FUMIGATION OF BAREROOT AND CONTAINER-GROWN LODGEPOLE PINE SEEDLINGS FOR EUROPEAN PINE SHOOT MOTH CONTROL

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Methyl bromide effectively controls European pine shoot moth in either fall or spring fumigation. Phytotoxicity of methyl bromide to lodgepole pine seedlings was evident.

The European pine shoot moth, *Rhyacionia buoliana* (Schiffermueller), introduced into North America from Europe, was first reported as damaging Scots pine in New York in *1914 (1).* The insect was first found in British Columbia, at Vancouver, in 1925 (4) and by 1961, it had spread from the coast to the Okanagan Valley (6). It severely affects both terminal and lateral buds, as well as new growth on some species of pines.

Because of the destructive potential of this insect, nurserymen, foresters, and entomologists are concerned that it could spread via infested nursery stock (2) to new plantations or native pine stands. Consequently, regulations have been adopted in B.C. which require that pine nursery stock grown in the Vancouver forest district, where the moth occurs, be fumigated with methyl bromide before leaving the nursery (5).

Both bareroot and containergrown stock are shipped from the nursery in spring or fall; the proportions shipped in either season vary according to planting conditions in the field.

The chemical experiment was designed to determine the susceptibility of the European pine shoot moth in the container and bareroot nurseries to methyl bromide fumigation in spring and fall and, concurrently, to determine any phytotoxicity the fumigation might have to seedlings.

Table 1.—*European pine shoot moth mortality and temperature and relative humidity during fumigation*

Test dates	No. of tips	Percent larval mortality	Chamber Temp. °F (°C)	Chamber Humidity percent
1971				
1 - 9/10	125	99.00	48 (9)	96
2 - 10/10	120	97.00	52 (11)	94
3 - 10/24	111	100.00	46 (8)	87
4 - 10/25	57	100.00	44 (7)	90
1972				
5 - 2/24	140	98.00	42 (6)	95
6 - 3/7	130	94.00	48 (9)	92
7 - 3/17	128	100.00	65 (18)	88
8 - 3/27	125	100.00	52 (11)	95
9 - 3/27	125	100.00	52 (11)	90
10 - 3/28	141	100.00	58 (14)	76
11 - 3/29	131	100.00	50 (10)	80
1973				
12 - 2/24	140	98.00	45 (7)	86
13 - 3/17	128	100.00	47 (8)	89

Material and Methods

The fumigation trials were conducted using a small portable fumigation chamber as described earlier (3). Temperature and relative humidity were determined at each fumigation. The methyl bromide was applied at the rate of 1 lb *(453* g) per *250* ft^3 (ca. 7.1 m^3) of chamber space. A series of 13 fumigation trials were conducted: four in September-October *1971,* seven

Table 2.—*Mortality of fumigated and unfumigated seedlings*

Treatment	Greenhouse Transplant		Field Transplant	
	No. of seedlings	Percent mortality	No. of seedlings	Percent mortality
Bareroot fumigation	607	4.8	1138	7.3
Bareroot control	100	0	100	2.0
Container fumigation	443	0	492	11.2
Container control	80	0	50	4.0

in February-March 1972, and two in February-March 1973. The stock treated included: 1-0 lodgepole pine both in and extracted from styroblocks, and 2-0 lodgepole pine bareroot stock in the nursery bed and lifted from the bed. As this stock had not been attacked by the European pine shoot moth, infested lodgepole pine shoots were interspersed among the container grown and bareroot seedlings. After fumigation, the infested shoots were removed, dissected, and dead and living larvae were counted.

To determine any phyotoxic effects of the methyl bromide fumigation, each class of stock was divided after fumigation and transplanted into the greenhouse or the field for further observations. The greenhouse transplants were grown in 6-inch plastic pots containing equal parts of sand and peat. Those transplanted into the field were grown in sod at the Surrey Nursery. Control seedlings, i.e., unfumigated 1-0 container stock and 2-0 bareroot stock, were transplanted at the same time.

Results and Discussion

These experiments showed that the larvae were equally susceptible to spring or fall fumigation. A 99 percent average kill was achieved, with most fumigations being 100 percent effective. Where less than 100 percent mortality occurred, we feel it was attributable to the infested shoots being wet with rain at the time of fumigation. Higher insect mortality correlated fairly well with lower humidity and higher temperature (table 1).

In observations for phytotoxic effects of methyl bromide, no difference in mortality was seen between the container stock treated before and after extraction, or between the bareroot stock lifted before and after fumigation. Mortality of fumigated seedlings averaged 5 percent more than that of the control seedlings (table 2). Mortality of seedlings transplanted into the field, in all cases, was more than that of those transplanted into the greenhouse. The higher mortality in the field was undoubtedly due to the less favorable growing conditions. From this experiment, we have concluded that the European shoot moth infested bareroot and container stock is susceptible to methyl bromide fumigation in either spring or fall, and the methyl bromide fumigation has a negligible phytotoxic effect on dormant container grown or bareroot lodgepole pine seedlings, either before or after extraction.

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