

PETROLEUM OILS IN ORCHARD MITE CONTROL¹

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ABSTRACT

Investigations with oil sprays for the control of European red mite, *Panonychus ulmi* (Koch), revealed the following: as dormant sprays, Pennsalt Superior oil was more effective than Shell Neutrol; when either oil was applied at the half-inch green bud stage, the control was better than with dormant applications of the same oil; half-inch green bud sprays of Pennsalt Superior and Imperial 862 were equal in effectiveness. There was no difference in control with a half-inch green bud spray of Volck Supreme, Orchex 796, or Shell Neutrol; summer sprays of Pennsalt Superior oil gave effective control of European red mite.

None of the above applications of oil gave effective control of the McDaniel spider mite, *Tetranychus mcdanieli* McG.

Half-inch green bud sprays of Pennsalt Superior, Imperial 862, Orchex 796 and to a lesser extent Volck Supreme, caused bark lenticel injury to Delicious apple trees but not to McIntosh, Newtown, Rome Beauty, Jonathan, Winesap and Stayman apple trees. Shell Neutrol oil did not produce bark injury.

INTRODUCTION

Marshall (1948) made a study of spray oils on deciduous fruit trees in British Columbia. When comparing oils from California crude he found that a dormant oil of 200-220 SSU at 100° F was more effective against the San Jose scale, *Aspidiotus perniciosus* Comst., and the European red mite, *Panonychus ulmi* (Koch), than an oil of 100-110 SSU. He also found that the heavier oil caused less injury to apple and pear trees than the lighter oil. Based on Marshall's findings the 200-220 SSU oil was and still is recommended in British Columbia as a dormant spray to control certain insects and mites. A combination of this oil with DNOC or lime sulphur was recommended until the mid 1950's to control European red mite but this recommendation was dropped when a pink bud spray of ovex (chlorfenson) or fenson was shown to be more effective (Downing 1958).

During 1960-1963 the European red mite developed tolerance to ovex and fenson. Morestan² subsequently replaced ovex and fenson (Downing 1966a) but further investigations into the use of oils for European red mite

control seemed advisable because there is no evidence of mite resistance to oils (Chapman 1959).

Pearce and Chapman (1947) issued specifications for a "100 second superior oil" and stated that it could be used up to the period when leaves of the fruit buds of apple were exposed about $\frac{3}{4}$ inch. Later, Chapman and Pearce (1959) issued specifications for a "70 second superior oil" that could be used throughout the verdant period as a "summer oil". This is a report on investigations carried out at Summerland, British Columbia, with these so called superior type oils and with a 200-215 SSU dormant oil.

METHODS

Most of the sprays were applied by a "Turbo-mist" concentrate sprayer that applied 60 gal. of spray mixture per acre. In some experiments a high-volume handgun sprayer was used. It was operated at 425 psi and the trees were sprayed until dripping. Where the concentrate sprayer was used, each plot consisted of 8 to 12 trees and there were usually 3 replicates per treatment. Estimates of mite densities were made by taking a 20-leaf sample from each of 5 trees per plot. Where the handgun sprayer was used, each plot consisted of 2 trees and there were 2 replicate plots per treatment. Samples of 25 leaves from each

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² 6-methyl-2,3-quinoxalinedithiol cyclic carbonate 25% wettable powder.

of the 2 trees per plot were taken in the latter case. The leaves were processed by the method of Henderson and McBurnie (1943) as modified by Morgan *et al.* (1955).

Identification of the phytoseiid mites was based on the key of Schuster and Pritchard (1963).

RESULTS AND DISCUSSIONS

Effect On Mites

A preliminary experiment in 1962 compared Pennsalt Superior, a superior type oil of 70 SSU at 100°F, at the green tip stage of McIntosh apple with Morestan at the pink bud stage. The sprays were applied by concentrate sprayer. Records taken in early July showed that the Superior oil at 6 gal. per acre and Morestan at 6 or 8 lb. per acre gave good control of the European red mite but the McDaniel spider mite, *Tetranychus mcdanieli* McG. was not controlled in the oil plot. The McDaniel mite did not increase appreciably on the Morestan plots until the end of July.

In 1964 an experiment was designed to compare: dormant applications of Shell Neutrol, a western dormant oil with a viscosity at 100°F of 200-215 SSU and Pennsalt Superior oil; and half-inch green bud sprays of Pennsalt Superior and Imperial 862 which is a superior type oil with a viscosity at 100°F of 90 SSU. All sprays were applied by concentrate sprayer. The results of this experiment summarized in Table 1 show that: Pennsalt Superior was more effective than Shell Neutrol when both were applied at the dormant stage; the half-inch green bud spray of Pennsalt Superior oil was more

effective than the dormant spray of the same oil; Pennsalt Superior and Imperial 862 were equal in effectiveness when applied at the half-inch green bud stage.

In 1965 applications of Shell Neutrol oil were made at the dormant and half-inch green bud stages of Delicious apple trees by handgun sprayer. Samples of leaves taken on May 26 and June 21 indicated that the half-inch green bud spray was more effective than the dormant spray against the European red mite.

In 1966 a number of apple orchards were sprayed with the following oils: Shell Neutrol, Volck Supreme (140 SSU at 100° F) and Orchex 796 (71 SSU at 100° F). They were applied by handgun sprayer at 2 gal. per 100 gal. or by concentrate sprayer at 6 gal. per acre. All the sprays were applied during the prebloom period from the half-inch green bud stage through to the prepink bud stage.

Table 2 summarizes the results obtained in a 4-acre mature orchard composed of common Delicious and Newtown apple trees. These results, similar to those obtained in the other orchards, show that all oils gave good control of the European red mite and fair control of the apple rust mite, *Vasates schlechtendali* (Nal.).

Effect On Trees

Hikichi and Wagner (1965) noticed that superior oils of 60, 70, or 100 seconds viscosity caused enlargement and cracking of bark lenticels when they were applied in the delayed dormant stage to Delicious apple trees. The bark of McIntosh and Northern Spy was not affected.

In Summerland, similar injury to

TABLE 1.—Average numbers of the European red mite per leaf after spraying Delicious apple trees with 6 gallons per acre of various oils by concentrate sprayer, Summerland, B.C., 1964.

Oil	Stage	European red mites per leaf		
		May 29	July 2	July 22
Shell Neutrol	Dormant *	16.7	sprayed	
Pennsalt Superior	Dormant	2.1	10.8	28.9
Pennsalt Superior	Half-inch green **	0.4	1.4	6.0
Imperial 862	Half-inch green	0.8	4.0	9.8
Check — no treatment		21.8	sprayed	

* Dormant sprays applied March 16, 1964.

** Half-inch sprays applied April 24, 1964.

TABLE 2.—Average numbers of the European red mite, apple rust mite, and predaceous phytoseiid mites per 100 leaves after spraying Delicious and Newtown apple trees at the half-inch green bud stage with 6 gallons per acre of various oils by concentrate sprayer, Kelowna, B.C., 1966.

Oil	Mites per 100 leaves					
	European red		Apple rust		Phytoseiid	
	May 25	July 13	May 25	July 13	May 25	July 13
Shell Neutrol	2	92	305	26350	16	9
Volck Supreme	2	86	545	23310	16	13
Orchex 796	1	74	700	28040	32	44
Check — no treatment	30	sprayed	2247	sprayed	23	sprayed

the bark of Red Delicious apple occurred in 1964, when concentrate applications of either Pennsalt Superior or Imperial 862 were applied at the half-inch green bud stage. The bark of Newtown, Jonathan or Rome Beauty was not affected. Where Pennsalt Superior was applied at the dormant stage the bark injury was hardly noticeable and there was no indication of any injury where Shell Neutrol was applied at the dormant stage.

Shell Neutrol at 2 gal. per 100 gal. was applied in 1964 to one Delicious and one McIntosh apple tree that were in the half-inch green bud stage to determine whether the oil was phytotoxic when applied at that stage of bud growth. No damage resulted then or in the following year when Shell Neutrol was applied to Delicious apple trees at the dormant and at the half-inch green bud stages.

In 1966, Volck Supreme was compared with Shell Neutrol and Orchex 796 because its viscosity is midway between the other two and therefore might be safe to apply at the half-inch green bud stage. These 3 oils were applied to Red Delicious, common Delicious, Newtown, Winesap, Jonathan, and Stayman apple trees. Shell Neutrol did not cause noticeable injury to the bark or foliage. Applied by concentrate sprayer Orchex 796 consistently caused lenticel swelling and cracking on both common and Red Delicious trees but not on the other varieties. Volck Supreme oil caused similar lenticel swelling and cracking where it was applied to Red Delicious by concentrate sprayer but no injury was noted from handgun applications. The bark of the other

varieties including common Delicious was not injured by concentrate or handgun applications of Volck Supreme.

Effect On Predaceous Phytoseiids

An earlier paper (Downing 1966b) showed that both the heavy dormant oil, Shell Neutrol, and the light Pennsalt Superior were low in toxicity to the predaceous phytoseiid mite, *Neoseiulus caudiglans* (Schuster) whether applied in the dormant or half-inch green bud stage of apple. The light oil was also low in toxicity when applied in the summer. These results were confirmed in 1966 when 3 oils were applied during the prebloom period without serious injury to the predaceous phytoseiid mites (Table 2).

Effect of Summer Applications 1962-1966

Pennsalt Superior oil has been the only miticide used since 1962 in a Delicious and McIntosh apple orchard. It was applied during the summers by handgun sprayer at 1 gal. per 100 gal. except on two occasions when the McDaniel mite was so numerous that the oil concentration was increased to 1.5 gal. The oil applications have virtually maintained the trees free of European red mite but have not satisfactorily controlled the McDaniel mite. A total of 10 sprays of oil were applied to the trees during the summers of 1962-1966 and most of these were applied to control McDaniel mite.

Until 1966 no injury appeared on fruit or foliage of Delicious or McIntosh trees although very slight injury to lenticels was evident on Delicious

trees. In 1966, however, after an application of oil on July 9, approximately 15% of the primary leaves of the Delicious apple trees yellowed and dropped. Oil sprays will be continued on these plots to determine if this

symptom was an indication of cumulative oil injury.

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A CERAMBYCID IN A CITY APARTMENT

In April, 1967, I was asked to identify a beetle which had emerged from oak flooring on the eighth floor of a 10-storey apartment building in Vancouver. The building was of reinforced concrete, with a "floating floor" on each level. This type of floor, from top to bottom, consists of 5 16-inch kiln-dried oak, 5/8-inch fir plywood, 3/4-inch air-dried white spruce and 7 16-inch rigid fibre board insulation as a base, all resting on the concrete. The apartment was completed in May, 1966, and the flooring was laid at this time. In December, 1966, a larva was seen in a hole in the floor on the 7th storey. This was noticed by the owners after a tenant had moved, in an area which had been covered by a rug. In March, 1967, a beetle was found emerging from a hole in the floor on the 8th storey. The beetle was identified as the cerambycid *Meriellum proteus* (Kirby).

The life history of this boreal species is not well known. Its host plants

include pine, spruce and balsam fir (Gardiner, 1957) in which the larvae feed in the phloem.

The spruce sub-flooring in this apartment, originating from the Kamloops area, was known to include a few boards with bark attached. This was confirmed when the damaged oak was replaced. These boards must have harbored the beetles. The mature larvae left the phloem, gnawed through the plywood and partially through the oak to pupate just beneath the surface. The adult then emerged prematurely in the spring. The flight period, according to Linsley (1964), is June and July.

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