# Role of some biopesticides in management of some forest insect pests

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**ABSTRACT**

The naturally occurring pesticides thus appear to have a prominent role in the development of future commercial pesticides not only for agricultural and forestry crop productivity but also for the safety of the environment and public health. The harmful environmental implications of the synthetic chemicals like the development of insect resistance, distribution of natural enemy complex and increased contamination have compelled to search for some alternative methods. This lead to increased development of compounds based on the models of naturally occurring toxins of biological origin, having various biological activities. This includes plant extract and microbes which are now known because they are environmentally harmless, host specific and less residual. These different concentration of plant extracts *viz. Azadirachta indica* seed extract / cake, *Jatropha curcas* leaf extract / cake, *Pongamia pinnata* leaf extract/ cake, *Aloe vera* leaf extract, *Annona sqamosa* leaf extract, *Calotropis procera* leaf extract, *Vitex negundo* leaf extract were tested for their feeding inhibition properties against six major forest insect pests in laboratory and field condition and the most effective concentration has been worked out. Similarly, the different doses of three toxins of thuricide (*Bacillus thuringensis*) have also been tested against some forest insect pests and their efficacy has been compared.

**Key words:** *Ailanthus excela, Dalbergia sissoo, Dendrocalamus strictus, Pithecolobium dulce* and *Tectona grandis*

## INTRODUCTION

The harmful environmental applications of the synthetic chemicals like the development of insect resistance, distribution of natural enemy complex and increased contamination have compelled to search for some alternative methods. This led to increased development of compounds based on the models of naturally occurring toxins of biological origin, having various biological activities. These include plant extracts and microbes which are known because they are environmentally harmless, host specific and less residual. Over the last 50 years, more than 200 plant species belonging to different families and genera have been reported to contain toxic principles which are effective against insects. Antifeedant properties of these plant products help to check the outbreak by disturbing their normal feeding and sometimes causing death. Some of the important contributions in this field have been made by some authors like Beeson, 1941; Wada and Manakata, 1971; Yano, 1983; Saxena *et al*., 1986; Rao *et al*., 1990 and Passerini and Hill, 1993) but , as far as their efficacy against forest insect pests are concerned the literature is limited. Similarly, the work on efficiency of thuricide is also restricted (Harper, 1974; Singh and Mishra, 1978; Mishra and Singh, 1993 and Roychaudhary *et al*., 1994). Therefore the present study was undertaken to test the antifeedant properties of some plant extracts and varietal toxins of *Bacillus thuringiensis* against some forest insect pests and the results are summarised as here under.

## MATERIALS AND METHODS

To test the antifeedant activity of some plant products *viz.* seeds and leaves of *Azadirachta indica,* leaves of *Aloe vera, Annona sqamosa, Calotropis procera, Jatropha curcas, Pongamia pinnata* and *Vitex negundo* the different concentrations i.e. 0.5, 0.4, 0.3, 0.2, 0.1, 5.0 and 10.0 per cent of plant extracts were prepared by diluting the product in water (Table 1) and each of the concentration was sprayed on both surfaces of numbered, 5 cm dia. cut leaf circles of the host plants. These were dried in room conditions and provided to the larvae for 24 hrs along with the untreated control. The consumption of leaf circles was measured after 24 hrs using leaf area meter 'Systronics-211' and percentage consumption in treated and untreated leaf discs was calculated.

To test the efficacy of varietal toxins of *Bacillus thuringiensis*, the different concentrations i.e. 2, 1.5, 1.0, 0.75, 0.5, 0.25, 0.1, and 0.05 of B. t. kurstaki (LDC), B. t. thuringiensis (BTB), B. t. Kurstaki (Dipel, 8 L ) and B. t. Dendrolimus (DDB) were sprayed on three marked host trees of each species *i.e. Ailanthus excela, Dalbergia*

**Table 1.** Inhibitant properties of some plant products against the larvae of some forests pests

| Treatments | Percentage of Mean leaf area consumed in 24 hrs. | | | | |
|---|---|---|---|---|---|
| | *E. machaeralis* | *Papilio demoleus* | *Plecoptera reflexa* | *Pyrausta bambucivora* | *Atteva fabriciella* |
| *Azadirachta indica* seed extract 0.5%(Petroleum ether) | 15.30 | - | - | - | - |
| *Azadirachta indica* seed extract 0.5% (Methanel extract) | 16.35 | - | - | - | - |
| " 0.3% | - | 32.70 | - | - | - |
| " 0.1% | - | 51.40 | - | - | - |
| *Azadirachta indica* leaf extract 0.3% (Petroleum ether) | - | - | 17.15 | 20.50 | - |
| " 0.1% | - | - | 22.30 | 39.50 | - |
| *Azadirachta indica* leaf aqueous 10% | - | - | 6.50 | 0.00 | - |
| " 5% | - | - | 12.50 | 20.50 | - |
| *Jatropha curcas* leaf 0.5% (Petroleum ether) | 14.00 | - | - | - | - |
| *Jatropha curcas* (leaf) 0.4% (Petroleum ether) | - | - | - | - | 35.50 |
| " 0.3% | - | 70.40 | - | - | 45.50 |
| " 0.2% | - | - | - | - | 54.50 |
| " 0.1% | - | - | - | - | 60.80 |
| *Pongamia pinnata* 0.5% (Petroleum ether) | - | - | - | - | 3.50 |
| " 0.4% | - | - | - | - | 9.50 |
| " 0.3% | - | - | - | - | 26.35 |
| " 0.2% | - | - | - | - | 33.60 |
| " 0.1% | - | - | - | - | 42.14 |
| *Aloea vera* 0.5% (Methanel extract) | 2.70 | - | - | - | - |
| *Annona squamosa* leaf 0.5% (Petroleum ether) | 9.80 | - | - | - | - |
| *Calotropis procera* leaf 0.5% (Petroleum ether) | 18.60 | - | - | - | - |
| *Vitex negundo* leaf 0.5% | 27.80 | - | - | - | - |
| Amrut guard 0.5% | 17.70 | - | - | - | - |
| Neem oil based commercial product 0.5% + Triton | - | 72.15 | - | - | - |
| Control | 60.90 | 84.70 | 45.60 | 58.25 | 72.00 |
| SE | 1.80 | 12.50 | 0.90 | 1.06 | 0.85 |
| CD at 5% | 3.80 | 28.50 | 1.90 | 3.00 | 1.20 |

*sissoo, Dendrocalamus strictus, Pithecolobium dulce* and *Tectona grandis* in 0.25 ha area in the field. The sprayed leaves were plucked and provided as food to known ten number of larvae kept in the beakers in the laboratory. The percentage kill larvae after 72 hrs were counted and analysed statistically.

## RESULTS AND DISCUSSION

### Efficacy of Plant extracts

The data Table 1 shows that 10 per cent aqueous solution of neem leaves is highly effective to deter the larvae of *Plecoptera relexa* and *Pyrausta bambucivora* for feeding their hosts. Further diluting their concentrations from 10 to 5 per cent, though effective but inhibits less percentage of larvae. *Aloe vera* leaf extract 0.5 percent is proved to be the best and most effective, to inhibit the larva of teak skeletonize, *Eutectona machaeralis*, the larvae feed only 2.70 per cent treated leaf area in 24 hrs as compared to 60.90 per cent leaf are consumed in untreated conrol. Neem seed extract both in petroleum ether and methanol and leaf extract of *Jatropha curcas* are proved to be equally effective to inhibit feeding of the larvae of *E. machaeralis*. These extra cts need to be tested against some more species of insects before leading to any final conclusion. Passerini and Hill (1993) have also tested the efficacy of neem extracts on the Sahelian grasshopper, *Kraussaria angulifera* (Krauss) and found that 0.5% and 1% neem seed extracts reduce the grasshopper feeding. In the present findings, neem leaf aqueous extract, neem seed methanol extracts proved to be effective to minimise the larval feeding of forest insect pests.

**Table 2.** Efficacy of *Bacillus thuringiensis* toxins against some major defoliators

| Treatment | Larvae killed after 72 hrs at concentrations (in per cent) | | | | | | | | Without treat ment | SE | CD 5% |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2.0 | 1.5 | 1.0 | 0.75 | 0.5 | 0.25 | 0.1 | 0.05 | | | |
| *B.t. var kurstaki (LDC)* | | | | | | | | | | | |
| *Hyblaea puera* | 80.00 | 80.00 | 85.50 | - | 70.00 | 60.00 | 30.00 | - | 0.00 | 3.00 | 6.00 |
| *Eutectona machaeralis* | -60.00 | 50.00 | - | 40.00 | - | 40.50 | 20.00 | 2.00 | 4.00 | 10.50 | |
| *Plecoptera reflexa* | 80.00 | 80.00 | 90.00 | - | 80.00 | 60.00 | 10.50 | - | 0.00 | 10.50 | 20.50 |
| *Atteva fabriciella* | 80.00 | 84.50 | 70.00 | 70.00 | 60.00 | - | 30.50 | - | 3.00 | 7.00 | 10.50 |
| *B.t. var. thuringiensis (BTB)* | | | | | | | | | | | |
| *Hyblaea puera* | 80.00 | 85.50 | 90.00 | - | 50.00 | 40.00 | 20.50 | - | 0.00 | 3.00 | 10.00 |
| *Eutectona machaeralis* | -80.00 | 60.50 | 50.50 | 40.00 | - | 40.50 | 30.00 | 10.00 | 3.50 | 6.00 | |
| *Plecoptera reflexa* | 80.00 | 80.00 | 90.00 | - | 80.00 | 40.50 | 10.50 | - | 0.00 | 5.00 | 10.00 |
| *Atteva fabriciella* | 80.77 | 80.00 | 80.00 | 80.00 | 70.00 | - | 40.50 | - | 5.00 | 6.50 | 10.00 |
| *B. var. dendrelimus (DDB)* | | | | | | | | | | | |
| *Eutectona machaeralis* | -70.50 | 60.00 | 50.50 | 30.00 | - | 20.00 | 20.00 | 5.50 | 6.00 | 10.00 | |
| *Atteva fabriciella* | 80.16 | 80.00 | 90.50 | 90.00 | 80.00 | - | 80.00 | - | 2.50 | 5.00 | 10.50 |
| *B.t var. kurstaki dipel (BL)* | | | | | | | | | | | |
| *Hyblaea puera* | 80.15 | 80.00 | 90.00 | - | 70.00 | 40.00 | 20.00 | - | 0.00 | 6.00 | 10.50 |
| *Plecoptera reflexa* | 80.00 | 80.00 | 90.50 | - | 80.50 | 40.50 | 20.00 | - | 0.00 | 5.00 | 10.00 |

**Efficacy of varietal toxins of *B.T.***

The data Table 2 shows that all the treatments are significantly superior to the untreated control at 5% level. The results are summarised in Table 2. Roychaudhary *et al.*, (1994) also tested three varietal toxins of *Bacillus thrungiensis* viz. BTB, LDC and Dipel against the third instar larvae of teak sleletonizer, *Eutectona machaeralis*. Hence this microbial insecticide, *B. thuringiensis* can be safely used for the control of the pest population in teak nurseries and plantations ecosystem.

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