forest health news

forest research

No. 116, March 2002

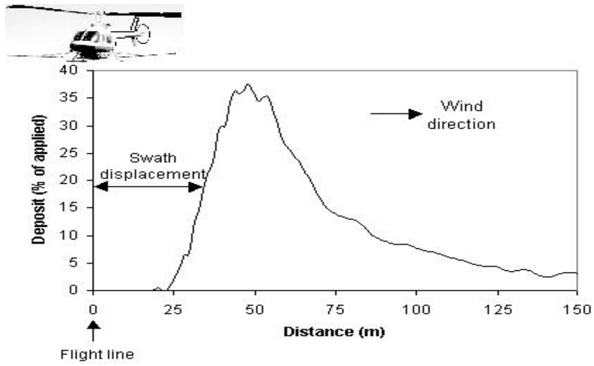
- **TECHNOLOGY AIDS PAINTED APPLE MOTH ERADICATION PROGRAMME**

Most readers of *Forest Health News* will know of the current aerial spraying programme being conducted in west Auckland by the Ministry of Agriculture and Forestry (MAF) as part of the eradication campaign against the introduced painted apple moth (*Teia anartoides*; *FHNews* **90**:1; **112**:1). However, few will be aware of some of the painstaking behind-the-scenes work that has gone into the preparation for this undertaking. As part of this groundwork, scientists at Forest Research were recently asked to provide some important operational advice to MAF based on knowledge and experience acquired during many years of field research in aerial spray methodology. An indispensable tool assisting this preparatory work was a spray simulation model known as "SpraySafe Manager", developed during the past decade by Forest Research in collaboration with the United States Department of Agriculture (USDA).

Field testing the results from the spray simulation model

The objectives and general specifications for the aerial spray operation were determined by MAF. Their initial plan was to spray Btk insecticide only over the narrow riparian margins between the Whau estuary and adjacent residential areas, where the moth larvae were most concentrated. Although evidence supports the view that Btk is not harmful to people, this approach would limit the extent to which the general population might be exposed to the insecticide.

To determine the best spray application procedures, SpraySafe Manager was used to simulate different scenarios. The software was able to predict the fate of spray droplets when released under varying conditions, and to estimate their horizontal movement from the point of release to the point of deposition on the ground. The magnitude of this displacement was very sensitive to wind speed and even relatively light winds moved the swath significantly downwind. A pilot would be required to judge the correct flight line position necessary to adjust for the estimated swath displacement. This would clearly be a difficult task, especially given variable wind speeds and the convoluted nature of the riparian strips. It was concluded that spraying a narrow strip was impractical using current application methods, and this was one reason why the operation eventually proceeded using larger spray blocks.



Model output demonstrating downwind swath displacement from the point of release. Under the initial plan, the pilot was required to judge the correct flight line position that would compensate for the displacement at the time of spraying.

In addition to determining the best aerial application strategy, the model also enabled scientists to address several areas of public concern. These included the time it took for the chemical to dry after deposition on plant surfaces, and the extent to which spray might drift over housing estates beyond the intended target area. Without the spray model, such questions could be answered only through extensive experiments or by informed guesswork.

While aerial spraying of crops or trees is never a simple operation, it is comparatively straightforward when compared to the complexity experienced working in populated areas. A forest is much more uniform than the average suburban landscape, which contains buildings, trees and other structures of varying heights and surface textures. The spray model is designed specifically for operational use in forestry and crop applications, and there are certain characteristics peculiar to the urban environment which are not yet built into this software. Future research is therefore planned with USDA collaborators to improve spray model capabilities in the urban setting.

(*Brian Richardson, Forest Research*)

- **BTK (*BACILLUS THURINGIENSIS* VAR. *KURSTAKI*)**

The aerial spraying campaign to eradicate painted apple moth from Auckland using Btk is now underway, so it is timely to recall the nature and mode of action of this widely applied organic insecticide (*FHNews* **26**:2). *Bacillus thuringiensis* var. *kurstaki* (Btk) is a bacterium found naturally in soil, which produces toxins injurious to

*Newsletter of the **Forest Health and Biosecurity Project**, and the **Forest Health Reference Laboratory** (incorporating the Forest Research Mycological Herbarium (NZFRI-M), the Forest Research Culture Collection (NZFS), and the National Forest Insect Collection (FRNZ). Edited by Ian Hood, New Zealand Forest Research Institute Ltd, Private Bag 3020, Rotorua. <ian.hood@forestresearch.co.nz> , Web site < http://www.foresthealth.co.nz>*

lepidopterous insect larvae (caterpillars of moths and butterflies). *Bacillus thuringiensis* was first isolated from diseased silkworms in Japan in 1901, and later, in 1911, from Mediterranean flour moths. Btk is only one of many varieties of *B. thuringiensis*. *Bacillus thuringiensis* var. *israelensis* (Bti), for instance, is very active against mosquito and sandfly larvae, but has only a fifteenth of the effectiveness of Btk against lepidopterous larvae. Btk grows well on standard bacterial media, and is mass-produced industrially in aerobic fermentation vats. The commercial product is prepared as either a wettable powder or an aqueous suspension, containing a mixture of bacterial endospores, crystals of a proteinaceous protoxin (toxin precursor) known as delta-endotoxin, and various additives. This mix is deposited on leaves and ingested by the larvae when they eat foliage that has been sprayed.

Delta-endotoxin is broken down enzymatically into toxic peptides in a high pH environment. This is why susceptibility to Btk is confined to insects, mainly lepidoptera, which have a strongly alkaline midgut. In these insects the breakdown products damage the gut lining, and the larvae are unable to feed. The endospores then germinate, and the larvae become filled with bacteria and die. The gut of humans and other vertebrates is acidic or only mildly alkaline, and the harmless protoxin passes through unchanged. All Bt insecticides are highly specific to their target insects, and compared to many synthetic insecticides are environmentally benign. Although there have been reports of adverse effects, risks to humans are negligible, and normal formulations and spray concentrations are generally non-toxic to mammals, birds, fish and plants.

(*Editor*)

- **INTRODUCED LEAFMINER SPREADING IN STANDS OF *EUCALYPTUS NITENS***

The black butt leafminer, *Acrocercops laciniella*, was first detected in New Zealand in Auckland early in 1999, and by February, 2001, had reached parts of the Waikato and Bay of Plenty regions (*FHNews* **83**: 1; **104**: 1). It continues to spread, and last spring was found on *Eucalyptus pilularis* (black butt) in Northland. This insect feeds on a variety of eucalypt hosts and there has been concern that it might become a significant pest in stands of *E. nitens*, as it has in plantations of *E. nitens* and *E. globulus* in Tasmania. Sure enough, populations of *A. laciniella* increased significantly in young stands of *E. nitens* in the Bay of Plenty region last summer. It is now common to find it on young flushing juvenile and sometimes adult foliage, forming characteristic spiral leaf mines that radiate out from the site where the egg was laid. Older mines eventually form a distinctive white blister that may cover up to a third of the leaf surface. There is currently no funding to support a biological control initiative against this pest, and its increase and spread is being viewed with some apprehension.

(*Toni Withers, Forest Research*)

- **STAFF MEMBER ATTENDS INSECT IDENTIFICATION COURSE**

An essential aspect of forest protection in this country is to ensure that our capability for recognising new pest and disease introductions is maintained and periodically updated. It is therefore important that appropriate staff are kept well skilled in all aspects of forest health and biosecurity. To this end a Forest Research Forest Health technician, Belinda Gresham, recently attended a one-week training course entitled *Identification of Coleoptera from the Australo-Pacific Region*. This course, run by the Australian National Insect Collection (ANIC) in Canberra, Australia, introduced participants to the diagnostic features of this large and varied group of insects, and covered the range of characters currently used for identifying adult beetles and larvae to the levels of family and subfamily. The course comprised a series of seminars, which were complemented by practical laboratory sessions where representative specimens of each taxon could be examined. The opportunity to compare a range of character-states for each diagnostic feature was particularly useful. Extensive resource material was provided, including basic dissecting equipment and copies of seminar presentations, checklists and other literature.

The course was presented by beetle expert and ANIC Honorary Research Fellow Dr John Lawrence assisted by a number of other staff members. It attracted a variety of entomological workers, including collection curators, beetle taxonomists, ecologists and quarantine officers, from Australia, New Zealand, Singapore, Japan and Spain. Many of the course participants extended their time in order to conduct their own research at ANIC, which holds in excess of eleven million specimens and is the largest collection of its type in the world. Administered by CSIRO Division of Entomology since 1962, most of the collection is housed in purpose-built, flame-proof cabinets located in facilities at the Black Mountain Laboratories in Canberra. An active volunteer programme makes a significant contribution to the organisation and maintenance of the collection.

(*Belinda Gresham, Forest Research*)

- **REQUEST FOR INSECT SPECIMENS**

A US researcher seeks collections for a molecular study on the eucalypt insect *Phoracantha semipunctata* (*Forest and Timber Insects in New Zealand* **4**). Anyone finding this longhorn beetle in eucalypt stands is asked to retain specimens, alive if possible, and contact Ecki Brockerhoff for further details.
Ph.: 03 364 2949; eckehard.brockerhoff@forestresearch.co.nz

- **NEW RECORDS**

The following records reported by the Forest Health Reference Laboratory (*Forest Research*) result from a general surveillance programme comprising public enquires, and small block and risk site surveys, funded by the Ministry of Agriculture and Forestry. Members of the public are encouraged to submit to this laboratory any samples of pests or pest damage on trees or shrubs that they suspect might be new to New Zealand. This is a free service funded by Ministry of Agriculture and Forestry for the detection of new pest introductions.

New distribution record for New Zealand – Fungus: *Gibberella tumidum*; **Bioregion:** Chatham Islands; **Host:** *Ulex euopaeus*; **Coll:** A Baird, 17/01/2002; **Ident:** MA Dick, 31/01/2002; **Comments:** This fungus can cause considerable dieback of gorse in some locations, given appropriate environmental conditions promoting infection. Records in the Forest Health database are from AK, WO, WA, TO, WN and NN. The fungus has also been reported from ND, BP, CL, BR and WD Bioregions by Landcare Research

New distribution record for New Zealand - Insect: *Eucalyptolyma maideni*; **Bioregion:** Bay of Plenty; **Host:** *Eucalyptus citriodora*; **Coll:** L Renney, 04/02/2002; **Ident:** C Appleton, 05/02/2002; **Comments:** Causing leaf deformation, spotting and minor dieback.

New distribution record for New Zealand – Insect: *Phylacteophaga froggatti*; **Bioregion:** Buller; **Host:** *Eucalyptus nitens*; **Coll:** B Doherty, 20/2/2002; **Ident:** R Crabtree, 26/2/2002; **Comments:** Causing leaf mining.

(*Geoff Ridley, Forest Research*)