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To: Robert Taylor
Product Manager PM 74
Registration Division (H7505C)

From: Henry P. Nelson, Ph.D., Head (acting) H Nelson
Environmental Assessment Section
Environmental Fate & Ground Water Branch/EFED (H7507C)

Thru: Henry Jacoby, Chief Henry Jacoby
Environmental Fate & Ground Water Branch/EFED (H7507C)

Attached, please find the EFGWB review of...

Reg./File # : 352-435

Chemical Name : Methyl 2-{{{(4-methoxy-6-methyl-1,3,5-triazin2-yl-
: amino}carbonyl)amino} sulfonyl}benzoate (Metsulforon Methyl)

Type Product : Herbicide

Product Name : Ally

Company Name : DuPont

Purpose : Evaluate spray drift studies

Action Code : 660 EFGWB #(s): 90- 0996 Total Review Time: 5 days

EFGWB Guideline/MRID Summary Table: The review in this package contains...

161-1		202-2		164-1		165-1		166-1	
161-2		162-2		164-2		165-2		166-2	
161-3		162-3		164-3		165-3		166-3	
201-1		162-4		164-4		165-4		167-1	
201-1		163-1		164-5		165-5		167-2	
202-2		163-3							

NOTE

TO: Mr. Robert Taylor, PM-25
Fungicide/Herbicide Branch

THRU: Henry Nelson, Chief, H Nelson
Surface Water Section, EFEB

THRU: Hank Jacoby, Chief Hank Jacoby
Environmental Fate and Groundwater Branch

From: Robert K. Hitch, Robert Hitch
Environmetal Fate and Groundwater Branch

Conclusions

Three Drift Field Evaluation studies were submitted by DuPont in accession 407670-17 in an effort to fill the Drift Field Evaluation guideline requirement (202-1) and to persuade the Agency to add aerial application to the Ally label. These three studies have been submitted previously and were evaluated in my 29 December 1989 review (EFGWB review # 90606 and 90645 -- a single review with two tracking numbers). In my 29 December 1989 review, all three studies were judged to be supplemental. Only the study by Akesson was judged to be potentially upgradeable to fully acceptable. The registrant should see the December 1989 review regarding the acceptability of the studies.

In addition, we note that stipulating a label requirement for a droplet size spectrum with a VMD in the range of 1000 microns ,or, about one millimeter, might greatly reduce drift.

Background

Whether or not aerial application should be allowed for Ally depends on the toxicology of the chemical and the magnitude of the exposure. The Spray Drift Task Force (of which DuPont is a member) is expected to provide a fully acceptable model for estimating spray drift exposure, but this may be years away. There is probably no definitive tool, as yet, for estimating deposition with distance from aerial application. However, Ms Sandra Bird (USEPA Athens, Georgia) recently (American Chemical Society, 1992) presented a literature review of aerial application drift field studies. Fourty-two such studies were covered by the review. Looking at the fourty-two studies, we can consider what parameter appears to be influential on the degree of off-site spray drift deposition. First, I would set aside the studies in Ms Bird's paper which had only one data point, because they do not have the same support as multiple point curves. In all the multi-point studies, with four exceptions, we see drift of over 0.1% out to, at least, 1000 feet downwind. Of the four which did not show this magnitude of deposition, three were conducted with droplet spectra having VMD's over 1000 microns (1.0 millimeter). In summary, it would appear that it may be difficult to reduce the deposition out to 1000 feet to less than 0.1% of the application rate unless the label calls for large diameter spray droplets possibly in the range of 1000 microns. The Ecological Effects Branch would be in a position to say whether 0.1% of the application rate might cause an environmental problem.

Attachment: Ms Bird's literature review as of September 1992.

cc: Richard Petrie, Ecological Effects Branch

Presented floor Sept 92 Washington Am. Chem Soc.

A Compilation of Aerial Spray Drift Field Study Data for Low-Flight Agricultural Applications

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Athens, GA

ABSTRACT

Offsite drift of aerially applied pesticides is a major contributor to chemical exposure of humans, fish, and wildlife. Data from 42 low-flight airplane agricultural applications (mostly single swath field trials) were collated, extrapolated to a standard 20 swath application, and normalized by the application rate. The field tests represent a wide range of meteorological conditions and nozzles types and show that median values for offsite deposition at 100, 200, 300, and 400 ft are on the order of 5%, 2%, 1%, and 0.08%, respectively As far as 1/4 mile downwind, deposition ranges from 0.02 to 2% of the application rate.

INTRODUCTION

Drift of airborne pesticides from the target site at the time of aerial spray application is a source of environmental concern due to the potential human health impacts, downwind contamination and damage of crops and livestock, and endangerment of ecological resources. While aerial application of pesticides provides a highly efficient method for control of both vegetation and insect pests and accounts for a substantial fraction of all pesticide applications, less than 50% of aerially-applied pesticides (Willis and McDowell, 1987) deposit on target. The remainder become contaminants of soil, water, and air.

Although there has historically been an interest in the problems presented by the off-site drift of pesticides, the new generation of pesticides, such as the synthetic pyrethroids and the sulfonyl urea compounds, add a new set of concerns relative to their potential ecological effects. The synthetic pyrethroids, which now comprise more than 25% of the insecticide market (Inglesfield, 1989) have a very low toxicity to terrestrial vertebrates but have a relatively high toxicity to fish and invertebrates. Therefore, the widespread use and persistence of the synthetic pyrethroids may potentially threaten aquatic ecological resources. The sulfonyl urea herbicides may be toxic to plants at residue levels that are not detectable using conventional chemical analysis techniques. Non-target species may be orders of magnitude more sensitive to these herbicides than the target vegetation posing a significant potential for both economic and ecological impacts.

Since the mid-sixties, results from a variety of off-site drift field studies have been published in the open literature. Typically, these studies compare off-site deposition under different application conditions to evaluate the relative drift produced using different spray nozzles or pesticide formulations, and the effects of meteorological conditions on drift behavior. These drift studies provide a potential database for validating spray drift models and for providing empirical guidelines for estimating pesticide exposure.

This article summarizes the findings of individual field trials and collates the deposition residue data reported for 42 separate field tests reported in the open literature for low flight aerial spray applications. The data in the literature were originally reported in a variety of formats and measurement units and for a range of single and multiple swath applications. In this report, all deposition data were normalized to a percentage of the nominal application rate, interpolated to consistent intervals, and extrapolated to reflect a standard 20-swath application scenario. The results are presented in both tabular and graphical form.

DATA BASE DEVELOPMENT

A review of the spray drift literature was performed, and articles containing more than 60 separate field trials measuring off-site deposition of pesticides from low-flight agricultural applications were identified. The only trials (42) included in this database were either field-scale applications or single-swath applications in which deposition data were collected at sufficient distances downwind to allow extrapolation to a 20-swath field. Only airplane applications to crops at very low altitudes are included in this summary. No helicopter, forest, or orchard applications are included, although a number of these types of trials have been reported in the open literature.

Deposition data were reported in these studies in a variety of ways including tabular, graphical, and regression formats. For deposition data reported at fixed measurement station locations, a linear interpolation between measured data points was used to estimate depositional values at selected intervals downwind of the edge of the field or swath. Single-swath field trials, which accounted for the majority of the reported data, as well as smaller plot trials were extrapolated to a 20-swath application by

$$TD_j = \sum_{k=1}^{NS} D_k$$

where

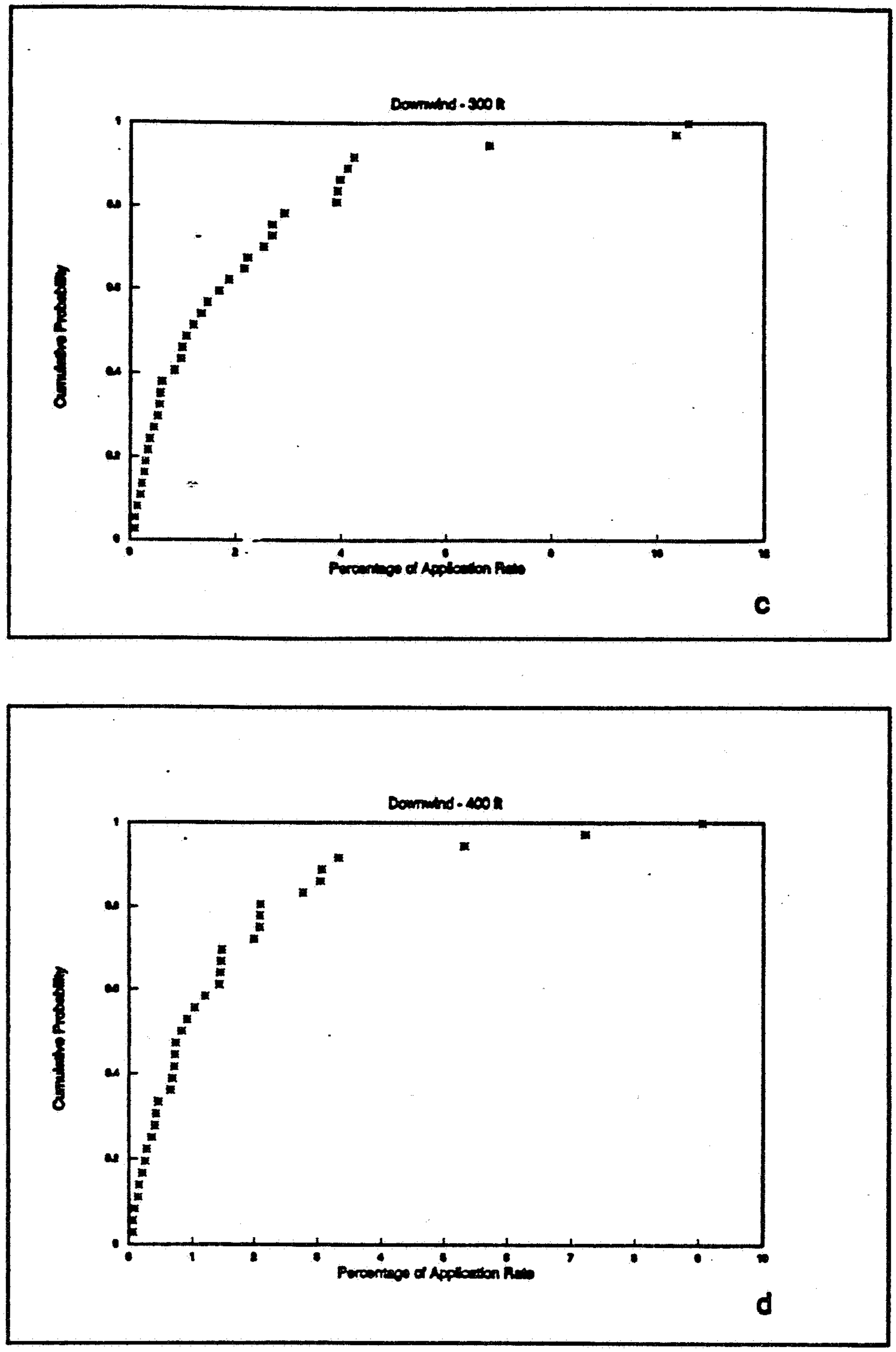

Figure 3. (cont'd) Cumulative Probability of Offsite Deposition at c) 300 ft and d) 400 ft Downwind

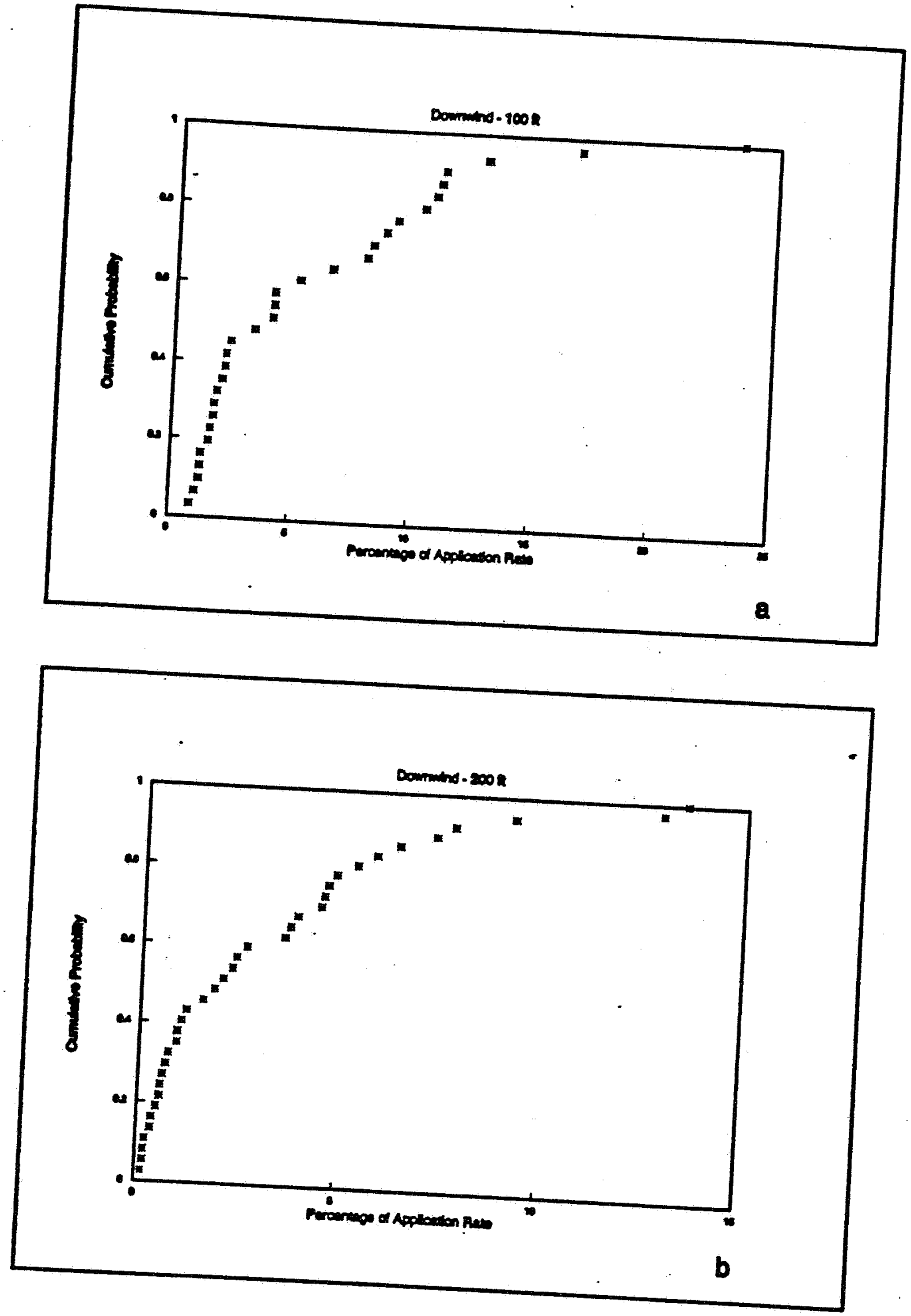

Figure 3. Cumulative Probability of Offsite Deposition at a) 100, and b) 200 ft downwind.

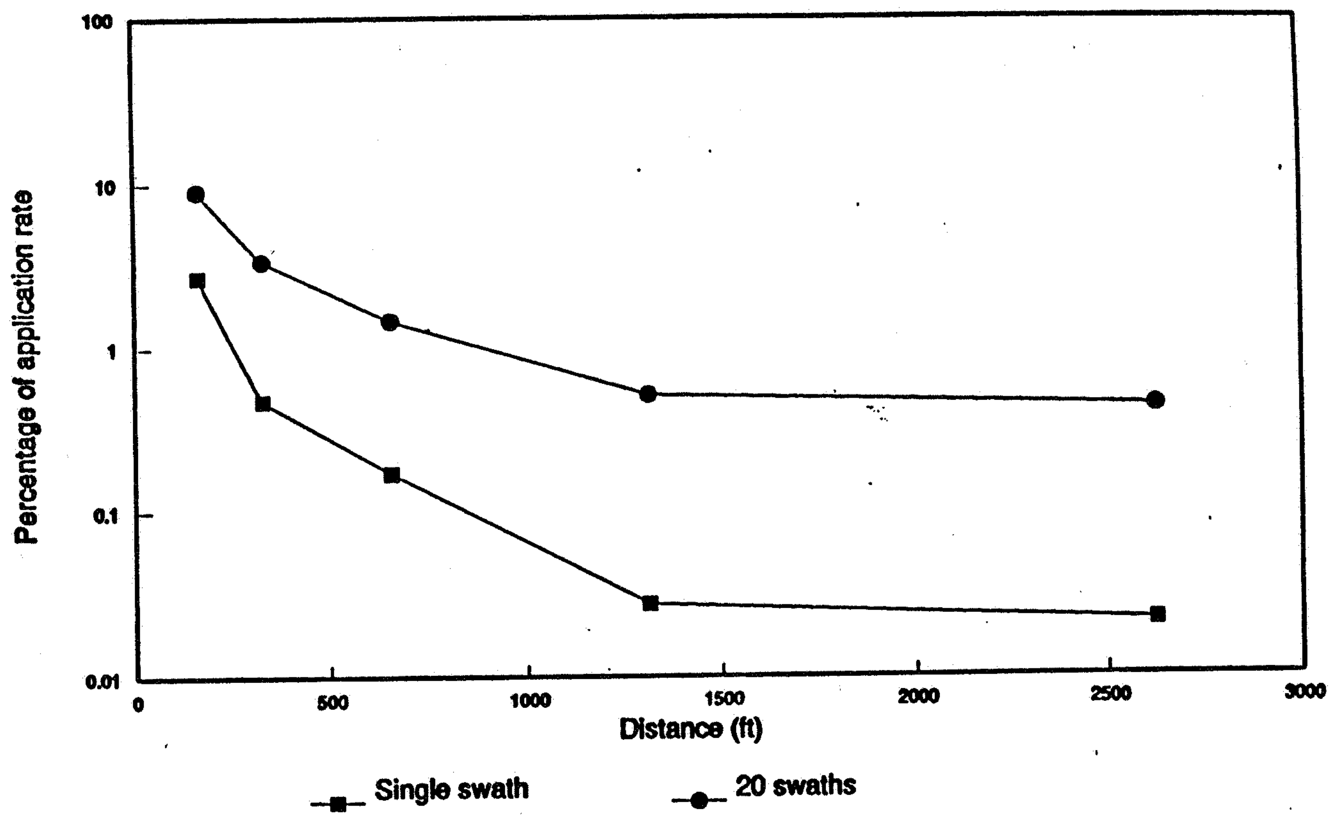

Figure 2. Example of the Difference in Potential Downwind Deposition from Single and 20 Swath Application.

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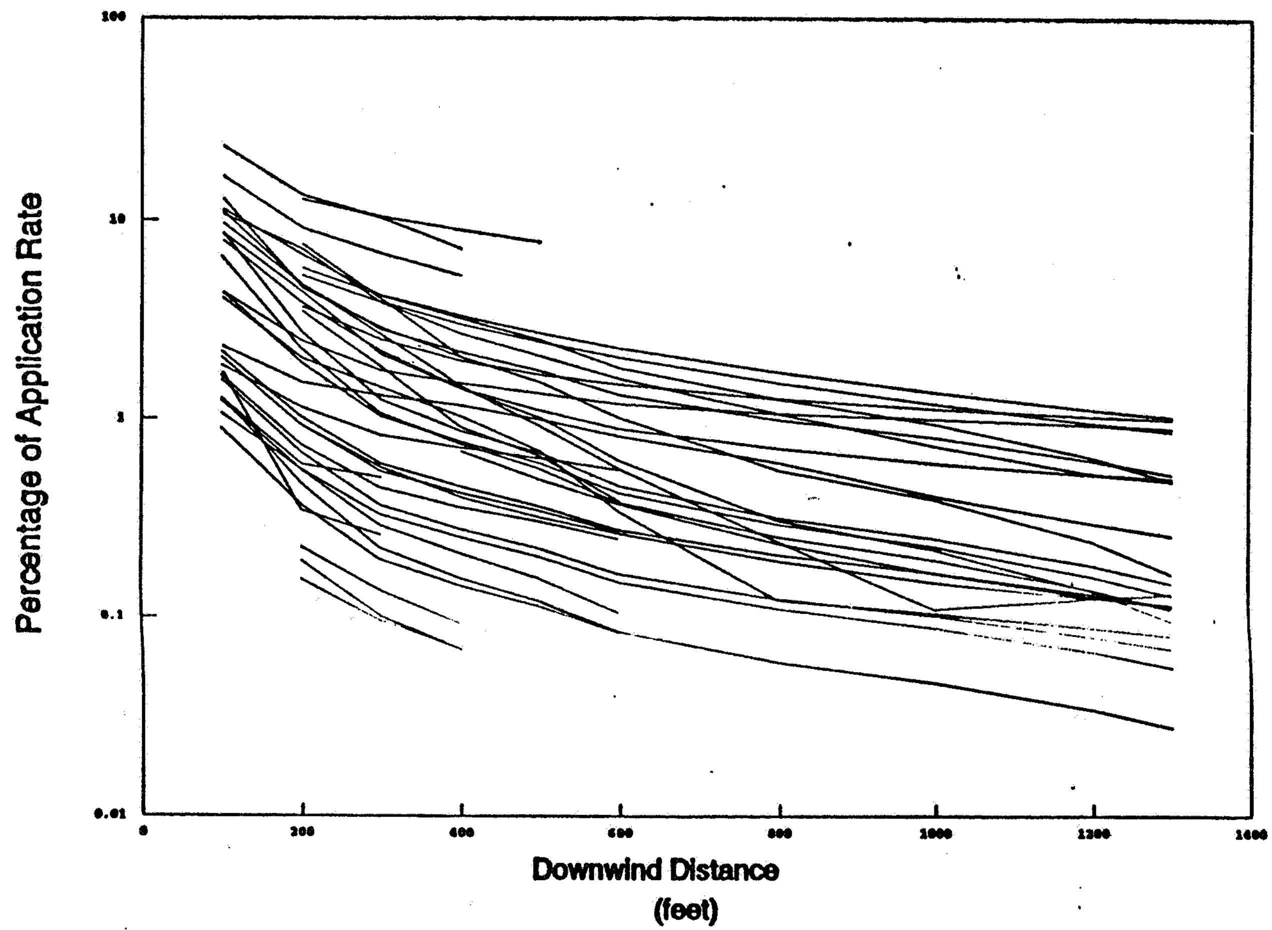

Figure 1. Deposition Downwind From 20 Swath Application

TABLE 2. DOWNWIND DEPOSITION AS A PERCENTAGE OF APPLICATION RATE

	DISTANCE DOWNWIND (FT)										
No	100	200	300	400	500	600	800	1000	1200	1300	
24		0.229	0.136	0.092							
25		0.158	0.097	0.069							
26		7.727	4.099	2.090	1.561	1.032	0.563	0.407	0.251	0.173	0.033
27		3.554	1.862	0.916	0.655	0.393					
28		12.917	10.575	9.049	7.921						
29	2.370	1.556	1.336	1.197	1.010	0.831	0.616	0.423	0.309	0.268	
30	1.768										
31	16.721	9.209	6.820	5.316							
32	12.865	4.604	2.906	2.077							
33	23.497	13.485	10.345	7.218							
34	7.972	3.860	2.209	1.429	1.023	0.616	0.312	0.226	0.140	0.097	
35	4.091	2.034	1.453	1.036	0.690	0.343	0.124	0.107	0.090	0.081	
36	11.098	4.803	2.675	1.472	0.919	0.559	0.245	0.112	0.127	0.135	
37	5.185	0.191	0.956	0.677	0.472	0.412	0.271	0.126	0.086	0.066	
38	1.269	0.602	0.515								
39	1.743	0.354	0.266								
40	10.300										
41	8.722	4.445	2.148	1.454	1.126	0.905	0.727	0.617	0.544	0.522	0.304
42	10.952	7.270	3.910	2.759	2.120	1.644	1.101	0.751	0.550	0.508	0.433

TABLE 2. DOWNWIND DEPOSITION AS A PERCENTAGE OF APPLICATION RATE

	DISTANCE DOWNWIND (FT)										
No	100	200	300	400	500	600	800	1000	1200	1300	
1	1.586	0.672	0.370	0.280	0.224	0.168	0.126	0.103	0.080	0.069	
2	2.195	1.023	0.593	0.456	0.367	0.278	0.210	0.173	0.135	0.117	
3	1.280	0.474	0.226	0.159	0.122	0.085	0.059	0.046	0.034	0.028	
4	1.873	1.148	0.830	0.716	0.635	0.554					
5	2.061	0.935	0.546	0.426	0.349	0.273					
6	1.074	0.555	0.332	0.256	0.204	0.152	0.112	0.089	0.066	0.055	
7	1.641	0.733	0.443	0.356	0.303	0.249					
8	0.888	0.369	0.195	0.144	0.113	0.082					
9	2.168										
10	1.240	0.550	0.289	0.208	0.156	0.105					
11	3.360										
12	6.536	2.255	1.055	0.734	0.557	0.379	0.255	0.197	0.139	0.110	0.007
13	4.128	1.822	0.978	0.723	0.564	0.405	0.284	0.220	0.156	0.124	0.007
14	4.129	2.360	1.673	1.445	1.292	1.139	1.023	0.961	0.899	0.868	0.011
15	9.179	4.515	2.674	2.071	1.670	1.269	0.953	0.776	0.598	0.509	0.018
16	8.210	2.603	1.188	0.824	0.632	0.440	0.305	0.241	0.177	0.145	0.008
17	10.762	6.360	3.961	3.055	2.394	1.732	1.210	0.914	0.618	0.470	0.027
18				0.653	0.468	0.355	0.227	0.162	0.123	0.109	
19		0.925	0.566	0.406	0.320	0.265	0.195	0.154	0.128	0.117	
20		3.689	2.516	1.984	1.696	1.516	1.281	1.148	1.054	1.019	
21		5.795	4.219	3.317	2.732	2.303	1.750	1.392	1.144	1.047	
22		5.310	3.891	3.031	2.461	2.063	1.550	1.215	0.976	0.880	
23		0.194	0.102	0.068							

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TABLE 1. FIELD TEST PARAMETERS

#	Reference	Original Field Size	Wind Speed (mph)	Atmospheric Stability Condition	Nozzle Type	VMD (µ)	Tank/Chemical Mix
36	Ware et al. (1974)	sm field	3.0	neutral	D4flood	ND	methoxychlor+BSF
37		sm field	3.0	neutral	Raindrop	ND	methoxychlor+BSF
38	Riley et al. (1989)	field	6.9	vstable	D645-back	ND	deltamethrin
39			7.9	stable	D645-back	ND	deltamethrin
40	Draper (1981)	field	ND	ND	ND	ND	parathion
41	Kludas (1990)	swath	4.1	vstable	D845-down	ND	ethyl parathion 8E
42		swath	9.5	vstable	D845-down	ND	ethyl parathion 8E

swath - single swath study
sm field - 2-5 swaths applied in original study
field - large field study
ND - data not given in paper

TABLE 1. FIELD TEST PARAMETERS

#	Reference	Original Field Size	Wind Speed (mph)	Atmospheric Stability Condition	Nozzle Type	VMD (μ)	Chemical/ Tank Mix
1	Yates et al.(1967)	swath	3.0-9.5	stable	D646-back	420	2.8% oil+dye
2		swath	"	vstable	D646-back	420	2.8% oil+dye
3		swath	"	unstable	D646-back	420	2.8% oil+dye
4		swath	"	vstable	D646-down	290	1.4% oil+dye
5		swath	"	stable	D646-down	290	2.8% oil+dye
6		swath	"	neutral	D646-down	290	2.8% oil+dye
7		swath	"	stable	D646-back	420	2.8% oil+dye
8		swath	"	neutral	D646-back	420	2.8% oil+dye
9		swath	"	vstable	D646-back	420	2.8% oil+dye
10		swath	"	unstable	D646-back	420	10% methoxychlor
11		swath	"	unstable	80015	130	100% Ethion
12	Yates et al.(1974)	swath	12.5	neutral	D646-back	450	7% oil+dye
13		swath	13.3	neutral	D646-back	450	2.8% oil+dye
14		swath	4.2	stable	D646-back	450	2.8% oil+dye
15		swath	8.4	stable	D646-down	175	2.8% oil+dye
16		swath	12.7	neutral	D646-back	450	2.8% oil+dye
17		swath	10.9	neutral	D646-back	450	100% oil+dye
18	Yates et al.(1976)	swath	11.1	stable	D646-back	450	2.6% oil+Mn
19		swath	9.3	stable	D646-back	500	0.2% Nalcotrol+Mn
20		swath	4.6	vstable	D6-down	650	2.6% oil+Sr
21		swath	4.4	vstable	D6-down	800	0.2% HEC/B+Sr
22		swath	4.9	vstable	D6-down	700	0.2% Nalcotrol+Mn
23		swath	6.7	stable	D6-back	1300	2.6% oil+Mn
24		swath	5.8	stable	D6-back	1400	0.6% HEC/B+Sr
25		swath	6.0	stable	D6-back	1600	0.15% Nalcotrol+Mn
26	Yates et al.(1977)	swath	5.0	unstable	N3000	120	DDT (392 g/l)
27		swath	6.8	unstable	N3000	135	DDT (78.4 g/l)
28	Ware et al.(1969a)	sm field	3.0-5.0	neutral	D845	ND	methoxychlor
29	Ware et al.(1969b)	sm field	<1.0	vstable	D8	ND	methoxychlor
30		sm field	1.0-2.0	stable	D8	ND	methoxychlor
31	Ware etal.(1972a)	sm field	1.5	vstable	D2flood	ND	methoxychlor+BSF
32		sm field	3.6	vstable	D2flood	ND	methoxychlor+BSF
33		sm field	3.2	vstable	D2flood	ND	methoxychlor+BSF
34	Ware et al.(1972b)	sm field	6-10	stable	D2flood	ND	methoxychlor+BSF
35		sm field	3.5-6.0	vstable	D2flood	ND	methoxychlor+BSF

deposition pattern.

Figures 3 through 6 illustrate the cumulative frequency distribution of offsite deposition at 100, 200, 300, and 400 ft downwind for a 20-swath application. Although the studies used for these figures are not a true, randomized sample, the wide range of conditions represented by the tests in the database provide a useful framework for evaluating potential offsite deposition. At 100 ft downwind, the 50th percentile value for the deposition is approximately 5% and the 90th percentile value is slightly over 10% of the application rate. At 400 ft downwind, the 50th percentile deposition value is slightly less than 1% of the application rate and the 90th percentile value is approximately 3% of the application rate.

SUMMARY OF DATABASE INFORMATION

Table 1 summarizes the references and conditions reported for each of the field trials. Included in this table is information concerning the reference for the field test, wind speed, atmospheric stability condition, nozzle type, estimated VMD of the spray emission, and spray formulation and tracer information. Atmospheric stability was based on the stability ratio calculation discussed in the previously. All of the studies are low flight row crop applications. Flight height was not explicitly reported in most of the studies, although this is probably an important variable in determining downwind drift of pesticides. Typically, the aircraft wheels were just at the top of the canopy. Table 2 summarizes the downwind deposition at 100 ft intervals for studies described in Table 1 based on a 20-swath application.

Figure 1 summarizes the data reported in Table 2 in a graphical form. At 100 ft downwind, deposition ranges from approximately 1% to 10% of the application rate and at 1300 ft downwind ranges from approximately 0.02% to 2% of the application rate given a relatively large scale field application, i.e. 20 swaths. For larger fields, depositional amounts drop off slowly and although the data extends to only 1/4 mile downwind, the shape of the curves suggest that 0.5% of the application rate could potentially be observed as far as a mile from the downwind edge of a very large field.

It should be emphasized that relatively large deposition at substantial downwind distances will only be observed for large field-scale applications. Figure 2 shows a comparison of the single swath data and extrapolation to a 20 swath application for Test 42 reported in Kludas (1990). While the multiple swath application increases estimated deposition at the near field location (100 ft) by a factor of three, deposition farther downfield (1000 ft) is increased by a factor of more than 10. The resulting deposition for this example is approximately 1% of the application rate as far as 1/2 mile downwind when the effects of the field scale application are considered. This difference is important to keep in mind when evaluating the results of single-swath drift trials, particularly for deposition a significant distance downwind. Additionally, it is important to realize that expansion to even larger scale applications could result in significant increases in the amount of material deposited at a distance of 1/4 mile and beyond.

This type of deposition pattern--the long slowly declining tails--is accentuated by the stable atmospheric conditions. The shape of the downwind curve illustrated in Figure 2 is not unique to this particular test and, although this study represents a high potential drift condition, i.e., relatively high wind speeds coupled with a significant temperature inversion and relatively small droplet spectra (approximately 200 μ VMD released from the nozzle), it does illustrate dramatically a potential downwind demonstrated that the fluorescent techniques provide an acceptable quantitative measure, the use of fluorescent tracers has been questioned by others due to their tendency to degrade under sunlight. In later studies, the UC-Davis researchers monitored an active ingredient or used salt tracers.

The University of Arizona group also performed a series of studies comparing effects of application equipment. These included a comparison of applications from an airplane to a high clearance ground sprayer (Ware et al., 1969A) and a mist blower (Ware et al., 1969B) along with a comparison of the drift from flooding and raindrop type nozzles for aerial applications. While the high clearance ground spray application resulted in substantially lower offsite deposition (4- to 5-fold) than the simultaneous aerial application, the mist blower resulted in substantial increases in downwind aerosol concentrations (6-fold) and moderate downwind deposition increases (2-fold). In one study (Ware et al., 1972b), researchers measured vertical drift using weather balloons as well as off-site deposition.

The study performed by Riley and Weisner (1989) is of interest since the drift of an active ingredient (deltamethrin) from a field scale application was monitored. Deposition in this study was measured only to 100 m downwind. The results of this study were consistent with values observed for the single swath studies that measured a surrogate for the active ingredient. At 100 m (328 ft) downwind, approximately 0.3% and 0.5% of the application rate were deposited. Kludas (1990) measured aerial drift of ethyl parathion from a single swath application for a 1 gallon per acre and a 10 gallon per acre application of an emulsifiable concentrate (EC). These studies were done during an atmospheric inversion and relatively high windspeeds -- a "worst case" meteorological condition -- resulting in high downwind deposition. Long and slowly declining depositional tales were observed under these conditions.

Data from three recent studies are not included in the database due to the limited downwind sampling distance or unresolved discrepancies in the data. Data in Gaidos et al. (1990) were not included as there is an unresolved discrepancy in the reported application rate. Two studies in the literature which were not incorporated in the database contain unique data. Wilson et al. (1986) which contains six trials comparing drift from an EC of fenvalerate diluted with water and an ultra-low volume (ULV) fenvalerate application with a vegetable oil carrier. A study by Crabbe and McCooeye (1985) includes eleven field tests and measures deposition on dress forms downwind of the application. These two studies do not contain sufficient downwind deposition data to allow extrapolation to the 20 swath size field. However, aerosol samplers and the dress forms were placed farther downwind and provide information of direct interest to human exposure assessment.

greater at higher windspeeds as one would intuitively suspect, but dilution in the atmosphere is apparently greater and counterbalances the additional mass at greater travel distances.

Another major thrust of the UC-Davis investigations involved defining the importance of spray atomization and factors affecting atomization on off-site drift. Droplet spectra emitted by nozzles are typically described by a volume mean diameter (VMD) -- the diameter at which half the spray volume is composed of droplets of larger diameter and half of smaller diameter. The UC-Davis group observed a 2-fold increase in downwind deposition beyond a 100 ft when applcations were made with a 290 μ VMD nozzle emission relative to a 420 μ VMD emission. They found that nozzles directed back with the emission in the direction of the airflow rather than directed down, perpendicular to the airflow, resulted in significantly less drift. When nozzles are oriented in the direction of the airflow, less fractionation of the droplets occurs and the VMD of the emission is higher with a substantially lower number of small droplets (less than 100 μ VMD, the category of droplets most likely to move offsite) being produced.

Researchers also explored the impact of formulation and adjuvants on drift (Yates et al., 1974; Yates et al., 1976). Although the use of thickening adjuvants decreased downwind aerosol concentrations, there was relatively little impact on residues deposited downwind. When the oil content in the tank mix was increased, the deposition of offsite residue increased. For 100% oil content, the shape of the deposition curve on a semi-log plot was observed to be convex rather than the concave shape typically observed for applications with a water-based carrier. Deposition between 500 to 1000 ft downwind for the oil application was 4 times that of the water carrier but approached the same levels 5000 ft downwind.

Although the UC-Davis group did not explicitly pursue the effects of flight height on off-site drift, results from two separate test sites reveal height to be a possibly significant factor in downwind residue levels. For example, in one study in which conditions were similar to those reported in Yates et al. (1974), depositions were much higher (at least five-fold) than reported in Yates et al. (1967). During the 1974 study, however, the pilot was forced to fly 2 to 3 feet higher due to the presence of a ditch and embankment at the end of the flight line. The authors speculated that the increased flight height might have been responsible for the observed differences in depositional patterns. However, micrometeorological conditions, which are not always well characterized or reported for a site, can have a significant impact on drift characteristics and cannot be disregarded as an explanation here.

A significant portion of the studies performed by the UC-Davis group used fluorescent tracers indicated in Table 1 as a dye. Although UC-Davis researchers believed that they applications. The University of Arizona studies were either small field (4-20 swaths) or single swath applications. Generally, published field studies focused on paired comparison trials to identify those parameters that most affected off-site drift and downwind deposition of pesticides.

The research program initiated at UC-Davis in 1960 was aimed at identifying the fundamental factors affecting pesticide drift. These studies focused on atmospheric stability, atomization, and chemical formulation as major determinants of downwind drift and deposition.

Stable atmospheric conditions have been identified in several studies as a high risk condition for downwind deposition of pesticides. The most typical measure of stability used by spray drift researchers is the stability ratio (SR) defined as

$$SR = \frac{T^{10} - T^{2.5}}{U^2} \times 10^5$$

where

T_{10} = Air temperature (°C) at 10 m height

$T_{2.5}$ = Air temperature (°C) at 3.0 m height

U = Average wind speed between 1 and 6 m height (cm/s)

A value greater than 1.0 indicates a very stable atmospheric condition, 0.1 to 1.0 is a stable condition, -0.1 to 0.1 is neutral, and a value less than -0.1 is unstable.

Research by the UC-Davis group suggests that stable atmospheric conditions resulted in an average factor of two increase in deposition at approximately 100 ft downwind (Yates et al., 1967) and a 3- to 13- fold increase 1/4-mile downwind and beyond (Yates et al., 1967; Yates et al., 1974) compared to neutral and unstable conditions. Additionally, more recent studies in aerial applications to orchards (MacCollom et al., 1985; Currier et al., 1982) measured residues at 500 m offsite under inversion conditions that were significantly higher than those observed under less stable atmospheric conditions. Field studies that compared drift under stable and unstable conditions suggest that relatively high windspeeds (8-16 mph) are optimal in minimizing offsite deposition at distances beyond 100 ft since neutral to unstable atmospheric conditions are virtually ensured. A recent study (Payne and Thompson, 1992) of aerial glyphosate applications to a forest canopy (10 m application height) showed increasing depositon at 400 m downwind as windspeed decreased. At the 50 m location, deposits increased as windspeed increased due to the swath displacement of the larger drop cloud. Thus, total mass of pesticide that moves off-site may, indeed, be j = downwind distance from the edge of the field

NS = number of swaths for which the extrapolation is performed

TD_j = total deposition at j distance from an NS swath application

D_k = ground deposition at location j contributed from the application of the kth swath where D_k is calculated as the measured deposition at a distance $x = j + [i * (k-1)]$ and i is the swath width

Swath widths reported for the applications in these studies ranged from 35 ft to 60 ft. Thus, a 20-swath application represents a field size on the order of 700 to 1200 ft in width. The selection of a 20 swath field size was to some extent arbitrary. However, 20 swaths represent a moderate scale agricultural field -- e.g., a 1000 ft by 1000 ft field is approximately 23 acres. In addition, based on the distance downwind data were collected most of the single swath studies could be readily extrapolated to the 20-swath scale field using the simple methods outlined previously. Up to 300 ft downwind, an additional increase in the size of the field will have a relatively minor impact on ground residues, but an increase in field size beyond 1000 ft can significantly increase deposition at locations farther downwind.

The studies incorporated in this data base are, for the most part, abstracted from peer-reviewed journals. The single exception, Kludas (1990), is a data submission to EPA's Office of Pesticide Programs (OPP). The long term plan is to expand this database to incorporate additional studies that have been submitted to OPP as they become available.

REVIEW OF SPRAY DRIFT STUDIES

The majority of field studies of spray drift from aerial application of pesticides to row crops reported in the open literature were performed by two research groups--one at the University of California-Davis led by W.E. Yates and N.B. Akesson and the other at the University of Arizona-Tucson led by G.W. Ware. The majority of the studies found in the open literature were performed in the late 1960's and early 1970's. Relatively few investigations were published during the 1980's. The majority of the data reported was based on single-swath field trials. Relatively few sampling studies are reported that were large scale field experiments. Clearly, study information submitted to OPP during the pesticide registration process needs to be incorporated into this database.

Studies performed at UC-Davis were generally single swath

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