

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
CENTER FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45226

SUPPLEMENT TO
HEALTH HAZARD EVALUATION DETERMINATION
COMPOSITE REPORT ON THIRAM FOR HHE 75-132-355

INDUSTRIAL FORESTRY ASSOCIATION
CANBY, OREGON

DECEMBER, 1976

I. INTRODUCTION

The National Institute for Occupational Safety and Health received the request for a hazard evaluation from the management of Industrial Forestry Association. This Supplement to the Composite Report on Thiram contains specific data on work process, study conduct, and results for the Industrial Forestry Association. A discussion of the findings and the conclusions drawn from the study as a whole are contained in the Composite Report.

II. HEALTH HAZARD EVALUATION

A. Description of Process

Industrial Forestry Association (IFA) grows reforestation trees on a tree farm at Canby, Oregon. The processes conducted that involve this evaluation are spraying of Thiram and lifting, culling, counting, and packing of Thiram-treated trees. This tree farm is one of the bare root facilities mentioned in the report. It is their practice to do all the Thiram spraying at the beginning of the planting season. Further they kept the seedlings moist during packing with a fine spray mist.

B. Study Progress and Design

1. General

The environmental-medical evaluations for IFA were conducted over a three-month period. IFA sprays all the trees that are to be treated with Thiram during the year in one time period which may cover several weeks, depending on the weather. The samples collected during the spraying application were collected on November 13, 17, and 18, 1975. The weather on November 13 and 17 was partly cloudy, 40° - 50°F, and a slight breeze. On November 18 it was clear, 40°F and there was a brisk wind. The sprayers and the helpers wore disposable coveralls, boots, and rubber gloves but no respirators.

Environmental sampling was conducted on January 26, 1976, during the lifting, culling, counting, and packing of Thiram-treated 2-0 Hemlock and 2-1 Douglas Fir trees. The weather was 39°F and overcast.

Control samples were collected on January 27, during the culling, counting, and packing of non-Thiram treated trees. The lifters wore rubber slickers. However, in the packing room, some employees wore rubber pants and long sleeved shirts while others wore cloth pants and long sleeve shirts.

There were wash basins in the packing room and in the restrooms. All employees were observed washing their hands prior to eating. There were lunchrooms provided; however, they were difficult to keep clean.

Medical evaluations were done on January 26-27. The blood sample period extended from January 26 in the morning to the afternoon of January 29. The exposure was considered to be four work days.

2. Environmental Sampling

For this evaluation, 34 breathing zone samples were collected. They included 16 during the spraying of Thiram, 15 during the lifting, culling, counting and bagging of Thiram treated trees and 3 control samples during the culling, counting, and bagging of non-Thiram treated trees.

Four trees were taken as samples during the packing of Thiram treated trees and two trees were taken as non-Thiram treated controls.

3. Medical Sample

Of about 60 workers on duty at the time of the study 34 workers were seen (15 men and 19 women). Blood samples were obtained on 30 workers. Details on age, sex and general work area are contained in Table I D.

C. Evaluation Results

1. Environmental (Tables II and IV taken from Composite Report)

As shown in Table II (Company Number 1) none of the 34 breathing zone samples collected contained detectable amounts of Thiram (5.0 micrograms of Thiram per filter). These samples included 16 during spraying of Thiram, 15 during lifting, culling, counting, and bagging of Thiram treated trees and 3 control samples during culling, counting and bagging of non-Thiram treated trees.

A reason Thiram was not detected in the air could be a result of keeping the trees moist during the packing operations. This would prevent the Thiram from flaking off.

Results of the tree samples taken (Table IV) show that there was no Thiram on the trees packed during the collection of the control samples (trees #11, 12), and there was 89 and 122 micrograms of Thiram per gram of 2-1 Douglas Fir trees (#9, 10) and 628 and 707 ug/gr of 2-0 Hemlock trees (#13, 14), which were handled during the evaluation period. (For all trees samples during the Thiram study, the amount of Thiram on the trees ranged from 80 ug of Thiram/gm of tree to 8400 ug/gm).

2. Medical

Table VI D shows symptoms developing over the study period among these nursery workers and Table VII D gives symptoms reported on detailed questioning. Table XI D gives some detailed on blood Thiram level on the initial test in relation to the pre-test exposure history. Table XII D does the same for serum DBH.

At this facility the mean systolic blood pressure was 118.9 ± 8.1 mm Hg, mean diastolic pressure was 69.6 ± 4.7 mm Hg and mean pulse rate was 71.2 ± 3.9 per minute. This is essentially the same as the means for all nursery workers. Blood pressures below 140 mm Hg systolic and 90 mm Hg diastolic are considered normal. Younger persons would expect to be lower than older adults. There is no defined lower limit of normal in otherwise healthy individuals.

III. AUTHORSHIP AND ACKNOWLEDGMENTS

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TABLE I D

CHARACTERIZATION OF WORKER SAMPLE
 THIRAM STUDY, INDUSTRIAL FORESTRY ASSOCIATION
 CANBY, OREGON HHE 75-132
 January 26-29, 1976

WORKER GROUP	MALE	FEMALE	TOTAL	AGE		
				AVERAGE	MEDIAN	RANGE
INSIDE or INSIDE and Outside	2	16	18	42.7	38.5	18 - 76
OUTSIDE ONLY	11	3	14	40.8	32.5	19 - 75
SPRAYING	2	0	2	24.5	24.5	21 - 28
TOTAL	15	19	34	40.9	34	18 - 76

11
RESULTS OF PERSONAL BREATHING ZONE AIR SAMPLES COLLECTED DURING NURSERY OPERATIONS
THIRAM STUDY, REFORESTATION, PACIFIC NORTHWEST

COMPANY IDENTIFICATION NUMBER	JOB DESCRIPTION	TREATMENT	NUMBER POSITIVE* NEGATIVE FOR THIRAM DETECTION		THIRAM CONCENTRATION mg/m ³		TOTAL NUMBER SAMPLES
1	Sprayers and Helpers	Thiram	0	16	4 < 0.02 5 < 0.03	1 < 0.04 6 < 0.05	16
	Pullers, Counters, Cullers, Baggers, Tying Bags	Thiram	0	15	9 < 0.01 6 < 0.02		15
	Cullers Packers	none (no Thiram)	0	3	3 < 0.03		3
2	<u>Nursery Plugs</u> Sprayers and Helpers	Thiram	0	4	2 < 0.04 2 < 0.05		4
	Extractors, Cullers, Box Closer, Boxers	Thiram	0	11	11 < 0.03		11
	<u>Bare Root</u> Sprayers and Helpers	Thiram	0	1	1 < 0.01		1
	Lifters, Packers, Cullers, Sorters, Belt Loaders	Thiram	1	12	0.015 Hand Puller 9 < 0.01 3 < 0.02		13
	Packers	None (no Thiram)	0	5	5 < 0.02		5

*Minimum detectable amount of Thiram was 5.0 micrograms per filter.

TABLE IV, cont.
THIRAM CONCENTRATION ON TREES
THIRAM STUDY, REFORESTATION, PACIFIC NORTHWEST

SAMPLE NUMBER	HOW TREATED	TYPE AND SIZE OF TREE	RESULTS ug THIRAM/gm TREE*	WEIGHT OF TREE gm*
Tree 15	"Snow"	2-0 Douglas Fir	7	6.8
Tree 16	"Snow"	2-0 Douglas Fir	1	8.5
Tree 17	Thiram	2-1 Douglas Fir	3000	50.1
Tree 18	Thiram	2-1 Douglas Fir	2800	15.9
Tree 19	Thiram	1-1 Douglas Fir	3700	15.9
Tree 20	Thiram	1-1 Douglas Fir	4300	25.2
Tree 21	Thiram	2-0 Douglas Fir	3100	12.3
Tree 22	Thiram	2-0 Douglas Fir	3000	13.5
Tree 23	Thiram	2-1 Hemlock	400	18.1
Tree 24	Thiram	2-1 Hemlock	700	7.6
Tree 25	Thiram	Plug Douglas Fir	8400	3.1
Tree 26	Thiram	Plug Douglas Fir	6100	3.9

* Above ground portion of tree

TABLE IV
THIRAM CONCENTRATION ON TREES
THIRAM STUDY, REFORESTATION, PACIFIC NORTHWEST

SAMPLE NUMBER	HOW TREATED	TYPE AND SIZE OF TREE	RESULTS ug THIRAM/gm TREE*	WEIGHT OF TREE gm**
Tree 1	No Thiram	Plug Douglas Fir	0	2.0**
Tree 2	No Thiram	Plug Douglas Fir	0	2.4
Tree 3	Thiram	Plug Douglas Fir	1800	2.0**
Tree 4	Thiram	Plug Douglas Fir	1800	2.0**
Tree 5	"Snow"***	2-0 Douglas Fir	4	12.0**
Tree 6	"Snow"	2-0 Douglas Fir	6	12.0**
Tree 7	Thiram	2-0 Douglas Fir	105	13.8
Tree 8	Thiram	2-0 Douglas Fir	97	16.7
Tree 9	Thiram	2-1 Douglas Fir	89	19.8
Tree 10	Thiram	2-1 Douglas Fir	122	14.1
Tree 11	No Thiram	2-1 Douglas Fir	1	27.4
Tree 12	No Thiram	2-1 Douglas Fir	1	21.5
Tree 13	Thiram	2-0 Hemlock	707	4.2
Tree 14	Thiram	2-0 Hemlock	628	5.0

* Above Ground Portion of Tree

** Estimated Weight of Tree (Laboratory only reported total weight of Thiram found on these samples).

*** Snow - A substance similar in appearance to Thiram

TABLE VI D

SYMPTOMATOLOGY BY EXPOSURE GROUP - NURSERY WORKERS
 THIRAM STUDY, INDUSTRIAL FORESTERY ASSOCIATION, CANBY, OREGON
 HHE 75-132 January 26-29, 1976

Symptoms Developing Over the Study Period

SYMPTOMS	INSIDE	OUTSIDE	TOTAL	PERCENT
Number of Workers	15	14	29	
Eye Complaints	4	3	7	24
Nasal Irritation	5	7	12	41
Throat Irritation	3	3	6	21
Cough	4	1	5	17
Chest Discomfort or Shortness of Breath	2	0	2	7
Skin Problems	3	1	4	14
Total with Local Symptoms Likely To Be Due to Thiram	8	9	17	59
Headaches	5	4	9	31
Dizziness or Lightheadedness	1	1	2	7
Fatigue	0	0	0	0
Nausea or Upset Stomach	3	3	6	21
Diarrhea	0	0	0	0
Alcohol Intolerance	0 of 2	0 of 3	0 of 5	
Total With Systemic Symptoms Likely To Be Due to Thiram	5	6	11	38
Kidney Complaints	0	1	1	3
Total With No Complaints	6	3	9	31

TABLE VII D

SYMPTOMATOLOGY BY EXPOSURE GROUP - NURSERY WORKERS
 THIRAM STUDY, INDUSTRIAL FORESTRY ASSOCIATION, CANBY, OREGON
 HHE 75-132 January 26-29, 1976

Symptoms by History

SYMPTOMS	INSIDE	OUTSIDE	SPRAYERS	TOTAL	PERCENT
Number of Workers	18	14	2	34	
Self Health Assessment					
Good	17	12	2	31	91
Fair	1	2	0	3	9
Eye Complaints	3	0	1	4	12
Nasal Irritation	1	2	1	4	12
Throat Irritation	1(1)*	1	0	2(1)*	6
Cough	0	0	0	0	0
Chest Discomfort or Shortness of Breath	0	0	0	0	0
Skin Problems	7(1)	2(1)	1	10(2)	29
Total with Local Symptoms Likely To Be Due to Thiram	8(1)	3(1)	1	12(2)	35
Headaches	2	0	1	3	9
Dizziness or Lightheadedness	0	0	0	0	0
igue	(1)	0	0	(1)	0
sea or Upset Stomach	1	0	0	1	3
Diarrhea	0	0	0	0	0
Abdominal Cramps	1	0	0	1	3
Alcohol Intolerance	0 of 10	0 of 6	0 of 2	0 of 18	0
Total With Systemic Symptoms Likely To Be Due to Thiram	2(1)	0	1	3(1)	9
Problems with Menstrual Periods	1	0	0	1	5(n=19)
Problems with Other Sprays or Forest Products	2	0	0	2	6
Total With These Two Plus Other Problems Probably or Definitely Not Related to Thiram	5	4	0	9	26
Total With No Health Complaints	4	7	1	12	35

*Nature of the problem was insufficiently clear to definitely categorize it. These are not included in percentages. Workers with the questionable complaints were excluded from the "No health complaint" group.

TABLE XI D

PRE-TEST BLOOD LEVELS OF THIRAM
 THIRAM STUDY, INDUSTRIAL FORESTRY ASSOCIATION, CANBY, OREGON
 HHE 75-132 January 26-29, 1976

PRE-TEST EXPOSURE FOR THE FEW WEEKS PRIOR TO THE TESTING	NUMBER IN GROUP	NUMBER WITH THIRAM LEVELS			ACTUAL THIRAM LEVEL IF GREATER THAN 1 ppm
		Less than 1 ppm	1 ppm	Greater than 1 ppm	
None	1	0	1	0	--
Intermittent Nursery, excepting spraying or outside only	16	15	0	1	2.7
Nursery, Outside only	11	9	0	2	2.4, 4.8
Nursery, Spraying	2	1	0	1	2.2
Total	30	25	1	4	

TABLE XII D

PRE-TEST SERUM LEVELS OF DOPAMINE BETA-HYDROXYLASE
THIRAM STUDY, INDUSTRIAL FORESTRY ASSOCIATION, CANBY, OREGON
HHE 75-132 January 26-29, 1976

Pre-Test Exposure for the Few Weeks Prior to the Testing	Number In Group	Mean Value Units/Liter	95% Confidence Interval of Mean
None	1	8	----
Intermittent Nursery, excepting spraying or outside only	16	30.9	± 7.8
Nursery, Outside only	11	20.7	± 3.9
Nursery, Spraying	2	38.2	----
Total	30	26.8	± 5.4