THE PERFORMANCE, PHYTOTOXICITY AND PERSISTENCE OF THREE PETROLEUM OILS FOR CONTROL OF THE PEAR PSYLLA[1,2]

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ABSTRACT

Good control of the pear psylla, **Psylla pyricola** Foerster, was obtained with two of three petroleum oils tested under field conditions. Each oil was applied three times during the season, once in the delayed dormant stage and twice in the summer. Oil B (vis. 145 S.S.U.) and oil C (vis. 70 S.S.U.) provided seasonal control. Oil A (vis. 71.7 S.S.U.) did not give satisfactory control because of poor kill of pear psylla adults.

All three oils caused enlargement and suberization of the bark lenticels on Bartlett pear trees. There was no significant injury to foliage. Oil treated fruit was equal in quality to fruit from a standard treatment.

The three oils persisted upon foliage for more than 35 days after treatment. Oils A and B showed no loss from the initial deposit. Oil C had a higher initial deposit but this deposit declined 36 per cent after 8 days.

INTRODUCTION

The resurgence of interest in the use of petroleum oil for control of the pear psylla, *Psylla pyricola* Foerster, is partly due to the problem of resistance and partly to the possibility that oils may fit into an integrated control program. Smith (1965) in New York has shown that oils are promising for early season control of the pear psylla. The complexities in evaluating oils because of phytotoxicity and the wide range of oil specifications have been indicated by Howitt and Pshea (1965).

Studies in British Columbia by Madsen and Williams (1967) showed that an oil of 145 viscosity gave better control of the pear psylla with less phytotoxicity than oils of 60 viscosity. The 60-viscosity oils did not persist upon foliage—a desirable property—but the lack of adequate control precluded further evaluation of oils of this viscosity. In 1966 an oil of 70 viscosity, one of 71.7, and the 145-viscosity oil mentioned above were evaluated for pear psylla control, phytotoxicity and persistence on pear foliage.

MATERIALS AND METHODS

The properties of the three oils are shown in Table 1. Experimental plots were located in a mature Bartlett pear orchard near Kelowna, B.C., which had a high overwintering population of pear psylla. Each plot consisted of 32 trees in a 4x8 block with two replications per treatment. The oils were used in a 3-spray program, one at the delayed dormant stage of tree development (21 Mar.) and two during the summer (6 June and 13 July). All treatments were made with a concentrate sprayer set to deliver 60 gal[3] of spray mixture per acre. The oils were used at a dosage of 5 gal of formulated oil per acre[4].

Perthane, [1,1-dichloro-2,2-bis(*p*-ethylphenyl) ethane], at a dosage of 1 gal of 4.5 E.C. in the delayed dormant period and 2 gal of 4.5 E.C. in each of the two summer sprays was applied as a standard treatment.

Control was evaluated by counts of pear psylla adults and nymphs at approximately biweekly intervals. Adults were sampled by limb beats with an 18x18 inch[5] tray held beneath the branch. Each sample consisted of two limb beats per tree. The 12 center trees in each plot were sampled. Nymphs were counted on 100 leaf samples, 50 from senescent leaves and 50 from new growth. An

1 **Psylla pyricola** Foerster (Hemiptera: Psyllidae)
2 Contribution No. 209, Research Station, Research Branch, Canada Department of Agriculture, Summerland, British Columbia.
3 Imp. gallon — 4.55 l
4 Acre — 0.405 ha
5 Inch — 2.54 cm

TABLE 1.—Specifications of the petroleum oils evaluated for pear psylla control.

Specifications	Oil A[1]	Oil B[2]	Oil C[3]
Viscosity (S.S.U. at 100°F)	71.7	145	70
50% distillation temperature at 10 mm Hg	443	490	425
Corrected to 760 mm Hg	720	774	699
10-90% distillation range at 10 mm Hg	72	107	95
Average molecular weight	325	385	320
Unsulfonated residue	96.3	94	92

[1] Orchex 796—Humble Oil Company.
[2] Volck Supreme—Chevron Chemical Company.
[3] Pennsalt Superior—Pennsalt Chemicals Corporation.

untreated check plot was maintained until 6 June. At that time it was necessary to spray the untreated trees with Perthane to prevent excessive damage to the leaves and fruit.

Oil deposits were analyzed by a modified gravimetric method first described by Pearce, Avens and Chapman (1941). Leaf samples consisted of 50 leaves per tree picked at random from five trees in each plot.

Phytotoxicity was determined by field observation of the treated trees. At harvest four boxes each of oil-sprayed pears and pears from the standard treatment of Perthane were picked and placed in standard cold storage. The pears were removed after two months' storage and evaluated for quality.

RESULTS

PEAR PSYLLA CONTROL

Adult and nymphal counts (Fig. 1) show that Perthane gave adequate control of the pear psylla. It was not necessary to apply a second summer spray on 13 July but by 1 Aug. the infestation had increased to a level that required a second summer spray. Oils B and C gave good control, with oil C being slightly better than oil B. Oil A gave poor control and a Perthane spray was applied 13 July to prevent excessive injury to foliage and fruit.

The performance of these oils can be explained by their relative effectiveness against adult pear psylla since they all gave good control of the nymphal stages. It has been shown by several investigators (Smith 1965, Madsen and Williams 1967) that oil has no residual effect against pear psylla adults, nymphs or eggs, but that residual oil deposits on bark deter egg laying. In the trials at Kelowna oil deposits on leaves did not deter egg laying and the degree of reinfestation depended upon the number of surviving adults. The nymphal population in the oil A plot increased rapidly and required retreatment 3 to 4 weeks after the summer oil spray was applied.

The decline in adult populations in both treated and check plots from 30 Mar. to 18 May was due to natural mortality of the overwintered adults. The rapid rise in adults after 18 May reflected the appearance of the first generation of summer adults. The nymph counts on the check trees were not included in Fig. 1. The counts on these trees were 1655 nymphs per 100 leaves on 18 May and 2160 per 100 leaves on 6 June.

PHYTOTOXICITY

The oil-sprayed trees were examined at frequent intervals for injury. There was little leaf injury although some spotting occurred on sucker growth in the tree centers. The grower applied a nutrient spray containing iron, zinc, manganese and magnesium a week after the first summer spray of oil. This treatment caused a general leaf spotting throughout the orchard and the injury was more apparent on the oil-sprayed foliage. By harvest, bark injury of equal intensity was noticeable on all trees sprayed with oil (Fig. 2). Bark lenticels were enlarged and suberized on the current year's growth and on 1- and 2-year-old wood. The damage is

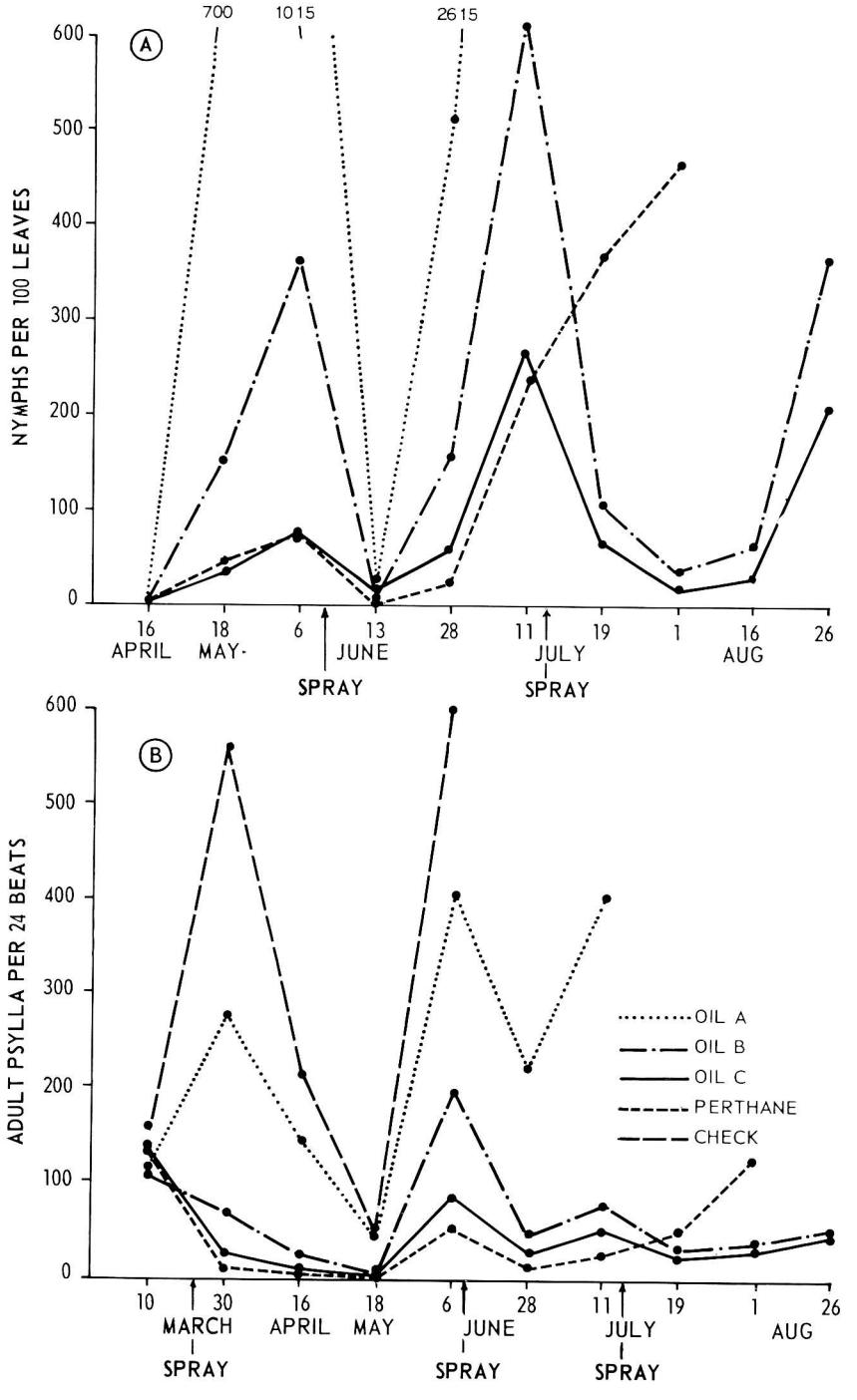

Figure 1.—Pear psylla control with oils—1966.

TABLE 2.—Initial deposit and persistence of oils upon pear leaves (micrograms per cm^2)

Oils	0 day	8 days	15 days	22 days	35 days
Oil A[1]	55	51	50	45	51
Oil B[2]	58	61	56	45	66
Oil C[3]	84	54	41	41	49

[1] Orchex 796—Humble Oil Company.
[2] Volck Supreme—Chevron Chemical Company.
[3] Pennsalt Superior—Pennsalt Chemicals Corporation.

superficially similar to that caused by egg deposition of the buffalo tree hopper. It is not known when this injury occurs, but the presence of enlarged lenticels on the current season's growth indicates that summer sprays are involved. The fruit from the oil-sprayed and Perthane-treated trees was removed from cold storage on 24 Nov. and examined after being held for eight days at 21.1°C. There was no difference in appearance, ripening, eating quality and condition between the two lots of fruit. Reyneke and Pearse (1945) found that pears dipped in an oil emulsion showed reduced respiratory activity. This resulted in better keeping qualities in storage and an increased juice content.

PERSISTENCE

The analytical data on oil deposits and persistence upon pear leaves are shown in Table 2. Oils A and B showed no dissipation up to 35 days after treatment. Oil C gave a higher initial deposit than either of the other oils and the deposit was reduced by 36% within eight days. After this early loss, there was no further dissipation of oil C. These data are in agreement with the work of Fiori, Smith and Chapman (1963). They showed in laboratory tests that there was no volatilization of oils with an average molecular weight of 300 or above. All three of the test oils fall within this category. The high initial deposit obtained with oil C may be due to the type and amount of emulsifier in the formulation. It has been shown by Marshall (1958) that surfactants will often increase the deposit of spray materials in a concentrate application.

It has been mentioned previously that persistence of oil upon foliage is not a desirable attribute. The presence of oils upon leaves has caused phytotoxic problems when other pesticides are applied after an oil spray (Madsen 1964).

DISCUSSION

These data indicate that certain petroleum oils can provide control of the pear psylla in British Columbia orchards. One weakness of oils is their complete lack of residual action. Unless a high initial adult kill can be obtained, reinfestation will nullify good control of the nymphal stages. The difference in control of adults obtained from oil A compared to oils B and C is difficult to explain. Studies in 1965 by Madsen and Williams (1967) had indicated that oils of 60 viscosity were poor against adult pear psylla. Smith (1965) in New York did not find that oils in the range of 60 viscosity gave poor control. Since oils A and C have similar properties and are both paraffinic in origin, there must be other factors which account for differences in control. One possibility is the wetting properties of the formulated oils. Oil C contained a higher percentage of emulsifier than A and the latter oil may not have wetted the adults sufficiently to obtain control. This point will be investigated further.

Although there was no adverse effect of the oils on fruit or foliage, the enlargement of bark lenticels is of concern. The long-term effect of this symptom on growth and fruit production needs to be determined, and studies to ascertain if altering the time of treatment will reduce or prevent injury are underway.

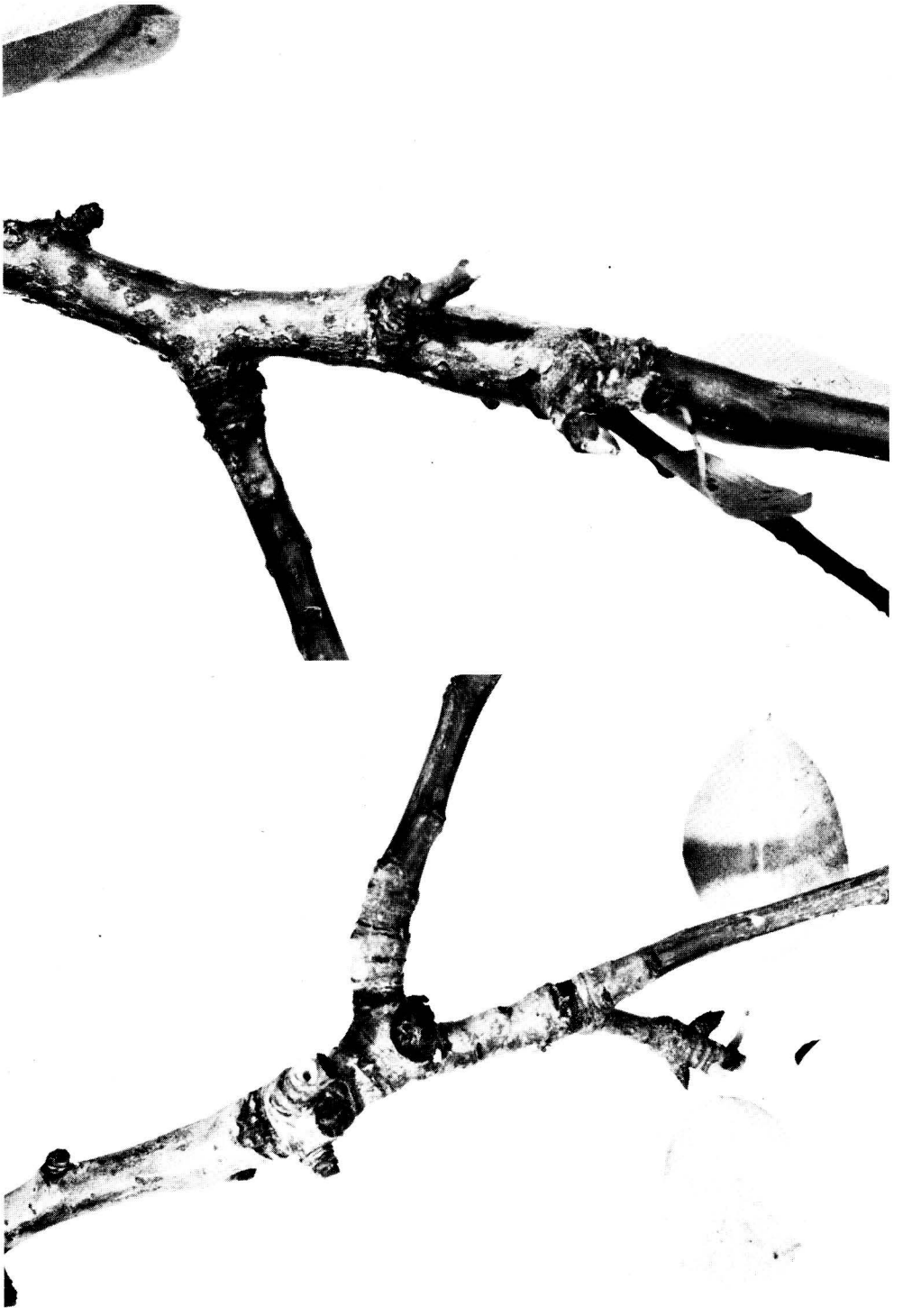

Figure 2.—Oil-treated Bartlett pear twig (upper) compared to a Perthane-treated twig (lower).

When this study was initiated, it was hoped that oils could be found that would control the pest and dissipate rapidly from treated surfaces. Thus far, all the oils which have given good pear psylla control have been persistent upon pear leaves. Although petroleum oils have drawbacks they do offer promise as a means of control if resistance develops to the insecticides currently recommended.

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NOTE ON DAMAGE TO GRASSES IN THE PEACE RIVER REGION BY THE SPITTLEBUG, *PHILARONIA BILINEATA* SAY, (CERCOPIDAE:HEMIPTERA)

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ABSTRACT

Nymphs of the spittle bug, **Philaronia bilineata** Say, were observed to feed on seed stalks of Merion bluegrass near Dawson Creek, B.C. When nymphs fed on a tuft all the seed stalks turned white and died, regardless of how many nymphs were present. This suggested that the nymphs were phytotoxic or possibly a vector of a pathogenic organism. The damage differed from other types observed and studied. Red fescue was much less affected. Treatment with DDT is recommended.

In 1965 some fields of Merion bluegrass near Dawson Creek, British Columbia, were infested with a spittlebug, *Philaronia bilineata* Say, which caused damage of a type not previously noted in the Peace River region. The damage became evident in the last week of May when the earliest developing seed stalks, with heads partly emerged began to turn white and appear dead (Fig. 1.). The damage is distinct from the so-called silver top, which occurs later in June when most of the seed heads have emerged, or from cutworm damage in which stalks are cut off at the grass crown.

Spittle masses, hidden by the grass crown, were present on the lower portions of seed stalks. In tufts of grass with more than one seed stalk, one or more nymphs might be pres-

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