effects on beneficial insects. e.g. pollinators, parasites and predators and also on other types of animal life which we wish to conserve. In other countries the indiscriminate use of pesticides has created many new insect problems. Insects which previously had never been serious pests have come to the forefront with the advent of DDT and other broad spectrum pesticides. Research has shown that these pesticides decimate the natural enemies of many plant-feeding insects which in the absence of these natural checks have reproduced rapidly and become pests.

Additional applications of insecticides have thus become necessary to protect the crop. In certain instances, for example on citrus in South Africa, profits disappeared because of the cost of increased applications to control a complex of new pests developing after insecticides applied for another insect had killed their natural enemies. Yet if the insecticidal sprays had been terminated suddenly the entire crop would have been destroyed before natural enemies could re-establish in adequate numbers to give control. Similar trends occurred with the use of DDT against pests of apples in eastern Canada and of cotton in Peru. Intensive study has in each of these instances provided a partial solution, the use of selective pesticides which control the pests but have less deleterious effects on the natural enemies and renewed efforts to conserve and encourage natural enemies. Partly because of such examples but also because there are many pests which cannot be economically controlled by pesticides, increasing attention is being paid to the possibilities of biological control and the importance of natural enemies as factors in regulating populations of pests.

The introduction of natural enemies to areas where they do not occur or their manipulation in areas where they do is called biological control. The practice of biological control is not new. Chinese citrus growers in ancient times encouraged a species of predaceous ant to prey on leaf-feeding caterpillars. The same practice still persists; in some areas in China the farmers even place bamboo poles from tree to tree to serve as bridges for the ants. There are now hundreds of examples of successful biological control of insect pests. However, although it is the most desirable and most permanent form of control, biological control is a

specialised field and each pest and its natural enemies require intensive study. With the state of our present day knowledge there are many insect problems which are not amenable to this form of control. Certain of these with concentrated research can be solved.

Throughout the world there are several organisations working in the field of biological control. One of these, the Commonwealth Institute of Biological Control (CIBC) maintains laboratories in Trinidad and in five other parts of the world to investigate the natural enemies of agricultural and forestry pests and to attempt to utilise them where possible.

As an example attempts by the Forestry Department to establish pure plantations of Mahogany or Cedar have been seriously hampered by the attack of a caterpillar which tunnels in the young shoots thereby stunting or distorting the trunks of young trees. This insect, called the mahogany shoot borer, is difficult and economically impossible to control by the use of pesticides.

Even were it possible to achieve control by this method the widespread use of the pesticides would in all probability have dire effects on the wild life which we wish to conserve. Accordingly the CIBC at the request of the Forestry Department has engaged in studies of the natural enemies of the mahogany shoot borer both in Trinidad and India. The initial phases of the research are almost completed. In India, there are a number of species of tiny parasitic wasps which attack the eggs, larvae or pupae of a related shoot borer. Currently these parasites are being tested carefully to determine that they cannot develop on beneficial insects; their potential as controlling agents is also being evaluated prior to their release in Trinidad. The type of biology of these parasites precludes any danger that they themselves could become pests of plants. They are so host specific that they perish rather than feed on other insects or plants if they cannot find mahogany shoot borers to attack. If introductions of these parasites are successful the results would have a direct value in the conservation of existing stands of young cedar and mahogany, and would give added incentive to large scale planting of these valuable trees. Equally important, there would be no need to apply insecticides which might endanger other forms of wild life in mahogany and cedar plantations.

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