

EFFECT OF SPEED OF TRAVEL ON THE PERFORMANCE OF CONCENTRATE ORCHARD SPRAYERS¹

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Introduction

For several years the official recommendation for British Columbia fruit growers has been to operate concentrate sprayers at a speed of one mile per hour in mature plantings with rows 30 feet apart (3). This recommendation was necessary because, when travelling at a faster speed, many of the sprayers did not give good spray coverage in the tree tops. During the last few years most of the concentrate orchard sprayers manufactured in British Columbia have been improved to the point where it should be feasible to operate them at higher speeds. In experiments carried out by Messrs. D. B. Waddell and J. M. McArthur at the Summerland Research Station (unpublished work) it was determined that an efficient concentrate sprayer gave as good deposits at two miles per hour as at one mile per hour, in pre-bloom sprays in large apple trees. In the work reported here, two makes of sprayers were operated at one, and two, miles per hour, for applying summer sprays, and a comparison was made of the spray deposits in the trees at the two speeds.

Methods

Two concentrate sprayers in common use in British Columbia orchards were used for the experiment. Sprayer A was a single-side sprayer that delivered 7000 cubic feet of air per minute at an average velocity of 115 miles per hour; Sprayer B was a double-side sprayer that delivered 10,300 cubic feet of air per minute per side at an average velocity of 87 miles per hour.

The experiment was carried out in three parts. In May, and August, of 1956 Sprayer A was used to apply DDT to replicated plots of mature McIntosh apple trees in three orchards, at speeds of one, and two miles per hour. The plots that were sprayed at one mile per hour received 72 gallons of spray mixture per acre, and those sprayed at two miles per hour, 36 gallons per acre. The per-acre dosage of DDT was the same for all plots. The sprays were applied at a pump pressure of 300 pounds per square inch.

The second part of the experiment was carried out in July 1957, when Sprayer A was used to apply DDT in two orchards of mature McIntosh apple trees at speeds of one, and two, miles per hour. Fifty gallons of spray mixture per acre were applied on all plots at a pump pressure of 75 pounds per square inch.

The third part of the experiment was carried out in the fall of 1957 when both sprayers were used to apply a post-harvest spray of methoxychlor to replicated plots of mature McIntosh apple trees. The sprayers were operated at one, and two, miles per hour with pump pressures of 75, and 300, pounds per square inch. All plots received 50 gallons of spray mixture per acre.

In all the orchards used in the experiments, the trees ranged in height from 18 to 22 feet, and in diameter from 25 to 30 feet. The trees were 30 feet apart in the rows, and the rows were 30 feet apart.

Leaf samples were taken for insecticide deposit analysis after each spray. Fifty leaves were taken from the top, and 50 leaves from the bottom, of each of five trees per plot. Tree-top samples were taken 15 feet above ground level, and tree-bottom

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samples 6 feet above ground level. Sampling technique and sample treatment were the same as reported by Waddell and McArthur (5). DDT was determined by a modified Schechter-Haller procedure (2); methoxychlor was determined by a modified Fairing-Warrington method (1).

Results and Discussion

The results in Tables 1 and 2 show that, in a majority of the plots, the tree-top deposits on leaves were slightly higher at two miles per hour. It is likely, therefore, that, with the sprayers used, pests in the tree tops can be controlled as well at two miles per hour as at one mile per hour.

TABLE 1—DDT Deposits on Leaves (mmg./sq. cm.) with Sprayer A Operated at Two Speeds. Spray Applied at 300 p.s.i. (Average of 10 Determinations.)

Date	Orchard	Tree tops		Tree bottoms	
		1 m.p.h.*	2 m.p.h.**	1 m.p.h.	2 m.p.h.
May, 1956	1	2.5	3.4	8.1	12.0
	2	4.6	4.7	9.1	14.2
	3	5.1	3.3	9.4	6.8
	Average	4.1	3.8	8.9	11.0
August, 1956	1	4.1	6.0	6.9	9.4
	2	5.6	6.1	9.4	12.1
	3	4.7	4.0	7.3	8.5
	Average	4.8	5.4	7.9	10.0

* Spray applied at 72 gallons per acre.

** Spray applied at 36 gallons per acre.

In general, the tree-bottom deposits were higher at two miles per hour. In concentrate spraying, more spray chemical is usually deposited in the lower parts of the trees than is required for pest control. Evidently this tendency is accentuated when the sprayer speed is increased.

In this experiment the amount of pesticide applied per acre was the same at both speeds. In the sprays applied in May and August, 1956, this was accomplished by using the same nozzle orifices at both speeds, and doubling the concentration of pesticide in the spray liquid applied at two miles per hour. Theoretically, at the two-mile-per-hour rate, there would be only half as many spray drops per unit area of sprayed surface, and each drop would contain twice as much pesticide. This type of distribution of spray chemical is probably satisfac-

tory for the control of mobile pests but may be inadequate for the control of diseases such as apple scab (4). In the remainder of the experiment suitable nozzles were used to apply the same amount of spray liquid per acre at both speeds. It is interesting to note that the relationship between amounts of insecticide deposited at the two speeds was independent of the volume of spray liquid applied per acre and of the pump pressure.

Growers having sprayers with air-stream characteristics similar to those of the sprayers used in the experiment can save considerable time, without sacrificing effectiveness of the spray, by spraying throughout the season at a speed of two miles per hour; growers having less efficient equipment should continue to spray at the previously recommended rate of one mile per hour.

TABLE 2—Insecticide Deposits on Leaves (mmg./sq. cm.) with Two Sprayers Operated at Two Speeds. Spray Applied at 50 Gallons per Acre. (Average of 10 Determinations.)

Sprayer	Date	Orchard	Pump pressure p.s.i.	Tree tops		Tree bottoms	
				1 m.p.h.	2 m.p.h.	1 m.p.h.	2 m.p.h.
A	July, 1957	1	75	2.8	2.9	6.3	6.8
		2	75	4.0	3.2	5.5	7.2
		Average		3.4	3.1	5.9	7.0
A	September, 1957	4	300	2.8	3.6	2.9	4.5
			75	3.3	3.8	3.9	4.4
B	September, 1957	4	300	2.9	2.2	4.3	6.7
			75	2.2	2.6	4.0	9.3

References

1. Anonymous. Methoxychlor—a summary of analytical methods. E. I. Dupont de Nemours and Co. (Inc.) Bull. pp. 34-36. 1951.
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3. Marshall, J. Concentrate spraying in deciduous orchards. Can. Dept. Agr. Pub. 1020, p. 25. 1958.
4. Swales, J. E., and K. Williams. Further note on surfactants in concentrate mixture for control of apple scab. Can. J. Plant Sci. 37: 82-83. 1957.
5. Waddell, D. B., and J. M. McArthur. Effects of pruning on spray deposits from concentrate orchard sprayers. Can. J. Agr. Sci. 34: 448. 1954.

TWO RECORDS OF *IXODES SIGNATUS* BIRULA AND ONE OF *IXODES URIAE* WHITE, MARINE BIRD TICKS

The first Canadian record of *Ixodes signatus* Birula was by Eric Hearle² in 1938 from 2 females and 22 nymphs which I had taken from a cormorant at Tofino, Vancouver Island, in 1926. Other records from Cormorant as given by Gregson¹ are 4 nymphs and 1 larva from Gull Island, 1 female larva from Cowichan Bay and 3 females from Langara Island. Gregson gives also one unusual record of 3 females and 1 nymph from a rosy finch from the Pribilof Islands.

To these records I can now add 2 others, of collections given me by students at the University who have given me ectoparasites from birds and mammals at odd times.

The first collection was made by Rudolf Drent and G. F. van Tets from *Phalacrocorax pelagicus* Pallas, the pelagic cormorant, found dead on 6 May 1959 on Mandarte Island, B.C. and consists of 1 adult engorged female, 3 adult males, 17 male nymphs and 54 female nymphs and 317 seeds or larvae of both sexes, giving the remarkable total of 392 ticks off one bird. The second collection was made by Rudolf Drent from another pelagic cormorant found dead on 2 June 1959

on Mandarte Island and consists of 2 engorged females, 2 partly engorged females, 1 flat female, 1 small and 1 very small female nymphs and 1 female seed or larva, a total of 8 females and no males.

The third record is of *Ixodes uriae* White, the hairy tick, collected by F. H. Fay from the head of *Uria lomvia* s.s. *arra* the Thick-billed Murre, in June 1954 at Gambell, St. Lawrence, Alaska, and consists of 1 engorged female adult and 11 engorged female nymphs of several sizes. The proportion of females to males in these collections, is interesting; in 2 collections there were no males at all; in the large collection the proportion was roughly 3 females to 1 male; in all collections, 1 or at most 2 engorged females seemed to be responsible for the entire infestations. The 3 collections totalled 412 specimens of what are normally, relatively rare ticks. All the material is in the entomological museum at the University.

¹ Gregson, John D., 1956. The Ixodoidea of Canada. Pub. 930 Science Service, Ent. Div. Canada Dept. of Agr., Ottawa.

² Hearle, Eric., 1938. The Ticks of British Columbia. Sci. Agr. 18: 341-354.

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