

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 75-188-353

CHALLENGE REFORESTATION, INC.  
FALLS CITY, OREGON

DECEMBER, 1976

I. INTRODUCTION

The National Institute of Occupational Safety and Health received a request for a hazard evaluation from the owner of Challenge Reforestation, Inc. This Supplement to the Composite Report on Thiram contains specific data on work process, study conduct, and results for the Challenge Reforestation, Inc. 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

Challenge Reforestation, Inc., plants reforestation trees under contract to various land holders such as lumber firms, the U.S. Forest Service, etc. During this survey, they were planting bare root trees for the International Paper Company.

The planters working for this concern usually stay in motels. They average a little better than 1500 trees per day per man. They normally work a five day week with weekends off.

B. Study Progress and Design

1. General

The environmental-medical evaluations for this firm were conducted on March 8 and 9, 1976. The trees being planted were 2-0 Douglas Fir, which has been treated with a Thiram-Latex mixture.

The weather was clear, sunny and there was a slight breeze. The temperature was 30 to 50°F. During the day some of the planters removed their jackets and some rolled up their sleeves. There was no water available for the men to wash their hands before eating and smoking.

Most medical interviews were conducted at the motel with the aid of a bilingual planter as some of the planters spoke only Spanish. A few interviews were done in the field. Blood was drawn at the motel on March 8 before going to the field and again on March 9 after return from the field for pre- and post-exposure respectively. Exposure was 2 work days.

## 2. Environmental Sampling

For this evaluation, six environmental air samples were collected in the breathing zone of the planters on March 8, 1976. Only six were collected as some of the members of this crew did not want to wear a sampler.

Two trees were collected from the lot being planted in order to determine the concentration of Thiram per gram of trees (above ground portion only). In addition, 2 cigarettes were collected from the planters after they had simulated smoking them to determine if Thiram particles were being transferred to the cigarettes during smoking.

## 3. Medical Sample

Of the 12 man planting crew, 9 participated in the study, but it was possible to complete questionnaires on only 7. All planters were men with an average age of 26.4, a median age of 26, and a range of 22-35. Two planters had had no prior experience with either Thiram or tree planting.

## C. Evaluation Results

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

As shown in Table III ( Company number 5), one of the six breathing zone air samples collected on March 8, 1976, during the planting of Thiram treated trees by Challenge Reforestation contained more than detectable amounts of 5.0 micrograms per filter. The one sample contained 0.021 mg of Thiram per cubic meter of air.

This concentration is approximately 1/250th of the existing Federal standards of 5 mg/m<sup>3</sup> or about 1/7 of that amount needed to achieve through inhalation a daily intake of 2 mg per day which the World Health Organization considers a maximum daily exposure.

Results of the tree samples taken (Table IV) show that there were 3100 and 3000 micrograms (ug) of Thiram per gram (gm) of tree on the trees (#21, 22) planted on March 8, 1976. (For all trees sampled during the study, the amount of Thiram on the trees ranged from 89 ug Thiram/gm of tree to 8400 ug/gm).

Two cigarettes were collected from two planters after they had simulated smoking them. They had not washed their hands prior to handling the cigarette. Thiram was not detectable on either cigarette.



## 2. Medical

Table VIII A shows symptoms developing over the study period and Table IX A gives symptoms reported on detailed questioning.

Of the 7 planters on whom the full examination was done 3 were seasoned planters and 4 had started planting for the season within the last 10 days. For the group as a whole ( $n = 7$ ) means and 95% confidence intervals of the mean for systolic and diastolic blood pressure and pulse were (respectively):  $118.6 \pm 14.6$  mm Hg;  $70.9 \pm 12.8$  mm Hg;  $80.6 \pm 8.9$  /min. 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.

None of the pre-test bloods for which the prior exposure history was known showed a measurable Thiram level. One blood for a planter on whom there was no questionnaire showed a pre-exposure level of 2 ppm. Two of these planters had no prior exposure to Thiram, the other five having worked with Thiram in the recent past. The 5 planters who had been working with Thiram had a mean Dopamine beta-Hydroxylase level of  $49.6 \pm 35.2$  units/liter. The two planters with no prior exposure to Thiram averaged 30.5 units/liter.

## II. AUTHORSHIP AND ACKNOWLEDGMENTS

Report Prepared By: Arvin G. Apol  
Regional Industrial Hygienist  
Region X

Theodore W. Thoburn, M.D.  
Medical Officer, Medical Section  
HETAB, NIOSH  
Cincinnati, Ohio

Originating Office: Jerome P. Flesch, Acting Chief  
Hazard Evaluations & Technical Assistance Branch  
NIOSH  
Cincinnati, Ohio

Acknowledgments: Lloyd Simpson, CDC Regional Consultant for  
Disease Control  
Region X

TABLE III

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

COMPANY IDENTIFICATION NUMBER	TYPE OF TREES PLANTED	TREE TREATMENT	NUMBER POSITIVE* NEGATIVE FOR THIRAM DETECTION		THIRAM CONCENTRATION mg/m <sup>3</sup>	TOTAL NUMBER SAMPLES
3	Bare Root	"Snow" **	0	10	10 < 0.02	10
	Bare Root	Thiram	4	6	0.029 0.028 0.030 0.157 6 < 0.02	10
4	Bare Root	"Snow"	0	9	9 < 0.01	9
	Bare Root	Thiram	3	14	0.021 0.021 0.018 14 < 0.02	17
5	Bare Root	Thiram	1	5	0.021 5 < 0.02	6
6	Bare Root	Thiram	0	3	3 < 0.02	3
	Plugs	Thiram	5	10	0.012 0.020 0.021 0.011 0.019 10 < 0.02	15
7	Bare Root	None (no Thiram or Snow)	0	7	7 < 0.02	7

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

\*\* Snow - a substance similar in appearance to Thiram.

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 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 VIII A

SYMPTOMATOLOGY BY EXPOSURE GROUP - TREE PLANTERS  
 THIRAM STUDY, CHALLENGE REFORESTATION, INC., FALLS CITY, OREGON  
 HHE 75-188 March 8-9, 1976

## Symptoms Developing Over the Study Period

SYMPTOMS	THIRAM TREES	
	TOTAL	PERCENT
Number of Workers	7	
Eye Complaints	3	43
Nasal Irritation	2	29
Throat Irritation	1	14
Cough	0	0
Chest Discomfort or Shortness of Breath	1	14
Skin Problems	1	14
Total With Local Symptoms Likely To Be Due to Thiram in the Planters Planting Thiram Trees	3	43
Headaches	1	14
Dizziness or Lightheadedness	2	29
Fatigue	0	0
Nausea or Upset Stomach	2	29
Diarrhea	0	0
Alcohol Intolerance	0 of 5	
Total With Systemic Symptoms Likely To Be Due to Thiram in the Planters Planting Thiram Trees	3	43
Kidney Complaints	0	0
Total With No Complaints	2	29

TABLE IX A

SYMPTOMATOLOGY BY EXPOSURE GROUP - TREE PLANTERS  
 THIRAM STUDY, CHALLENGE REFORESTATION, INC., FALLS CITY, OREGON  
 HHE 75-188 March 8-9, 1976

## Symptoms by History

SYMPTOMS	TOTAL	PERCENT
Number of Workers	7	
Self Health Assessment		
Good	5	71
Fair	2#	29
Eye Complaints	3(1)*	43
Nasal Irritation	0	0
Throat Irritation	0	0
Cough	0	0
Chest Discomfort or Shortness of Breath	0	0
Skin Problems	0	0
Total With Local Symptoms Likely To Be Due to Thiram	3(1)	43
Headaches	0	0
Dizziness or Lightheadedness	0	0
Fatigue	(1)	0
Increased Problem with Prolonged Work Week	0	0
Nausea or Upset Stomach	0	0
Diarrhea	0	0
Alcohol Intolerance	0 of 6	0
Total With Systemic Symptoms Likely To Be Due to Thiram	(1)	0
Total Other Problems Probably Or Definitely Not Related to Thiram	1	14
Total With No Health Complaints	2	29

# One planter who had just started planting was apparently coming down with the flu.

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