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CRYOLITE VERSUS LEAD ARSENATE FOR CONTROL OF CODLING MOTH *

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In 1939, cryolite was recommended for late codling moth spray applications in the interior of British Columbia. The purpose of the recommendation was to avoid heavy deposits of lead arsenate. A number of growers who have not accomplished satisfactory control of the codling moth since that time have blamed cryolite for their failure. Their distrust of cryolite has been increased by the appearance of the diluted spray mixture, as it resembles muddy water rather than spray material. Then too it leaves a less obvious deposit than lead arsenate. But the chief reason for unfavorable opinion results from the time of application, since it is more difficult to prevent codling moth entries during July when cryolite is used than during May and June when lead arsenate is applied. Furthermore, for every larva attempting to enter the fruit in May or early June, there may be twenty-five or more attempting to enter in July and August. A review of the investigations that serve as a basis for the cryolite recommendation will therefore be timely.

First it will be well to examine some of the work that has been done with cryolite in the neighboring state of Washington. This is summarized in Table I.

* Contribution No. 2221, Division of Entomology, Science Service, Department of Agriculture, Ottawa, Canada.

* Reset and reprinted, with slight changes, from "Country Life in British Columbia" [Vernon, B.C.] 27 (2): 23 April 1943, through the kindness of Charles A. Hayden, Editor and Manager.

TABLE I

Codling Moth Infestation Following Use of Cryolite and Lead Arsenate In Washington State

	Per Cent Infested Fruit or Worms per 100 Fruits		
Year	Cryolite	Lead Arsenate	Reference
1928-9	24.7 (Fish oil sticker)	24.1 (2 yr. ave.)	Newcomer & Carter
1932	28. (Fish oil sticker)	34. (2/3 conc. only)	Webster et al.
1935	7.2 (Non-inverted oil mixture)	5.8 (inverted oil mix)	Unpub. records, Wash. Exp. Sta.
1936	24. (Non-inverted oil mixture)	12. (inverted oil mix)	Unpub. records, Wash. Exp. Sta.
1937	8. (Inverted oil mixture)	14. (inverted oil mix)	Marshall et al.
1938	74. (Inverted oil mixture)	121. (inverted oil mix)	Marshall et al.

In the Washington investigations, which were continued intermittently from 1928 to 1938, cryolite and lead arsenate gave approximately similar results on four occasions; cryolite appeared the more effective twice, while lead arsenate appeared the more effective once. The differences are such as might occur in separate experimental plots sprayed with same material, since with inverted mixtures in particular, the nature of the solid insecticide is by no means the only factor that plays an important part in the effectiveness of the resultant spray residue. For example, in 1936 the cryolite particles in the oil-cryolite-soap mixture remained water-wetted, while the lead arsenate particles in the corresponding lead arsenate mixture became oil-wetted. The lead arsenate gained greatly in effectiveness thereby.

In British Columbia, cryolite was first compared with lead arsenate for codling moth control by B. Hoy of the British Columbia Horticultural Branch, Kelowna, in 1936. A great deal of work has been done with it since that time.

In the British Columbia experiments, all infestations were recorded as per cent wormy fruit. In no instance was there a pronounced difference in the results from the two materials. Reduced to averages, the infestations are: cryolite 6.1 per cent and lead arsenate 5.7 per cent infested fruit. Granting the suspicion with which averages should be viewed, the difference is no greater than would be expected if in each instance both plots had been sprayed with the same material. With one exception casein-lime spreader was the adjuvant.

It is worth mentioning that trees at East Kelowna, sprayed with cryolite-casein-lime throughout the season were, at the end of the third year, no more heavily infested than the adjoining trees sprayed with lead arsenate-casein-lime each season.

There has been some speculation as to whether synthetic cryolite of United States manufacture and natural cryolite are equally effective. These materials have differed somewhat in fluorine content. An investigation of effectiveness was conducted at East Kelowna and the records are assembled in Table III.

TABLE II.

Codling Moth Infestation Following Use of Cryolite and Lead Arsenate in British Columbia*

	Per Cent Infested Fruit	
Year	Cryolite	Lead Arsenate
1936	1	1
1938	2	1
1939	16	17
1940	9	9
1940	13	12
1941	9	10
1942	4	3
1942	5	4
1942	3	2
1942	8	6
1942	1	3
1942	5	4
1942	2	2
1942	8	6

* Figures for 1936 and 1938 from unpublished records, B. Hoy, B.C. Dept. of Agriculture, Kelowna; the remainder from records of the Dominion Entomological Laboratory, Vernon.

TABLE III.

Comparison of Effectiveness of Natural Cryolite and Synthetic Cryolite

Year	Per Cent Infested Fruit* Natural Cryolite	Synthetic Cryolite
1940	9	13
1941	9	22
1942	4	1
1942	3	2
1942	5	5
1942	8	8
1942	2	2
1942	3	3
1942	12	7

* The first seven comparisons from the records of the Dominion Entomological Laboratory, Vernon; the last two, from unpublished records of B. Hoy, B.C. Dept. of Agriculture, Kelowna.

Nine direct comparisons are available from this work. With three exceptions, one of which favors one product, two the other, differences are slight to nil. Averaged infestations, i.e., 6.1 per cent wormy fruit for natural cryolie and 7.0 per cent for synthetic cryolite, support the opinion that there is no essential difference in the effectiveness of the two products. The probable reason for the much higher infestation of the synthetic cryolite plot in 1941 was the greater population in this plot resulting from the high infestation of the previous season, when other spray materials had been used.

Summary

(1) Extensive investigation in Washington and British Columbia under arid or semi-arid conditions, has indicated that cryolite and lead arsenate are for practical purposes, equally effective in codling moth control. This holds whether the two compounds have been used with oils or with casein-lime spreader.

(2) Natural cryolite and synthetic cryolite have proved equally satisfactory.

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Note on Trachoma falciferella Wlshm. (Lepidoptera: Plutellidae)

This insect was not uncommon on orchard trees some years ago but is comparatively scarce today, owing no doubt to the heavy applications of arsenicals used for codling moth control, which have had a repressive effect upon a number of orchard pests. Choke cherry (**Prunus demissa** Nutt.) is its native host. Larvae were taken at Vernon, B.C., in 1931, feeding upon the terminal growth of apple and pear. The leaves are partially skeletonized and drawn together with a few silken threads to form a frail nest, within which the caterpillars remain concealed until they are disturbed. They then become exceedingly active and move over the leaf surface in a series of rapid snake-like motions.

Mature larvae measure 11-12 mm. in length, and are strongly fusiform in outline. The general colour is pale green tinged with yellow. Head pale with no markings. Dorsum pale green, with the intersegmental areas yellowish. There is a well-defined, narrow, whitish line on each side of the dorsum; these lines commence on the second thoracic segment and continue to the anal segment. Thoracic feet pale brown; prolegs concolorous with venter; the anal prolegs are extended at a wide angle with the body when the larva is at rest.

Eleven larvae which pupated between May 16 and June 13, produced adults from July 9 to 19. The pupa is formed within a silken cocoon composed of two parts: an exterior web of filmy construction and open texture, within which is a smaller case containing the pupa. The pupa, which is pale green in its earlier stages, becomes pallid and transparent prior to the emergence of the adult. —E. P. Venables, Vernon, B.C.