Howitt, A. J. 1958. Chemical control of **Hylemya antiqua** (Meig.) in the Pacific Northwest. J. Econ. Entomol. 51:883-887.

————, and S. G. Cole. 1959. Chemical control of the carrot rust fly, **Psila rosae** (F.), in Western Washington. J. Econ. Entomol. 52:963-966.

———— ————. 1962. Chemical control of **Hylemya brassicae** in the Pacific Northwest. J. Econ. Entomol. 55:33-38.

Kenaga, E. E. 1963. Commercial and experimental organic insecticides (1963 Revision) indexed as to their scientific, common, and trade names, code designations, uses and manufacturers. Bull. Entomol. Soc. America 9:67-103.

Niemczyk, H. D., and C. R. Harris. 1962. Evidence of carrot rust fly resistance to aldrin and heptachlor in Canada. J. Econ. Entomol. 55:560.

FURTHER INSECTICIDE TESTS AGAINST THE DOUGLAS-FIR NEEDLE MIDGES, *Contarinia* SPP.[1]

D. A. ROSS[2], J. C. ARRAND[3], AND N. J. GEISTLINGER[2]

Introduction

In 1962, at Larkin, B.C., endosulfan (Thiodan) and DDT emulsible concentrates diluted to 0.3% and applied to run-off, when the buds had flushed, gave satisfactory control of *Contarinia* spp. (Ross and Arrand 1963).

In 1963, at Invermere, the effectiveness of lower concentrations of Thiodan and DDT wettable powders (WP), and Thiodan emulsible concentrate (E) was tested on single trees. Additional trials at Canal Flats to measure control in large blocks, and at Larkin to establish the optimum time for spraying, did not produce adequate data because of low numbers of *Contarinia* spp.

Methods and Results

At Invermere, 10 trees from 5 to 7 ft tall were used for each treatment and 10 were left unsprayed as checks. Insecticides were applied with a hand sprayer to run-off.

One Imperial gal of water was added to each of the following quantities of commercial concentrates to obtain the finished formulations:

1½ tablespoons Thiodan emulsible concentrate containing 2 lbs technical Thiodan per Imperial gal (0.1%); 1½ tablespoons of Thiodan 50% wettable powder (0.2%); 1½ tablespoons of DDT 50% wettable powder (0.2%).

Sprays were applied under warm (78 to 81° F.) calm conditions on May 22 and 23, when an average of 75% of the buds in the upper crown and 85% in the lower crown were open. At the time of spraying, midges were ovipositing on the buds.

Percentage infestation was determined in October from 10 terminal twigs picked at random at breast height from each tree (Table 1).

Wettable powders of Thiodan and DDT at 0.2% concentration, on the foliage of individual trees did not give adequate control, but an application of Thiodan emulsion at 0.1% concentration gave good control.

In October five twigs from each tree were examined for eggs of the spruce spider mite, *Oligonychus ununguis* (Jacot). Counts were limited to the basal inch of the underside of the terminal twig (Table 2).

There was no apparent difference between the check and the Thiodan treatments, but the DDT-treated samples had almost 100 times more

---

1 Contribution No. 1086, Forest Entomology and Pathology Branch, Department of Forestry, Ottawa, Canada.

2 Forest Entomology Laboratory, Vernon, B.C.

3 Asst. Provincial Entomologist, Vernon, B.C.

TABLE 1—Percentage Infestation of Current Year's Douglas-Fir Needles by **Contarinia** spp. Invermere, B.C., October, 1963.

Treatment (May 22, 23) 1963	Concentration %	Average	Range
Check	—	28.6	16 - 40
Thiodan E	0.1	5.4	2.9 - 8.6
Thiodan WP	0.2	13.2	4.8 - 31.9
DDT WP	0.2	14.5	1.2 - 28.8

mite eggs than the check or Thiodan treatments.

Two plots of 0.7 and 1.5 acres, at Canal Flats and Edgewater respectively, were each sprayed using a gas-powered machine, with Thiodan wettable powder at the rate of 2 lb per 100 gal (0.1% concentration) per acre. The machine had a portable slip-on tank and an Echo low volume pump with a 2.25 hp motor. The gun was a trigger-controlled Spraymiser.

Good data were not obtained at Canal Flats, because fewer than 2% of the needles in the check plot were infested by *Contarinia* spp. At Edgewater foliage in the check plot was 62% infested, whereas foliage in the treated plot was only 2% infested.

Discussion

Control was unsatisfactory with 0.2% concentrations of wettable powders of Thiodan and DDT at Invermere, applied with a hand sprayer. Thiodan emulsion at 0.1% was superior to the wettable powder at 0.2%. It seems likely that the superior control can be explained by the attributes of an emulsion such as better adhesion qualities, possibly greater penetration, or even greater inherent toxicity. Wetting agents will be used with wettable powders in future trials to see if control can be increased with this formulation.

In the tests of 1962 there was some slight 'burning' of a fraction of one per cent of the new foliage where DDT emulsible concentrate was used. No burning was apparent in the 1963 trials.

Better control with Thiodan wettable powder was obtained at Edgewater than at Invermere. This may be because the ground and all vegetation at Edgewater was wetted with spray whereas at Invermere only the test trees were sprayed and there was little drift of poison onto the ground or vegetation about the trees.

These tests demonstrated the practicability of protecting commercially-grown Douglas-fir Christmas trees from injurious attack by *Contarinia* spp. with early season sprays of Thiodan.

The DDT-treated samples at Invermere, B.C., bore almost 100 times more mite eggs than did those from the check or Thiodan treatments. This confirms reports of infestations by spruce spider mite following treatment with DDT, the earliest by Hoffman and Merkel in 1948. It would obviously be unwise to recommend DDT because of the possibility of inducing an epidemic of this destructive mite.

The importance of determining the need for chemical control just

TABLE 2—Average number of Mite Eggs on Basal Lineal Inch of Terminal Douglas-Fir Twig, 5 Twigs From Each of 10 Trees. Invermere, B.C., October 30, 1963.

Treatment (May 1963)	Range between trees	Mean
Check	0 - 3.2	0.58
Thiodan E	0 - 0.4	0.11
Thiodan WP	0 - 1.0	0.18
DDT WP	12 - 109.0	52.00

before the emergence of midges from the ground in spring was demonstrated at Larkin and Canal Flats. There was moderate to severe foliage damage at these localities during 1962, but high mortality of midges occurred, resulting in a population collapse by the spring of 1963.

Summary

At Invermere, B.C. in 1963, 0.1% Thiodan E applied to individual trees with a hand sprayer at the time of bud opening gave satisfactory control of Douglas-fir needle midges. At the concentrations used, 0.2% Thiodan WP and 0.2% DDT WP, gave inadequate protection.

By October 1963, the number of mite eggs on the trees with the DDT treatment was approximately 100 times greater than the number on those with Thiodan treatments, and the check.

At Edgewater, Thiodan WP at 2 lb per 100 gal applied with a gas-powered sprayer gave excellent control of the Douglas-fir needle midges. Anyone using this control method should be cautioned that Thiodan is a chlorinated hydrocarbon and should not be used where cattle may graze within 30 days of treatment.

Acknowledgements

The writers are grateful for the assistance of members of the British Columbia Forest Service in applying the spray on two of the areas, for the use of equipment, and for permission to use an experimental Christmas tree stand at Invermere. Kirks Ltd. kindly permitted tests to be carried out on their holdings at Edgewater, B.C.

References

Hoffman, C. H., and E. P. Merkel, 1948. DDT and the arthropod population in forests. J. Econ. Ent. 41:464-473.

Ross, D. A., and J. C. Arrand, 1963. Preliminary insecticide tests against the Douglas-fir needle midges, **Contarinia** spp., Larkin, B.C., 1962. Proc. B.C. Ent. Soc. 60: 32-33.

STAPHYLINIDS DAMAGING BLOSSOMS

In the first week in May, 1964, W. D. Touzeau, Plant Protection Division, Vancouver, asked me to go with him to investigate a serious infestation of rove beetles on fruit tree blossoms. On May 8, we visited a West Vancouver home on Shamrock Place, south of the upper levels highway. The sloping backyard garden was planted in fruit trees and bushes. Blossoms of apple, pear, flowering cherry, red and black currant were swarming with beetles, as many as six per blossom. Nearby rock plants such as **Arabis albida, Aubretia deltoides,** and **Papaver nudicaule** were also attractive. Raspberry and strawberry blossoms had no beetles.

The beetles were head down in the corolla of the blossom, with their mouthparts at the base of the petals. They withdrew and dropped at the slightest disturbance. It was likely that they were feeding in the region of the nectaries. In the process, the stamens were injured and shortly turned brown. Fruit set was very light.

The beetles have appeared in this garden at the same time for four consecutive years. They are present in large numbers for about two weeks. The beetles were identified as **Pelecomalium testaceum** Mann. by W. J. Brown of the Entomology Research Institute, Ottawa.

Little appears to be known about the species which is apparently indigenous to the Pacific northwest, and is described as very common in British Columbia, Washington, Northern Idaho, and Oregon (Hatch, 1957). Mrs. Clark (1949) found a specimen on skunk cabbage at Terrace, B.C., and Casey (1893 **in** Hatch, 1957), states that the genus occurs on flowers.

References

Clark, M. E. 1949. An annotated list of the Coleoptera taken at or near Terrace, B.C. Part 2. Proc. Entomol. Soc. Brit. Columbia 45:21-24.

Hatch, M. H. 1957. The Beetles of the Pacific Northwest. Part II: Staphyliniformia. University of Wash. Press. Seattle. p. 55.

--P Zuk, Research Station, 6660 N.W. Marine Drive, Vancouver, B.C.