

Study 32

030001

1/ 4/1988

005102

Chemical: 2,4-D (2 lb.ae.) and picloram (0.54 lb) triisopropanolamine per gal.

Formulation: Tordon 101

Citation: Warren, L.E. 1978. Evaluation of Nalco-Trol thickening agent to control drift from aerial application of Tordon 101 and Garlon 3A herbicide. Submitted by DOW Chemical. EPA Acc. No. 235247 (F-3)

MRID not located in OPPIN

Test Title: Spray Drift Field Evaluation - Aerial

Reviewer: Robert W. Holst, Ph.D.  
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*R. W. Holst* 4 Jan 88

Conclusions: During applications with a helicopter at 50 feet in 6 to 14 mph crosswinds, downwind drift was less than 1% ~~of~~ the applied material. Droplet sizes could not be quantitated.

Recommendations: This study is supplementary. There is insufficient information and data to fully evaluate this study with respect to droplet sizes or air quantities. This study does not fully meet the requirements of Subdivision R for a field evaluation study or a droplet size spectrum study. The flow rates of the Staplex air samplers are not given; therefore, air sampler quantities cannot be related to air concentrations and to respiratory burdens.

Materials and Methods: An aerial application study was performed in Davis CA vicinity in September 1974 using a Bell G-2 Helicopter fitted with V-jet 0020 and 0300 nozzles. Nozzle pressure was 25 to 34 psi. Height of application was 50 feet. Nalco-Trol drift agent was added to some of the application tanks. Mylar sheets (6 x 18"), bean plants, and Staplex air samplers were placed at varying distances downwind. Application rate was 8 lb. ae. 2,4-D per acre.

See the attached tables from the study (Tables 1 and 2) for details of the application rates and meteorological/stability conditions during the tests.

Results: The following are reproductions of tables from the report giving only the information on 2,4-D.

TABLE 1

Drift tests with TORDON 101 Mixture and GARLON 3A herbicide plus NALCO-TROL

Trt <sup>1</sup> No.	Run No.	Herbicide/ gpa	Additive and Rate	Mix Amt. (gals)			GPA/ Pass	Sec/Run 4 passes	MPH	S.R. <sup>2</sup>
				Made	Left	Used				
1	1	GARLON 3A 2-2/3/20	Nalco-Trol 1/4%	28	11	17	4.84	58/3200'	38	- 0.018
	2 <sup>3</sup>	do	do	25	6.5	18.5	5.05	64/3200'	34	0
2	3	GARLON 3A + FORMULA 40 1-1/3 + 1-1/3 per 20	Nalco-Trol 1/4%	25	7	18	4.91	63/3200'	35	0.012
	4	do	do	25	6.5	18.5	5.05	64/3200'	34	0.013
3	5	GARLON 3A + TORDON 101 1-1/3 + 2 per 20	Nalco-Trol 1/4%	25	7	18	4.91	60/3200'	36	0.013
4	8 <sup>3</sup>	TORDON 101 4/20	None	65	7	58	4.83	213/2 mi.	34	- 0.25
	9 <sup>3</sup>	do	do	65	7	58	4.83	212/2 mi.	34	- 0.20
5	6	TORDON 101 4/20	Nalco-Trol 1/4%	25	8	17	4.64	63/3200'	35	11.5
	7 <sup>3</sup>	do	do	65	12	53	3.8	230/2 mi	33	10.9
6	10 <sup>3</sup>	TORDON 101 4/20	Nalco-Trol 1%	65	14	51	4.22	224/2 mi	32	- 0.09
	11	do	do	25	8	17	4.64	62/3200'	32	0.72
7	12	TORDON 101 4/20	Nalco-Trol 1.5%	25	10	15	4.09	69.5/ 3200'	31	1.14
8	13	TORDON 101 4/20	NORBAK 40 sec.	45		21.5	5.87	62/3200'	35	0.62
	14	do	do		6.5	17 <sup>4</sup>	5.86	47/2560'	35	0.62

<sup>1</sup>V-jet nozzles 12 - 0020 on Trts. 1 to 5.  
12 - 0030 on Trts. 6 and 7.

2 OC-8C + 1 5050 on Trt. 8.

<sup>3</sup>Stability ratio computed from vertical temperature lapse and 16 foot wind speed (4).

<sup>4</sup>Air samples and xylar sheets for these runs.

<sup>5</sup>Ran out at 150 ft. of last pass.

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TABLE 2  
 Meteorological Conditions and Stability for Drift Tests  
 Davis, California

Run No.	Date Sept.	Wind Velocity (MPH)					Wind Direction Dev. from L	Temp. (°F) 32' - 8'	S.R. <sup>1</sup>
		4'	8'	16'	32'	64'			
1	3	3.3	9.8	11.2	10.8	-	7° E	- 0.08°	- 0.018
2	3	8.5	10.3	12.0	13.1		11° E	0°	0
3	3	8.0	9.5	10.9	12.1		7° E	+ 0.05°	0.012
4	3	9.0	10.7	12.2	13.0		9° E	+ 0.07°	0.013
5	3	8.5	10.1	11.5	12.5		6° E	+ 0.06°	0.013
6	5	2.9	3.4	4.1	5.2	4.2	11° E	+ 6.94°	11.5
7	5	2.2	2.7	3.8	4.7	6.4	0°	+ 5.68°	10.9
8	6	6.8	7.7	8.2	9.4	9.5	11° E	- 0.50	- 0.25
9	6	5.8	6.8	7.6	8.7	8.4	7° E	- 0.41°	- 0.20
10	6	2.3	5.0	5.9	8.1	9.4	23° E	- 0.01°	- 0.09
11	6	4.1	7.3	6.1	8.4	10.7	18° E	+ 0.96°	0.72
12	6	3.8	8.2	6.0	8.7	11.4	15° E	+ 1.48°	1.14
13	6	5.2	8.1	8.4	10.6	14.1	7° E	+ 1.57°	0.62
14	6	4.8	6.5	7.9	10.2	14.1	7° E	+ 1.38°	0.62

<sup>1</sup>Stability ratio is calculated from the wind velocity at 16 feet and difference in temperature from 4 to 32 ft. elevations.

Stability ratio as computed by Yates and Akesson (3) reflects the air stability as a function of the air speed at 8 foot elevation and the difference in temperature between 4 and 32 feet elevation. A vertical temperature lapse rate less than 3.2° per 1000 feet produces more stable air; this is a temperature inversion. Under these conditions there is less vertical mixing and small particles of spray can fall out greater distances downwind.

Sample No.	Run No.	Notation	ppm 2,4-D	Micrograms <sup>1</sup>	
				2,4-D	lb/acre
4	7	Mylar, Tordon 2, 200'	.497	24.9	.003185
5	7	Mylar, Tordon 2, 400'	.151	7.6	.00072
6	7	Mylar, Tordon 2, 800'	.112	5.6	.000716
7	7	Mylar, Tordon 2, 1600'	.043	2.2	.000281
8	7	Mylar, Tordon 2, 3200'	.027	1.4	.000179
9	8	Mylar, Tordon 3, 200'	5.30	265.0	.03390
10	8	Mylar, Tordon 3, 400'	1.88	94.0	.01202
11	8	Mylar, Tordon 3, 800'	1.27	64.0	.00818
12	8	Mylar, Tordon 3, 1600'	.243	12.1	.00155
13	8	Mylar, Tordon 3, 3200'	.143	7.2	.00092
14	9	Mylar, Tordon 4, 200'	6.04	302.0	.03863
15	9	Mylar, Tordon 4, 400'	2.16	108.0	.01381
16	9	Mylar, Tordon 4, 800'	.928	46.4	.00593
17	9	Mylar, Tordon 4, 1600'	.265	13.3	.00170
18	9	Mylar, Tordon 4, 3200'	.090	4.5	.000575
19	10	Mylar, Tordon 5, 200'	.438	21.9	.00280
20	10	Mylar, Tordon 5, 400'	.177	8.6	.00110
21	10	Mylar, Tordon 5, 800'	.113	5.9	.00075
22	10	Mylar, Tordon 5, 1600'	.019	1.0	.00012
23	10	Mylar, Tordon 5, 3200'	.011	0.55	.00007
25	7	Staplex, Tordon 2, 400'	.391	9.8	
26	7	Staplex, Tordon 2, 1600'	.125	3.2	
27	7	Staplex, Tordon 2, 3200'	.123	3.1	
*28	7	Staplex, Tordon 2, 1600'	.022	.6	
*29	7	Staplex, Tordon 2, 1600'	.009	.2	
*30	7	Staplex, Tordon 2, 1600'	.003	.08	
*31	7	Staplex, Tordon 2, 1600'	.002	.05	
*32	7	Staplex, Tordon 2, 1600'	.003	.08	
33	8	Staplex, Tordon 3, 400'	3.91	97.3	
34	8	Staplex, Tordon 3, 1600'	.707	17.7	
*35	8	Staplex, Tordon 3, 1600'	.115	2.9	
*36	8	Staplex, Tordon 3, 1600'	.051	1.3	
*37	8	Staplex, Tordon 3, 1600'	.022	.55	
*38	8	Staplex, Tordon 3, 1600'	.006	.15	
*39	8	Staplex, Tordon 3, 1600'	.017	.43	
40	9	Staplex, Tordon 4, 400'	3.66	91.5	
41	9	Staplex, Tordon 4, 1600'	.697	17.4	
42	9	Staplex, Tordon 4, 3200'	.281	7.0	
43	10	Staplex, Tordon 5, 400'	.287	7.2	
44	10	Staplex, Tordon 5, 1600'	.046	1.2	
45	10	Staplex, Tordon 5, 3200'	.030	.75	

\* Samples 28 and 35 each started a series labeled Hi Vol 1 through Hi Vol 5 in consecutive numerical order. (Cascade - for fine drops).

<sup>2</sup> Per 108 sq. in. sheet. for mylar; 12.5 sq. in. for Staplex.

<sup>3</sup> Estimated by dividing 2,4-D reading by 5.

<sup>4</sup> Should be over 1/5 of 2,4-D

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Table 3.

Analysis for 2,4-D on mylar sheets from aerial drift tests, 1974.

Product	Rate/ 20 gal	Drift Agent	Run	Herbicide Deposits/Station					SR
				Micrograms/sq.ft. / (milli.lb./acre)					
				200	400	800	1600	3200	
Tordon 101	4 gal	None	$\frac{8+9}{2}$	378 (35.0)	134 (12.9)	70 (7.2)	16.9 (1.6)	7.8 (0.7)	-0.23
Tordon 101	4 gal	Nalco-Trol 1/4%	7	33.3 (3.2)	10.1 (0.9)	7.5 (0.7)	2.9 (0.3)	1.9 (0.2)	11.0
Tordon 101	4 gal	Nalco-Trol 1%	10	29.3 (2.8)	11.4 (1.1)	7.9 (0.7)	1.33 (0.1)	0.73 ( $<0.1$ )	-0.9

Table 4.

Amounts of 2,4-D in air samplers

Chemical	Drift Agent	Run	SR	Herbicide Deposits/Station		
				ppm		
				400	1600	3200
Tordon 101 4 gal/20	None	$\frac{8+9}{2}$	-0.23	3.79	0.709	0.281
		Corrected (1.64)		6.22	1.163	0.461
	Nalco-Trol 1/4%	7	11.0	0.391	0.126	0.123
		Corrected (0.56)		0.219	0.071	0.069
	Nalco-Trol 1%	10	-0.9	0.287	0.046	0.030
		Corrected (0.78)		0.224	0.036	0.023

(Correction factor for wind speed to air speed through Staplex sampler.)  
 (Note: The air sampler flow rates were not given.)

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PC Code 030001

Study 29

Chemical: Bivert TDN and Nalco-Trol/Lo drift with 2,4-D + Picloram

Formulation: Tordon 101: Picloram

Citation: Stephenson, G.R. 197?. Evaluation of Nalco-Trol/Lo Drift and Bivert TDN for reducing herbicidal drift in roadside spraying. Dept of Environ. Biol. University of Guelph, Ontario. Submitted by DOW Chemical. EPA Acc. No. 235247 (F-7). ~~MRIO~~ MRIO 40346511

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RWH 4 Jan 88

Test Title: Spray Drift Field Evaluation

Conclusions: In a roadside application using a roadside sprayer, little pesticide effect was found beyond 10 feet when Nalco-Trol had been added. The effect was determined by a cucumber seedling root bioassay.

Recommendations: This study is supplementary. The 2,4-D was not separately or directly quantified though the bioassay is a very sensitive method. The study does not meet the requirements of Subdivision R for a field evaluation study.

Material and Methods: A road-side sprayer (John Bean) equipped with 2 peacock nozzles (#41-90) arranged to spray a 6.1 m swath was used. A 3-dimensional collection grid (20' long, 12' high, 70' downwind) was used to collect the drift in petri dishes. The quantity effect was determined by a cucumber seedling root bioassay. Vehicle speed was 13 km/hr; crosswind speed was 11 to 14 km/hr. Fluourescene dye and Tordon 101 (0.45 kg and 9.1 liters, respectively) were added to 227 liters of water.

Cucumber root bioassay was performed using Tordon 101 at  $10^{-7}$  to  $10^{-1}$  kg/ha. 2,4-D + picloram at 0.3 mg/petri dish equals  $10^{-1}$  kg/ha (2,4-D was not individually determined).

Results: Nalco-Trol/Lo Drift agent was more effective than the Bivert TDN in controlling drift of Tordon 101. During one test, the material with Nalco-Trol drifted less than 20 feet downwind, whereas pesticide without either agent drifted over 90 feet downwind in 8 to 10 mph crosswinds.



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