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 75-123-358

WEYERHAEUSER COMPANY
CENTRALIA, WASHINGTON

DECEMBER, 1976

I. INTRODUCTION

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

The Weyerhaeuser Company is involved in all phases of the reforestation process. The processes conducted that were involved om this evaluation are spraying Thiram on the trees, lifting, culling, counting and packing of both plug seedlings and bare root seedlings and the planting of bare root seedlings. It is this company's practice to spray trees with Thiram shortly before lifting. The plug facility at Rochester, Washington, utilized individual plastic cones which are placed in racks of 100.

The tree planters working for this company who were included in this study lived at home as all their work was based out of Cosmopolis, Washington. They average about 500 trees per day per man. The work week is usually limited to 5 days on, 2 off.

B. Study Progress and Design

1. General

The environmental-medical evaluations were conducted over a six-month period. These evaluations were conducted at 1) the Rochester, Washington "plug" facility on October 20 and November 11, 12, and 13, 1975, during the spraying of Thiram and culling, counting and packing of plug seedlings and a few medical interviews on January 23, 1976; 2) at the Mima, Washington tree farm on January 19, 20, 22, and 23, 1976, during the spraying of Thiram and lifting, culling, counting, and bagging of bare root trees; and, 3) during the planting of "Snow" treated trees near aberdeen, Washington on January 19, 20, and 21, 1976, and the planting of Thiram treated trees on March 22 and 25 and April 12, 1976, near Aberdeen, Washington.

a. Plug Facility - All the operations are conducted under cover. The environmental and medical evaluations were done during the spraying operations (the sprayers wore disposable coveralls and head covers, respirators, but no boots) and during the extracting, culling, counting, and boxing of the Thiram treated plug seedlings. These workers all wore long sleeve shirts and/or a jacket and four wore disposable paper respirators. There were wash facilities in the restrooms by the packing area and also by the lunch facilities. Several employees were observed eating lunch in the packing area.

Environmental samples were obtained on October 20 and November 12, 1975. Medical interviews were conducted on November 11, 12, 13, 1975, and January 23, 1976. Blood specimens were obtained on November 12, 1975, before and after packing thiram trees for about 2 hours.

b. Bare Root Facilities - Environmental and medical evaluations were conducted during the spraying of Thiram and the lifting, culling, counting, and packing of Thiram treated trees and also during the culling, counting and packing of non-Thiram trees. Hand wash facilities and a lunchroom were provided next to the packing area.

Environmental samples were obtained on January 20 and 22, 1976. Medical interviews were conducted on January 20, 22 and 23, 1976. Pre-exposure bloods were drawn the afternoon of January 19 and post-exposure bloods were drawn the afternoon of January 22, 1976, for an approximatly 2 work-day exposure period.

c. Planting - The first of the two evaluations of tree planting was near Aberdeen, Washington on January 21, 1976. The trees being planted were 2-0 Douglas Fir, which were treated with Latex, but an inert material was used in lieu of the Thiram. This group served as one of two blind controls to determine if the substances applied to the trees, other than Thiram, would give results, either physically or analytically on the blood samples and air samples similar to that of Thiram.

On January 19, 1976, the day environmental samples were obtained, the weather was clear and sunny. The temperature was 39°F at 8:30 a.m. and at 12:00 noon it was 44°F. There was a 10-15 MPH wind. There was no water available for the men to wash their hands before eating or smoking.

Medical interviews were conducted in the field on January 21. Pre-exposure blood specimens were obtained on January 19 before going to the field. Post-exposure specimens were drawn after return from the field on January 21. Exposure was 3 working days.

The second evaluation was conducted near Aberdeen, Washington, on March 22-25, and April 12, 1976. The trees being planted were 1-1 Douglas Fir which has been treated with the Thiram-Latex mixture. On March 24, planting was suspended due to high winds so the environmental sampling was postponed.

Medical interviews were conducted in the field on March 22nd and 25th. Pre-exposure blood specimens were obtained on March 22 before going to the field. Post-exposure specimens were drawn after return from the field on March 25. Exposure amounted to 3 days over the 4 day period.

Only two planters were seen both while planting "Snow" trees and while planting Thiram treated trees. They had blood specimens drawn both times and were questioned both times about symptoms developing over the study period but were not administered the detailed questionnaire on the second visit.

On April 12, the day environmental samples were obtained, the weather was clear, 45° to 55°F with very little breeze. There was no wash water available for the men to wash their hands before eating or smoking.

Approximately two weeks prior to this environmental evaluation the area had been sprayed for vine maple. There was still a detectable odor in the air of this spray on April 12.

2. Environmental Sampling

For this evaluation, 54 breathing zone samples were collected. They include 5 samples during the spraying of Thiram, 11 during the handling of Thiram treated plugs, 13 during the handling of Thiram treated trees and 5 during the handling of untreated trees in the bare root facility, 10 during the planting of "Snow" treated trees and 10 during the planting of Thiram trees.

A total of 10 trees were collected from the various lots of trees being packed or planted in order to determine the concentration of Thiram per gram of trees (above ground portion only). Two trees each were taken as follows: untreated trees at plug facility, Thiram treated trees at plug facility, Thiram treated trees at bare root facility, "Snow" trees being planted, and Thiram trees being planted.

3. Medical Sample

Of about 30 workers on duty in the area of concern at the plug facility at the time of the study, 28 were seen (2 men and 26 women). Bloods samples were obtained on 27 workers. No post-exposure questionnaires were obtained on this group of workers.

Of about 68 workers on duty at the bare roots facility at the time of the study, 34 were seen (4 men and 30 women). Blood samples were obtained on all 34.

Planting crews consisted of about 10 men. Eleven workers were seen planting "Snow" trees and blood specimens obtained on 9. Thirteen workers were seen planting Thiram treated trees and blood specimens obtained on 10. Only 2 planters were seen both times. All tree planters were men.

Details on age, sex and general work area are contained in Table I G.

C. Evaluation Results

1. Environmental (Tables II, III & IV taken from Composite Report)

As shown in Table II (Company Number 2), only 1 of the 27 breathing zone samples collected in the nursery operations contained Thiram and that concentration was 0.015 mg of Thiram per cubic meter of air. That concentration is 3% of the existing Federal standard of 5 mg/m^3 or 11% (1/9) of the amount needed to achieve a daily intake through inhalation of 2 mg per day which the World Health Organization (WHO) considers maximum exposure. The 5 control samples contained less than the detectable amount of Thiram on each filter.

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

As shown in Table III (Company Number 3), none of the 10 breathing zone samples collected during the planting of "Snow" treated trees contained detectable amounts of Thiram or other substances present on the trees that would give us a false indication that Thiram was present. However, during the planting of Thiram trees, 4 of the 10 samples collected were positive. They contained 0.029, 0.038, 0.030 mg/m^3 which are about 1/167th (0.6%) of the existing Federal Standard of 5 mg/m^3 which and 0.157 is 1/32 (3%) of the standard. Concentrations of 0.028, 0.029, 0.030 mg/m^3 are about 1/5 (30%) of that amount needed to achieve through inhalation a daily intake of 2 mg/day which the WHO considers a maximum intake. A concentration of 0.157 mg/m^3 would give an intake at heavy work of about 2.26 mg/day. This is 113% of the WHO recommended intake of 2 mg/day.

Results of the tree samples taken (Table IV) show that there was no Thiram on the trees (trees #1 and 2) used for blind controls. The Thiram trees (trees #3 and 4) handled in the plug facility contained 1800 ug of Thiram/gm of tree and in the bare root nursery (trees #7 and 8) they contained 105 and 97 ug/gm tree. Those trees being planted (trees #19 and 20) contained 2800 and 4300 ug/gm of tree. (For all trees sampled during the Thiram study, the amount of Thiram on the trees ranged from 89 ug/gm tree to 8400 ug/gm).

2. Medical

Table VI G shows symptoms developing over the study period among these nursery workers and Table VII G gives symptoms reported on detailed questioning. Tables VIII G and IX G do the same for the tree planters. Table X G presents the mean systolic and diastolic blood pressures and the mean pulse rates for the three groups involved. Table XI G gives some detail on blood thiram level for the initial test in relation to the pre-test exposure history. Table XIII B does the same for serum DBH. 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

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

TABLE I G

CHARACTERIZATION OF WORKER SAMPLE
THIRAM STUDY, WYEREHAEUSER COMPANY, CENTRALIA, WASHINGTON
HHE 75-132 November 1975 - March 1976

Worker Group & Date	Male	Female	Total	AGE Mean	AGE Median	AGE Range
NURSERY, Plug 11/11-13/75 & 1/23/76						
Total	1	25	26	32.2	29	18-54
Inside or Inside & Outside	1	21	22	30.7	26	18-47
Outside Only	0	2	2	48	48	42-54
Spraying	0	2	2	32	32	22-42
Seen but no Questionnaire completed(not included above)	1	1	2	--	--	--
NURSERY, Bare Root - 1/20-23/76						
Total	4	30	34	34.4	33	20-62
Inside or Inside & Outside	0	18	18	39.6	38	21-62
Outside Only	3	12	15	27.9	28	20-45
Spraying	1	0	0	36	--	--
TREE PLANTERS, "Snow" - 1/19-21/76 Thiram - 3/22-25/76						
Total	21	0	21	23.8	22	18-48
Seen twice(once planting thiram, once planting "Snow")	2	0	2	22.5	22.5	21-24
Planting Thiram treated trees	12	0	12	23.2	21	18-48
Planting "Snow" trees	11	0	11	24.2	24	20-31
Complete questionnaires, Experience with Thiram	19	0	19	23.8	22	18-48
Complete questionnaire, No Experience with Thiram	2	0	2	24	24	24
Seen but no Questionnaire completed(not included above)	2	0	2	--	--	--

TABLE II

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

COMPANY IDENTIFICATION NUMBER	JOB DESCRIPTION	TREATMENT	NUMBER POSITIVE* FOR THIRAM DETECTION	NUMBER NEGATIVE FOR THIRAM DETECTION	THIRAM CONCENTRATION mg/m^3	TOTAL NUMBER SAMPLES
1	Sprayers and Helpers	Thiram	0	16	4 < 0.02 1 < 0.04 5 < 0.03 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	Nursery Plugs 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
	Bare Root 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 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* FOR THIRAM DETECTION	NUMBER NEGATIVE FOR THIRAM DETECTION	THIRAM CONCENTRATION mg/m^3	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 VI G

SYMTPOMATOLOGY BY EXPOSURE GROUP - NURSERY WORKERS
BARE ROOT FACILITY
THIRAM STUDY, WEYERHAEUSER COMPANY, CENTRALIA, WASHINGTON
HHE 75-123 January 20-23, 1976

Symptoms Developing Over the Study Period

SYMPTOMS	INSIDE	OUTSIDE	SPRAYERS	TOTAL	PERCENT
Number of Workers	18	14	1	33	
Eye Complaints	2	2	1	5	15
Nasal Irritation	15	9	1	25	76
Throat Irritation	4	7	1	12	36
Cough	3	2	1	6	18
Chest Discomfort or Shortness of Breath	0	3	0	3	9
Skin Problems	4	3	1	8	24
Total with Local Symptoms Likely to be due to Thiram	16	11	1	14	42
Headaches	6	6	0	12	36
Dizziness or Lightheadedness	0	1	0	1	3
Fatigue	0	0	0	0	0
Nausea or Upset Stomach	2	1	0	3	9
Diarrhea	0	0	0	0	0
Alcohol Intolerance	0 of 0	0 of 0	0 of 1	0 of 1	
Total with Systemic Symptoms Likely to be due to Thiram	7	7	0	14	42
Kidney Complaints	0	0	0	0	0
Total with No Complaints	2	3	0	5	15

Note: The plug nursery workers were not administered the post exposure questionnaire and so are not included in this table.

TABLE VII G

SYMPTOMATOLOGY BY EXPOSURE GROUP - NURSERY WORKERS
THIRAM STUDY, WEYERHAEUSER COMPANY, CENTRALIA, WASHINGTON
HHE 75-123 November 11, 1975 - January 23, 1976

Symptoms by History

SYMPTOMS	INSIDE PLUGS	INSIDE BARE ROOT	INSIDE TOTAL	OUTSIDE	SPRAYERS	TOTAL	PERCENT
Number of Workers	22	18	40	17	3	60	
Self Health Assessment							
Good	21	16	37	14	1	52	87
Fair	1	2	3	3	2	8	13
Eye Complaints	10(1)*	8	18(1)*	5(1)*	1	24(2)*	40
Nasal Irritation	16(2)	9(1)	25(3)	6(1)	1	32(4)	53
Throat Irritation	8	6(2)	14(2)	5(2)	2	21(4)	35
Cough	1	0	1	0	0	1	2
Chest Discomfort or Shortness of Breath	1	2	3	1	0	4	7
Skin Problems	10(2)	10	20(2)	10(1)	2	32(3)	53
Total with Local Symptoms Likely to be due to Thiram	19(2)	14	33(2)	12(2)	3	48(4)	80
Headaches	4	3	7	3	1	11	18
Dizziness or Lighthead	0	1	1	0	0	1	2
Fatigue	1	0	1	1	0	2	3
Nausea or Upset Stomach	2	1	3	0	1	4	7
Diarrhea	0	0	0	0	1	1	2
Abdominal Cramps	0	0	0	0	0	0	0
Alcohol Intolerance	3 of 7	0 of 9	3 of 16	0 of 12	0 of 1	3 of 28	11
Total with Systemic Symptoms Likely to be due to Thiram	6	4	10	3	2	15	25
Problems with Menstrual Periods	3	1	5	1	0	5	9(n=55)
Problems with Other Sprays or Forest Products	2(1)	0	2(1)	1	0	3(1)	5
Total with these two plus other problems probably or definitely not related to Thiram	5(1)	5	10(1)	3	0	13(1)	22
Total with no health complaints	0	3	3	1	0	4	7

*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 VIII G

SYMPTOMATOLOGY BY EXPOSURE GROUP - TREE PLANTERS
THIRAM STUDY, WEYERHAEUSER COMPANY, CENTRALIA, WASHINGTON
HHE 75-123 January 20 - March 25, 1976

Symptoms Developing Over the Study Period

SYMPTOMS	THIRAM TREES		SNOW TREES	
	Total	Percent	Total	Percent
Number of Workers	10		11	
Eye Complaints	3	30	1	9
Nasal Irritation	7	70	4	36
Throat Irritation	2	20	3	27
Cough	1	10	1	9
Chest Discomfort or Shortness of Breath	1	10	3	27
Skin Problems	1	10	0	0
Total with Local Symptoms Likely to be due to Thiram in the Planters Planting Thiram Trees	9	90	5	45
Headaches	0	0	0	0
Dizziness or Lightheadness	0	0	1	9
Fatigue	0	0	0	0
Nausea or Upset Stomach	0	0	2	18
Diarrhea	0	0	0	0
Alcohol Intolerance	0 of 7		0 of 4	
Total with Systemic Symptoms Likely to be due to Thiram in the Planters Planting Thiram Trees	0	0	2	18
Kidney Complaints	0	0	1	9
Total with No Complaints Complaints	1	10	6	55

TABLE IX G

SYMPTOMATOLOGY BY EXPOSURE GROUP - TREE PLANTERS
THIRAM STUDY, WEYERHAEUSER COMPANY, CENTRALIA, WASHINGTON
HHE 75-123 January 20 - March 25, 1976

Symptoms by History, planters with past experience with thiram

SYMPTOMS	TOTAL	PERCENT
Number of Workers	19	
Self Health Assessment		
Good	17	89
Fair	1	5
Fair to Poor	1	5
Eye Complaints	7	37
Nasal Irritation	2(3)*	11
Throat Irritation	1(1)	5
Cough	0	0
Chest Discomfort or Shortness of Breath	0	0
Skin Problems	4(1)	21
Total with Local Symptoms Likely to be due to Thiram	9(2)	47
Headaches	1(2)	5
Dizziness or Lightheadedness	0	0
Fatigue	2	11
Increased Problem with Prolonged Work Week	0	0
Nausea or Upset Stomach	1	5
Diarrhea	0	0
Alcohol Intolerance	0 of 18	
Total with Systemic Symptoms Likely to be due to Thiram	3(2)	16
Total other problems probably or definitely not related to Thiram	5	26
Total with no health complaints	7	37

*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.

The two planters with no experience with thiram both considered themselves in good health.

TABLE X G

MEAN BLOOD PRESSURE AND PULSE BY WORKER GROUP - SEASONED WORKERS
THIRAM STUDY, WEYERHAEUSER COMPANY, CENTRALIA, WASHINGTON
HHE 75-123 November 11, 1976 - March 25, 1976

WORKER GROUP	Number	MEAN BLOOD PRESSURE mmHg		MEAN PULSE /min.
		Systolic	Diastolic	
Nursery Workers, Plug Facility	26	111.7 ± 5.4	64.4 ± 4.5	73.8 ± 3.0
Nursery Workers, Bare Root Facility	34	121.2 ± 5.2	74.2 ± 4.0	72.9 ± 3.0
Planters, Thiram Trees	10	128.8 ± 6.9	71.2 ± 6.0	72.3 ± 7.9
Planters, "Snow" Trees	9	119.6 ± 11.7	66.0 ± 4.7	74.4 ± 8.0

TABLE XI G

PRE-TEST BLOOD LEVELS OF THIRAM
THIRAM STUDY, WEYERHAEUSER COMPANY, CENTRALIA, WASHINGTON
HHE 75-123 November 11, 1975 - March 25, 1976

Pre-Test Exposure for the few weeks prior to testing	Number with Thiram Levels				Actual Thiram level if greater than 1 ppm
	No. in Group	Less than 1 ppm	1 ppm	Greater than 1 ppm	
PLUG NURSERY					
None	3	2	1	0	--
Intermittent Nursery, excepting spraying or outside only	16	11	0	5	1.8,2.0,2.1,3.1, 4.7
Nursery, Outside only	2	1	1	0	--
Nursery, spraying	4	4	0	0	--
Total	25	18	2	5	
BARE ROOT NURSERY					
Intermittent Nursery, excepting spraying or outside only	29	18	2	9	1.2,1.6,1.7,2,2.1, 4.8,4.8,6,18
Nursery, Outside only	4	3	1	0	--
Nursery, spraying	1	0	0	1	3.4
Total	34	21	3	10	
TREE PLANTING					
Planting Thiram Trees	13	13	0	0	--
Planting "Snow" Trees	8	7	0	1	12
Total	21	20	0	1	

TABLE XII G

PRE-TEST LEVELS OF DOPAMINE BETA-HYDROXYLASE
THIRAM STUDY, WEYERHAEUSER COMPANY, CENTRALIA, WASHINGTON
HHE 75-123 November 11, 1975 - March 25, 1976

Pre-Test Exposure for the few weeks prior to testing	Number in Group	Mean Value Units/Liter	95% Confidence Interval of Mean
PLUG NURSERY			
None	3	45.3	--
Intermittent Nursery, excepting spraying or outside only	16	41.6	± 8.7
Nursery, Outside only	2	65.0	--
Nursery, Spraying	4	39.5	± 22.9
Total	25	43.6	± 8.2
BARE ROOT NURSERY			
Intermittent Nursery, excepting spraying or outside only	29	34.9	± 8.5
Nursery, Outside only	4	22.8	± 19.4
Nursery, Spraying	1	14	--
Total	34	32.8	± 7.5
TREE PLANTING			
Planting Thiram Trees	13	33.9	± 9.0
Planting "Snow" Trees	8	33.4	± 18.2
Total	21	33.7	± 7.9