



Insecticides against Nantucket pine tip moth

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Monterey pines in California have long been infested with Monterey pine tip moth, *Rhyacionia pasadenana*, both tree and insect being natives. Occasionally noticeable damage occurred and DDT or lindane sprays were suggested for control. In 1967 a related but much more damaging and invasive insect—the Nantucket pine tip moth, *Rhyacionia frustrana*—was accidentally introduced into Santee. Curiously, this insect was introduced into San Diego County from Tifton, Georgia, on young Christmas tree seedlings of our own native Monterey pine. When first described by Comstock 100 years ago, *R. frustrana* was very common on Nantucket Island near Massachusetts.

In 1971, when first recognized in California, the Nantucket pine tip moth infested landscape and nursery pines throughout 30 square miles of San Diego County; small infestations were also found in Chino (San Bernardino County) and Wasco (Kern County). Today the moth covers more of San Diego County, is established in Orange County, and has been found in Riverside County. It will surely spread to other California locations having pines with 2- or 3-needle fascicles. Growing tips, especially in the tree tops, are tunnelled out and killed by as many as 30 larvae per tip. The unsightly, collapsed, brown, dead tips result in a proliferation of lateral buds which then also become infested. The continued killing of the top tips results in a low,

spherical, bushy tree rather than one with the usual conical shape.

Spray experiments were conducted at Santee in 1973 in part of the trees from Georgia, and again in 1974 in another part of this Christmas tree plantation. As *R. frustrana* has at least four annual generations in California, 4 cover sprays were applied in 1973 (on May 2, June 6, July 11, and August 31) in 1974 (on May 13, June 17, July 24, and September 3). Samples were taken on October 16, 1973 and on October 15, 1974. Sprays were buffered to pH 6.6. Sprays in 1973 were at the rate of 1 pound active ingredient (= ai) per 100 gallons of water. Besides spraying we also tested: (a) Christmas tree soil treatments with a lawn spreader (at 17 gms ai/tree) at El Cajon in 1974; and (b) landscape pine spreader/auger soil treatments and trunk implant treatments at La Mesa in 1976. The 1974 soil treatments were applied June 19 and sampled October 15, whereas in 1976 application was on March 23 and sampling on October 26. Each mean in tables 1 through 4 represents 1600 pine tips from these randomized-block experiments in which each treatment was replicated 4 times. (In a column, means followed by the same letter are not significantly different at 19:1 odds.)

Results

During each of two seasons 4 sprays of Zectran, phosalone, acephate, or dimethoate adequately controlled the damage of the Nantucket pine tip moth (tables 1 and 2). Zectran, acephate, and dimethoate are presently registered for this use, but because Zectran is no longer manufactured it may be difficult to find. We do not yet have data on damage that would result from fewer than 4 sprays, but with soil treatments one spreader application of granular carbofuran, on either Christmas trees (table 3) or landscape pines (table 4), gave fairly good season-long control of damage. A full-fledged registration for this use of granular carbofuran is not available, but limited special local needs registrations on Christmas trees have been obtained in San Diego and Orange counties. Granular disulfoton is registered for control of this insect and has been used in California, but in our tests it was not very effective. Trunk implants of systemic insecticides do not appear promising. In another small experiment two trees were pruned to the extent and at the times of good grower practice; pruning alone yielded 86 percent clean tips.

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TABLE 1. Spray Treatments for Nantucket Pine Tip Moth on Christmas Trees, Santee, 1973.

Insecticide and formulation	Percent infested pine tips
Zectran 2EC	6.0 a
Dimethoate 2.67EC	11.1 ab
Phosalone 3EC	11.2 ab
Acephate 75SP	11.6 ab
Carbaryl 80SP	16.3 abc
Trichlorfon 80SP	17.8 bc
Oxydemetonmethyl 2EC	18.0 bc
Gardona 75WP	18.1 bc
Mesurof 75WP	18.9 bc
Methoxychlor 2EC	27.1 c
Diazinon 4EC	39.6 d
Lindane 1.65EC	45.1 de
Malathion 4EC	53.8 e
Untreated check	76.0 f

TABLE 2. Spray Treatments for Nantucket Pine Tip Moth on Christmas Trees, Santee, 1974

Insecticide and formulation	lb ai/100	Percent infested pine tips
Phosalone 3EC	1	5.8 a
Zectran 2EC	1	6.2 ab
Imidan 50WP	1	6.6 ab
Acephate 75SP	3/4	9.3 abc
Acephate 75SP	1	9.9 abc
Acephate 75SP	1/2	10.4 abc
Dimethoate 25WP	1	10.7 abc
Chlorpyrifos 4EC	1	11.2 abc
Trichlorfon 80SP	1	11.9 abc
Dimethoate 2.67EC	1	12.1 abc
Acephate 1.3EC	3/4	12.4 abc
Acephate 1.3EC	1	12.8 abc
Chlorpyrifos 4EC	3/4	13.3 bc
Chlorpyrifos 4EC	1/2	14.6 c
Acephate 75SP	1/4	15.5 c
Untreated check		61.9 d

TABLE 3. Granular Insecticide Soil Treatments for Nantucket Pine Tip Moth on Christmas Trees, El Cajon, 1974.

Insecticide and formulation	Percent infested pine tips
Carbofuran 10G	8.2 a
Aldicarb 10G	14.6 a
Disulfoton 15G	48.8 b
Acephate 10G	58.6 b
Untreated check	49.8 b

TABLE 4. Soil and Trunk Implant Treatments for Nantucket Pine Tip Moth on Landscape Pines, La Mesa, 1976

Treatment and formulation	gm ai/4 in. trunk circumf.	Percent infested pine tips
Soil treatment:		
Spreader carbofuran 10G	5.4	14.5 a
Auger carbofuran 10G	5.4	32.7 a
Trunk implant:		
Medicap acephate tech.	1.25	68.7 b
Medicap dimethoate tech.	1.25	69.7 b
Acephate 75S solution	0.18	74.3 b
Dimethoate 2.67EC	0.32	73.2 b
Untreated check:		78.7 b