yet appeared to have been the most successfully protected (Table 1).

Experiments are planned to further improve and test the effectiveness of this type of treatment and to combine the use of these repellents with pheromone-based strategies to achieve protection from ambrosia beetle damage, as well as a reduction in local beetle populations.—W.W. Nijholt, Pacific Forest Research Centre, Victoria, B.C.

Chemical Control Trials on the Box Elder Twig Borer in Alberta.—The box elder twig borer, *Proteoteras willingana* (Kft.) is a common pest of the box elder, *Acer negundo* L., in shelterbelt plantings in the Prairie Provinces. In severe infestations many dormant buds and new shoots are destroyed and the destruction causes stunting and disfigurement of trees and seedlings. This note reports on the results of eight chemical insecticides applied as soil drenches in 1973 and 1974 and as foliar sprays in 1975, 1976, and 1978 to control this insect in three locations in Alberta.

The development of *P. willingana* in Alberta is about 2 wk later than that reported for Indian Head, Sask., by Peterson (Can. Entomol. 90:639-646, 1958). In Alberta, female moths usually lay a single egg near the midvein on the underside of the leaf in mid-July. After hatching from late July to mid-August, the first- and second-instar larvae, appearing from early to late August, skeletonize the mesophyll of the leaves. When the larvae reach the third instar, between mid-August and early September, they migrate down the leaf petiole to the twig and bore into a leaf bud. The fourth instar and an occasional fifth, appearing from June to mid-September, spin hibernacula in the fall and then overwinter. In the spring they become active and leave the hibernacula to resume feeding in the buds. In early June the fifth-instar larvae bore downward into the current shoots, the extensive feeding and tunnelling causing the tips to swell and form spindle-shaped galls. These galls usually become desiccated and die. Mature seventh-instar larvae leave the galls in early July, drop to the ground, and pupate in the duff and leaf mold. Adults emerge in late July, and egg-laying begins a few days later.

Insecticides used for the soil-drench trials were placed at the base of the tree in early May before insect activity began and were drenched with water to enhance translocation of the chemicals. Dimethoate, aldicarb, carbofuran, diazinon, oxydemeton-methyl, mexacarbate, and phorate were applied in 1973 and 1974 at Erskine, Stettler, and Bashaw at the rate of 4.5 g active ingredient/cm basal diameter for granular concentrates and 5.6 mL a.i./cm for emulsifiable concentrates. All plots consisted of 10 trees each, including the control plots. Percentage insect control was determined by applying Abbott's formula (J. Econ. Entomol. 18:265-267, 1925) to counts of living and dead larvae on eight 45 cm branches taken from each tree in the treatment and control plots approximately 8 wk after treatment.

Foliar sprays were applied with a hydraulic sprayer unit in early August 1975, 1976, and 1978. Plots consisted of two replicates of 0.04 ha each in a randomized block design in a box elder, or Manitoba maple, shelterbelt at Erskine. Spray solutions were applied at a pressure of 60 kg cm^{-2} and a rate of 114 L per plot at 0.5 mL a.i./L with a spreader sticker (Atplus 526) added at the rate of 0.25 mL/L. Percentage insect control was determined 24 h later by the previously described method. Results of all field tests are shown in Table 1.

Soil drenches did not perform well, except in one test with dimethoate that gave excellent borer control. Low soil moisture may have been a contributing factor. Foliar-spray results were good except for the 1975 test with diazinon, possibly because of rain showers that came shortly after application. No phytotoxicity was recorded on box elder from either soil or foliar application of the chemicals tested. Foliar sprays in Alberta should be applied in late July or early August for 2-3 consecutive years for maximum control. Dimethoate and diazinon are now registered for foliar application on box elder to control the box elder twig borer.—J.A. Drouin and D.S. Kusch, Northern Forest Research Centre, Edmonton, Alta.

TABLE 1
Results of chemical control field tests on the box elder twig borer, *Proteoteras willingana* (Kft.), 1973-76 and 1978

Material	Type	Location	Living (L) and dead (D) larvae and percentage control (%)													
			1973			1974			1975			1976			1978		
			L	D	%	L	D	%	L	D	%	L	D	%	L	D	%
Dimethoate	SD[1]	Erskine	0	3	100	2	5	66	—	—	—	—	—	—	—	—	—
Dimethoate	H[2]	"	—	—	—	—	—	—	—	—	—	10	29	73	3	13	76
Aldicarb	SD	"	22	18	45	—	—	—	—	—	—	—	—	—	—	—	—
Carbofuran	SD	"	19	9	32	—	—	—	—	—	—	—	—	—	—	—	—
Carbofuran	SD	"	—	—	—	18	3	1	—	—	—	—	—	—	—	—	—
Carbofuran	SD	Stettler	74	25	18	—	—	—	—	—	—	—	—	—	—	—	—
Diazinon	SD	Erskine	10	4	29	—	—	—	—	—	—	—	—	—	—	—	—
Diazinon	H	"	—	—	—	—	—	—	15	8	33	—	—	—	2	7	70
Oxydemeton-methyl	SD	Stettler	27	8	16	—	—	—	—	—	—	—	—	—	—	—	—
Mexacarbate	SD	Bashaw	22	8	27	—	—	—	—	—	—	—	—	—	—	—	—
Phorate	SD	"	39	5	11	—	—	—	—	—	—	—	—	—	—	—	—
Malathion	H	Erskine	—	—	—	—	—	—	—	—	—	5	20	79	—	—	—
Control plot		"	22	0	100*	6	1	86*	29	1	97*	64	3	96*	64	3	96*
Control plot		Stettler	33	3	92*	—	—	—	—	—	—	—	—	—	—	—	—
Control plot		Bashaw	2	0	100*	—	—	—	—	—	—	—	—	—	—	—	—

[1]SD = soil drench.
[2]H = hydraulic spray.
*Percentage living larvae in control plot.

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