

THE QUEST FOR ANTIFEEDANTS FOR THE SPRUCE BUDWORM

(CHORISTONEURA FUMIFERANA (CLEM.))

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Extracts of non-host plants and selected naturally occurring compounds have been screened for their effects on feeding by spruce budworm larvae, (Choristoneura fumiferana (Clem.)), using as diet a filter paper substrate impregnated with the synergistic feeding stimulants, sucrose, and L-proline. The most potent feeding deterrents identified to date are alkaloids.

A simple, fast and reproducible feeding assay for spruce budworm larvae, (Choristoneura fumiferana (Clem.)), was described by Bentley, Leonard, and Mott (1979).

For the assay, sixth-instar larvae are induced to feed on a filter paper substrate impregnated with the synergistic feeding stimulants sucrose and L-proline. Frass resulting from ingestion of this material is readily recognizable, and counts of frass pellets provide an indication of the quantity consumed. The effects on feeding of adding plant extracts and test chemicals to the substrate can thus be investigated readily. Its simplicity, speed, and modest requirements for test material make this assay suitable for mass screening, and it has, to

date, been used to test more than 110 non-host plants, as well as about 60 naturally occurring chemicals, for their effects on budworm feeding.

An analysis of the results, published recently (Bentley et al. 1982), reveals that although none of the plants tested is a normal host of spruce budworm larvae, only six extracts displayed activity in the category designated "highly deterrent". All plants belonging to the most active group are known to contain alkaloids, and, in each case, the greatest activity was found to be localized in the basic fractions. Among the pure alkaloids tested, including representatives of the pyrrolizidine, solanum, quinolizidine, berberine, and strychnos groups, fewer than 25% were "highly deterrent" at the concentrations assayed.

Recent research has been directed to a "fine-tuning" of the bioassay, to provide greater sensitivity and allow more protracted observation of the effects on larvae of the test compounds. In addition, further screening is planned in an attempt to identify potent feeding deterrents with minimal toxic properties. A study of the structure-activity relationships which have begun to emerge may prove to be a profitable direction for future research.

References

- Bentley, M.D.; Leonard, D.E.; Leach, S.; Reynolds, E.; Stoddard, W.; Tomkinson, B.; Tomkinson, D.; Strunz, G.; and Yatagai, M. Effects of some naturally occurring chemicals and extracts of non-host plants on feeding by spruce budworm larvae, (Choristoneura fumiferana). Technical Bulletin 107. Life Sciences and Agriculture Experiment Station, University of Maine at Orono; 1982. 23 p.
- Bentley, M.D.; Leonard, D.E.; and Mott, D.G. Spruce budworm feeding deterrents. Paper presented at ESA National Meeting, Denver, Colorado, Nov 29, 1979.

¹Paper presented by this author.