Experimental acaricides tested for control of

Spider Mites on Field Corn

on two San Joaquin Delta islands

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Spider mites attack field corn in most corn growing areas of California. In the interior valleys, and especially in the San Joaquin Delta region, the mite populations become so abundant in some years that they may cause premature drying of the foliage.

During the summer of 1960 experiments were conducted on Staten and Tyler islands in the San Joaquin Delta to determine the effectiveness of certain acaricides in controlling spider mites attacking field corn.

A survey on Staten and Tyler islands showed that three species of mites were attacking field corn: the two-spotted spider mite—*Tetranychus telarius* Linn.—the Pacific mite—*Tetranychus pacificus* McGregor—and a grass mite—*Oligonychus pratensis* (Banks). The two-spotted mite and the grass mite were the predominant species in most locations, frequently occurring along with smaller populations of the Pacific mite. The grass mite and the two-spotted mite were also infesting Johnson grass in the area.

A field of young corn with a moderate mite infestation was selected for the acaricide evaluation test. The two-spotted mite and the Pacific mite were the only species present in the selected field. The two-spotted mite occurred in a ratio of about 4:1 of the Pacific mite.

Experimental Materials

Tedion at the rate of 0.5 pound per acre, Trithion at 1.0 pound per acre, and ethion at 1.0 pound per acre were formulated as emulsion sprays and applied by airplane in 15 gallons of water per acre. Kelthane 3% dust was applied by airplane at the rate of 40 pounds per acre.

All of the materials tested—except ethion—are for experimental use only and do not have Federal registration for commercial use on corn.

The insecticides were applied once on August 11, 1960 beginning at 9:30 a.m. Each treatment was replicated twice and each replication was 120′ wide and 0.5 mile long, approximately 7.3 acres. The entire trial, including the untreated check areas, covered 75 acres.

Pre-treatment and post-treatment counts of mites were made by taking 30 infested leaves from each plot on each sampling date. Ten leaves were taken from a level on the plant 1′ above the ground, 10 from the 3′ level, and 10 from the 6′ level. A cork borer—½″ outside diameter—was used to outline a heavily infested area on the underside of each leaf. One such area from each of the 30 leaves constituted a sample for a given plot. These areas were examined

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STANDING TIMBER

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than in the case of small mills. One mill, for example, sold through more than 200 wholesalers in western and eastern areas.

As a group, medium-size mills are intermediate between small and large mills in most characteristics. Some resemble small mills, while others resemble large mills. The stability of firms operating medium-size mills has been greater than that of small-mill firms, but less than large-mill firms. The plants typically operate for more than 10 months a year, but only three of eight plants operated 12 months in 1959.

The 1959 log supply utilized by these plants was 69% old-growth and 31% young-growth timber. Some plants were processing primarily old-growth, while others processed mostly young-growth. All of the mills were equipped to produce dry lumber, and five of nine had planing mills, thus enabling them to produce surfaced lumber. In 1959, 34% of the lumber sold by six mills was rough green, while 46% was surfaced dry. The differences in the relative volumes marketed through various channels by small and medium size mills is explained by the differences in their product characteristics. With a higher proportion of finished lumber to market, medium-size mills sold 54% of their output through office wholesalers, 17% through yard wholesalers and 24% to remanufacturers.

Significance of Differences

The significance of the differences in the characteristice of the several mill-size groups, in this study, depends on how they influence each group's demand for stumpage and logs.

A statistical time-series study of the price-quantity lumber sales experience of the several mill groups in relation to their market channels, and the relationship of that sales experience to purchases of stumpage and logs, is planned.

The mill characteristics observed suggest that the operational and marketing behavior of mills obtaining their supplies from small woodlands is likely to be more unstable than that of other industry segments. The marketing position of small mills in general appears poorer than in the case of large and some medium-size mills. Smaller quantities are marketed through fewer buyers; the product is of poorer quality and needs further processing before being sold into final markets. Because the mills operate intermittently it is necessary that they reestablish their contact with buyers each season. Some of the outlets for small mill lumber are likely to stop purchasing from them during periods of low demand, which typically re-occur in a cyclic fashion in lumber's markets. Also, the low prices prevailing during such periods are much more likely to cause the small mills to shut down than the larger mills.

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under a binocular dissecting microscope, and the numbers of the active and the quiescent mites, as well as of the eggs, were recorded.

Post-treatment counts were made 4, 8, 19 and 28 days after application.

Mite Populations

The mite population was not uniform over the field. There was a gradient across the field from west to east. The data in the lower table show a heavier infestation in plots located in replication I than in replication II, and initial infestations in the check and Tedion plots were higher than in the other treatments.

Yields from 12 Rows of Corn Harvested from Each Treatment

Treatment	Field Wt.* pounds	Per cent moisture of grain at harvest	Pounds per acre at 15% moisture
Replication I			
Check	9,090	12.4	4,606
Tedion	11,520	12.4	5,837
Trithion	13,430	14.1	6,673
Ethion	13,330	14.4	6,585
Kelthane	11,830	14.7	5,837
Replication II			
Check	13,780	13.5	5,985
Tedion	15,290	14.3	6,580
Trithion	15,250	13.8	6,601
Ethion	14,130	15.1	6,024
Kelthane	15,430	14.3	6,640

* Replication I—12 rows = 2.034 A.
Replication II—12 rows = 2.343 A.

The pre-treatment counts, taken on August 10, showed that in all cases greater numbers of mites were present on the lower leaves than on the upper ones. Succeeding counts in checks and in some of the treatments indicated that the mite populations gradually move upward in the plants. Between August 15 and 19, heavy infestations were noted at the 3′ level on the plant, and from August 29 to September 7 heaviest infestations were at the 6′ level.

Control

Ethion and Trithion resulted in excellent control. There was no significant difference in the effectiveness of the two materials. Maximum control with these acaricides was noted eight days following application. Numbers of mites increased in the plots thereafter but control was still good 28 days after application when the counts were terminated. Both ethion and Trithion controlled mites on all portions of the plant, even on leaves 1′ above the ground. Considering that the corn was 7′–8′ tall, the results were better than expected.

Control was poor with Kelthane dust and Tedion. Mite populations continued to increase in the Tedion plots but the rate of increase was not so great as in the untreated checks.

The Kelthane treatment resulted in a slight reduction in numbers of mites four days after application, but populations increased progressively thereafter.

Yields

Field weights were taken from the plots when the corn was harvested on October 3, 1960. There was considerable variation in plant growth within the field, due to causes other than mite infestations.

During the growing season and at harvest the plants in the ethion and Trithion treatments had greener stalks and were sturdier than those in the check and the other treatments, At harvest, the plants in the untreated check of replication I were very dry and had many more broken stalks than those in most other treatments. Plants treated with Tedion were also dry, but not quite as severe as the check. The moisture content of the harvested corn was also lower in the checks and the less effective treatments.

Because the mite population was higher in replication I than in replication II, the difference may account for the larger differences in yield between the treatments of the two replications.

The mites did not display any appreciable tolerance to the organophosphorus compounds, and control was excellent. Ethion and Trithion are somewhat volatile, which may have accounted for the excellent control at the lower levels in the plants.

Kelthane is less volatile and its effectiveness depends entirely upon contacting the mites. The poor control with this material may possibly be attributed to the lack of adequate coverage on the under leaf surfaces, especially at the lower levels in the plants.

The poor control with Tedion may be attributed to relatively low temperatures that prevail on the Delta, and possibly also to coverage. Tedion is not a fast acting acaricide and is dependent upon high temperatures for effectiveness.

The preliminary trials on Staten and Tyler islands indicate that spider mites may cause a reduction in the yield of field corn when young plants are heavily infested.

Results with Acaricides Applied to Control Spider Mites Attacking Field Corn Staten Island, Walnut Grove, 1960

Material and amount applied per acre (pounds)[1]	Days after treating	Number mites per 10 unit areas on leaves at each height[3]						Total
		Replication I			Replication II			
		1′	3′	6′	1′	3′	6′	
Check	Pre-treat[2]	584	355	259	153	96	44	1,491
	4	227	770	342	275	235	111	1,960
	8	78	658	671	409	332	147	2,295
	19	175	697	1,155	316	783	353	3,479
	28	14	81	131	429	899	375	1,929
Tedion 0.5	Pre-treat	476	239	188	200	54	114	1,271
	4	306	438	304	116	134	83	1,381
	8	136	589	262	134	239	68	1,428
	19	63	334	457	256	444	173	1,727
	28	15	144	75	144	505	150	1,033
Kelthane 3% dust 40 lb/A	Pre-treat	311	94	40	122	78	59	704
	4	104	107	92	41	84	39	467
	8	134	203	114	64	116	28	659
	19	199	256	148	38	86	51	778
	28	117	328	315	86	78	78	1,002
Trithion 1.0	Pre-treat	302	141	142	116	51	47	799
	4	22	37	32	49	12	4	156
	8	0	12	2	1	2	4	21
	19	11	25	25	19	29	41	150
	28	20	26	52	96	155	172	521
Ethion 1.0	Pre-treat	234	201	116	124	47	26	748
	4	42	47	30	18	15	3	155
	8	7	20	2	4	2	2	37
	19	8	14	23	8	9	21	83
	28	87	63	27	23	39	46	285

[1] Tedion, Trithion and ethion applied as emulsion sprays by aircraft in 15 gallons of spray per acre, Kelthane as a 3% dust, 40 lb/A on August 11, 9:30–10:30 a.m.

[2] Pre-treatment counts on August 10.

[3] Unit area = circle ½" in diameter used to outline a heavily infested area on underside of a leaf. Ten leaves sampled at each height on plants in each replication on each date.

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