Effectiveness of Spray Adjuvants on Reduction of Spray Drift

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Introduction

- Spray drift is a major issue for pesticide applicators
- Spray droplet size is the primary factor influencing drift
- Drift reducing agents are a secondary tool in controlling droplet size and spray drift

Introduction

(continued)

- Drift reducing agents have been available in the modern marketplace for several years
- There are no product labeling or efficacy regulations for drift reducing agents
- Applicators must be judicious in selection and use of drift reducing agents
  - Experience
  - Technical information

Objective

- The objective of this study was to measure and quantify the effect of different spray adjuvants on the downwind deposition and transport of aerially applied sprays.

Materials

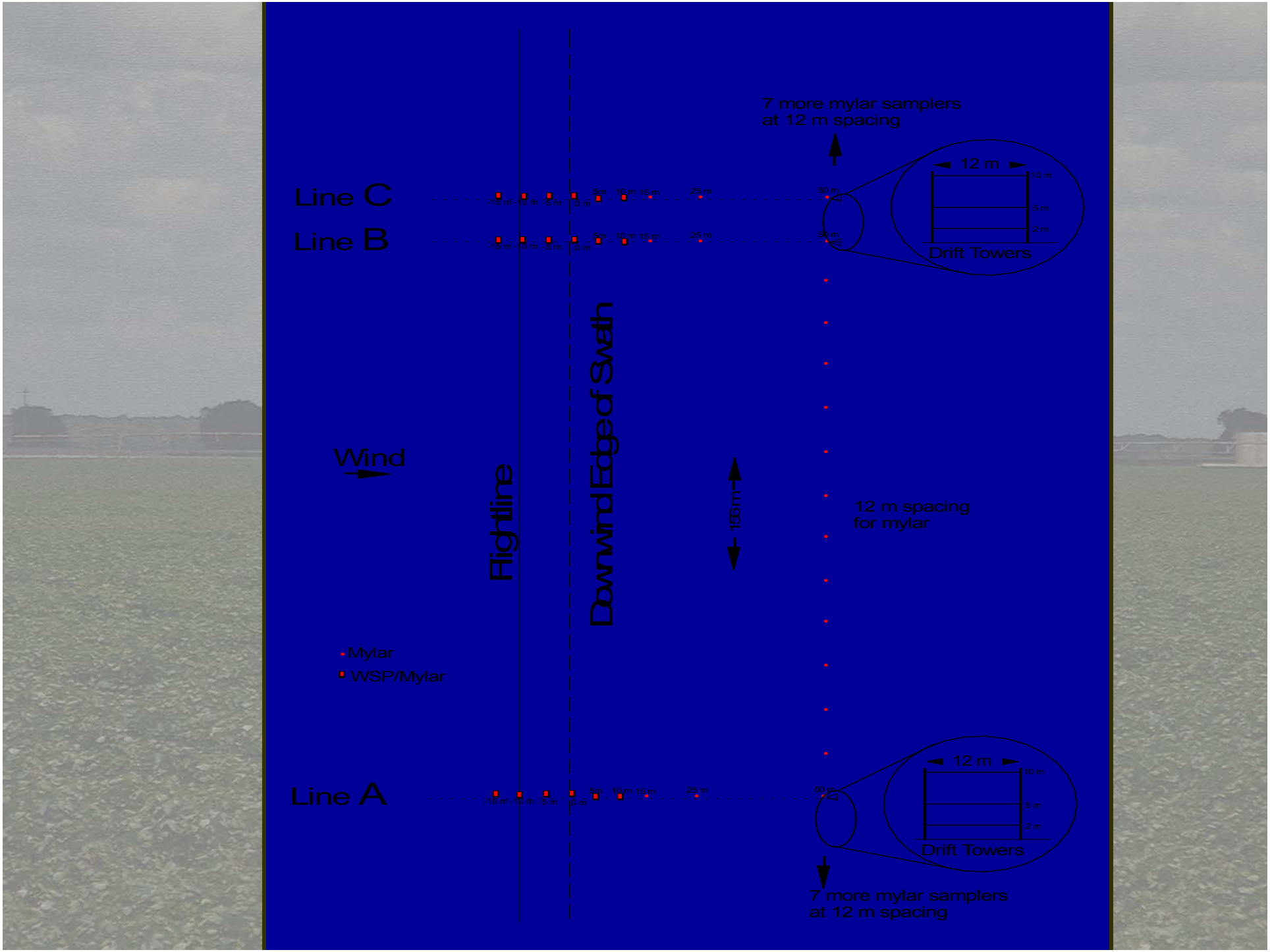
Treatment	Adjuvants	Company	Rate
T1	Array	Intec Agro Products Inc.	9 lb/100 gal
T2	EC Blank only	Exxon/ Stephan	
T3	In-Place	Wilbur-Ellis Inc.	2.5 gal/100 gal
T4	Vector	Rosen's Inc.	2 lb/100 gal
T5	Control	GarrCo Products Inc.	2.4 oz/100 gal

Spray Treatment

- **CP-11TT flat fan Spray Nozzle**
  - **#15 Orifice**
  - **75° Deflector**
- **Air Tractor AT-402B**
- **Pressure**
  - **35 psi**
- **Airspeed**
  - **135 mph**
- **Others**

  - 65 ft swath

  - 10 ft release height


7 more mylar samplers
at 12 m spacing
12 m
10 m
5 m
2 m
Drift Towers
Line C
Line B
-15 m
-10 m
-5 m
0 m
5m
10 m
15 m
25 m
50 m
Wind
Flightline
Downwind Edge of Swath
150 m
12 m spacing
for mylar
Mylar
WSP/Mylar
Line A
7 more mylar samplers
at 12 m spacing

Water Sensitive Card and Mylar Card

Statistical Analysis

- All the statistical analyses were performed using the Proc GLM procedures in SAS.
- Treatment means in samples -15-10 m in-swath and downwind edge of swath for deposition, $D_{V0.5}$, percent area coverage, and number of drops as measured by the WSP were separated by Duncan's Multiple Range Test ($\alpha = 0.05$).

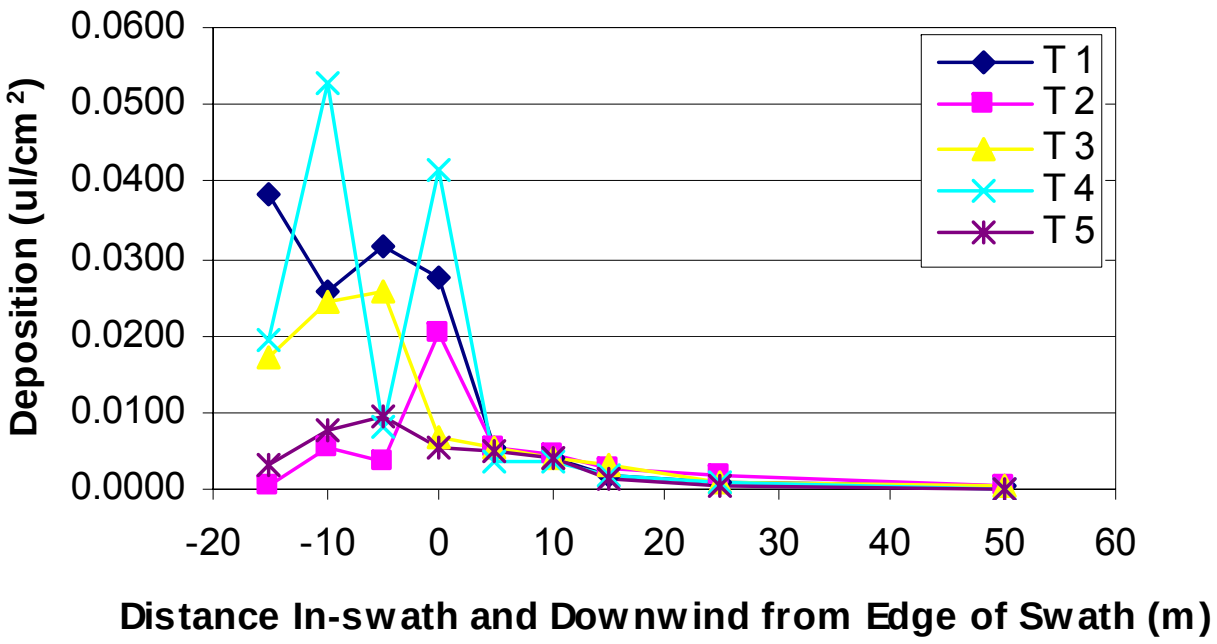
Results and Discussion

Test	Rep	Mean Wind (m/s)	Wind Angle Deviation[a] (deg)	Mean Temperature (C°)	Mean Relative Humidity (%)
1	1	3.4	13.4	31.3	62.6
1	2	3.2	10.1	31.3	62.5
1	3	3.1	9.9	31.7	61.6
2	1	3.2	11.4	31.4	61.5
2	2	3.2	16.7	31.7	60.5
2	3	3.1	13.6	32.0	59.4
3	1	3.1	15.2	32.2	58.0
3	2	3.1	14.2	32.4	56.9
3	3	3.1	12.3	32.7	55.9
4	1	3.0	9.0	33.0	54.6
4	2	3.1	10.0	33.2	53.4
4	3	3.1	8.1	33.5	52.4
5	1	3.1	6.9	33.7	51.5
5	2	3.1	3.3	33.9	50.8
5	3	3.1	1.1	34.1	50.1

Physical properties for the different adjuvants

Treatment ID	Adjuvant	Dynamic Surface Tension (dyne/cm^2)	Shear Viscosity (centipoise)	Specific Gravity	pH Value	Conductivity (mS)
T 1	Array	38.2	3.0	0.997	7.24	14.47
T 2	Blank	41.2	1.4	0.991	7.13	3.09
T 3	In-Place	43.4	1.4	0.987	7.00	2.24
T 4	Vector	37.5	2.6	0.992	7.07	4.82
T 5	Control	38.4	1.9	0.990	7.55	2.63

In-swath and downwind from edge of swath deposit as measured on horizontal Mylar cards



Effects of Sources on Deposition, VMD, Area Coverage% and No. of Drops ($\alpha<0.005$)

(Samples -15-10 m from In-swath and Downwind Edge of Swath-Horizontal WSP Tests)

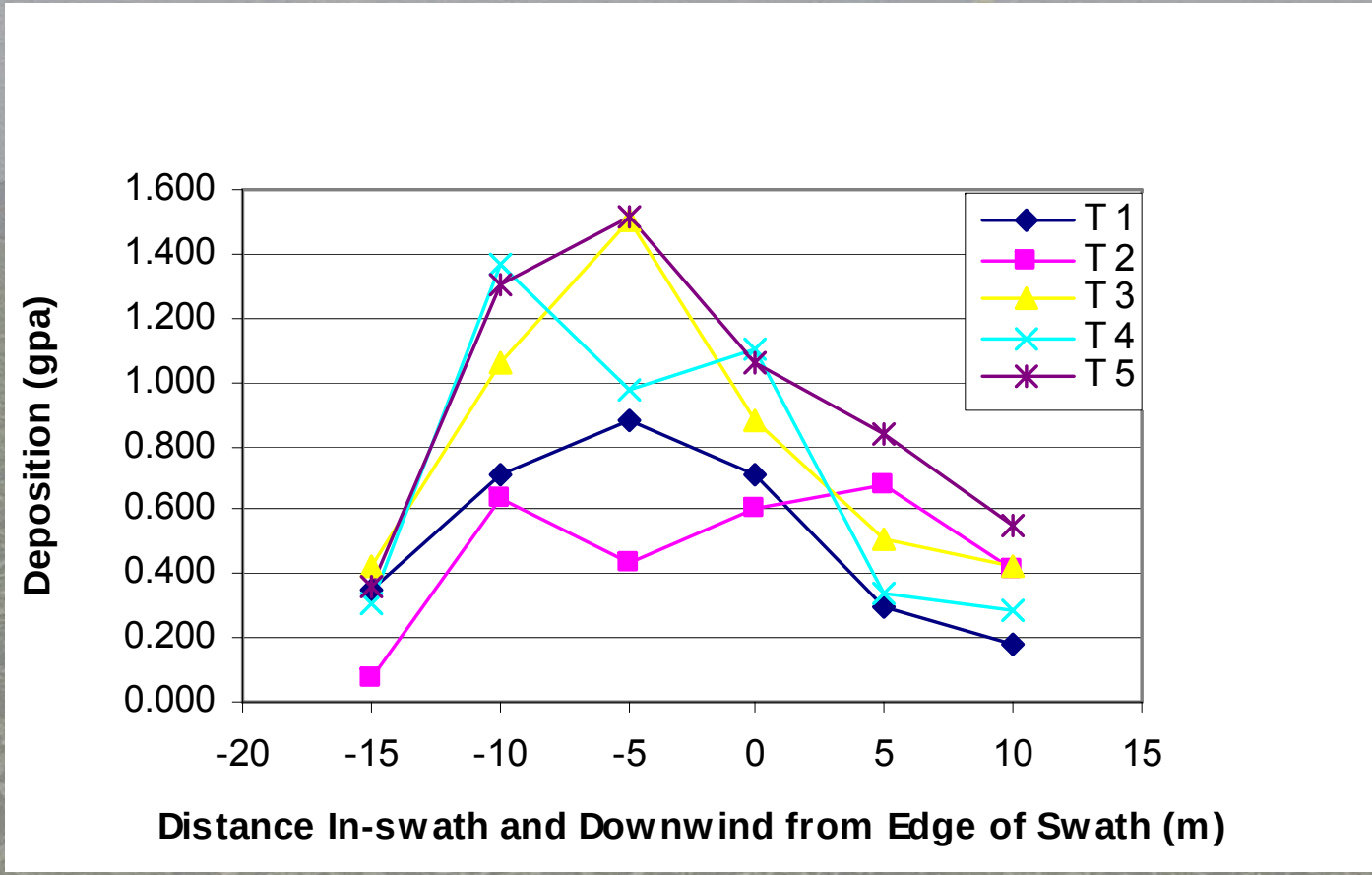
Source	Deposition	Droplet Size (VMD)	Area Coverage%	No. of Drops
Treatment	<0.0001	<0.0001	0.0016	0.0004
Line	0.2969	0.6055	0.5802	0.3907
Replication	0.5787	0.4550	0.3464	0.0311
Distance	<0.0001	<0.0001	<0.0001	<0.0001

Means in all Samples for Each Treatment

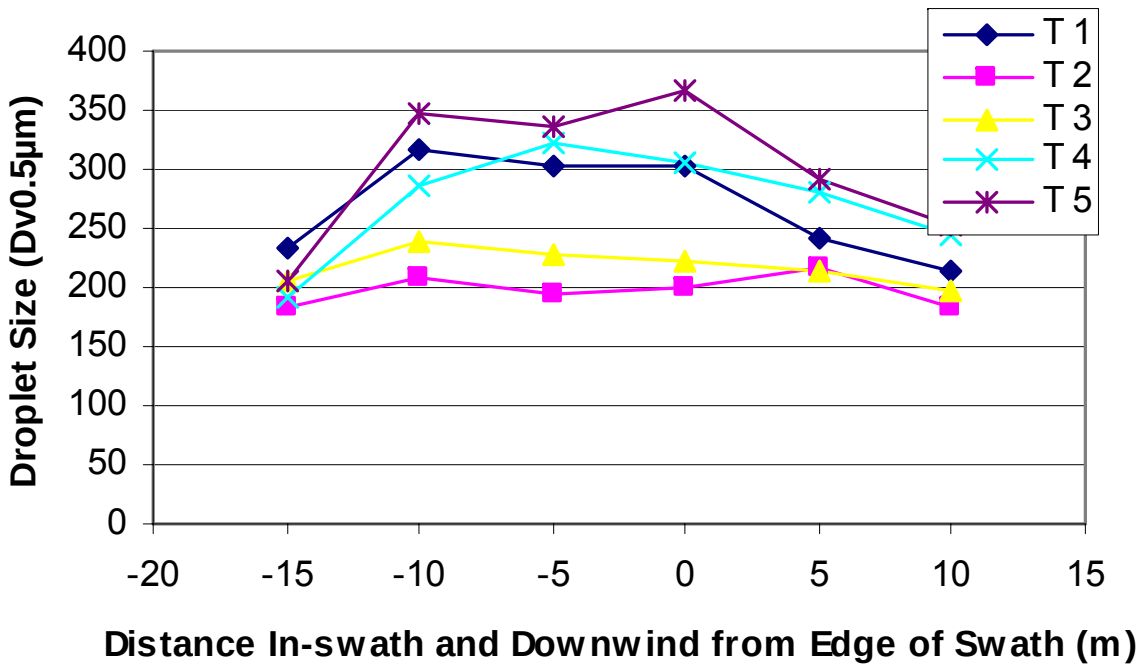
(Samples -15-10 m from In-swath and Downwind Edge of Swath-Horizontal WSP Tests)

Treatment	Deposition	Droplet Size (VMD)	Area Coverage%	No. of Drops
T1	0.54	273.17	1.51	611.30
T2	0.47	197.89	1.39	760.61
T3	0.81	222.12	2.24	914.76
T4	0.73	271.65	1.81	572.91
T5	0.96	305.14	2.40	601.88

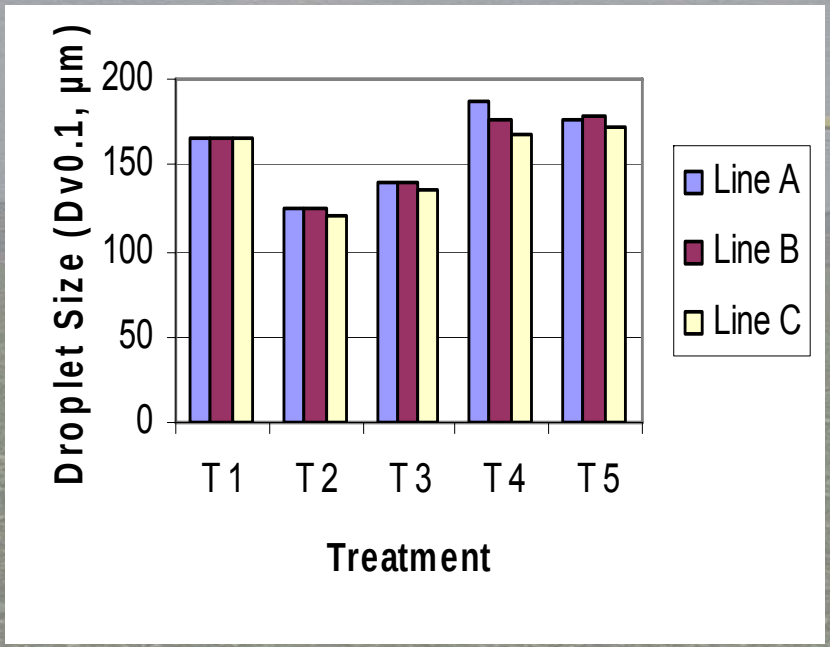
In-swath and downwind from edge of swath deposit as measured on horizontal WSP cards

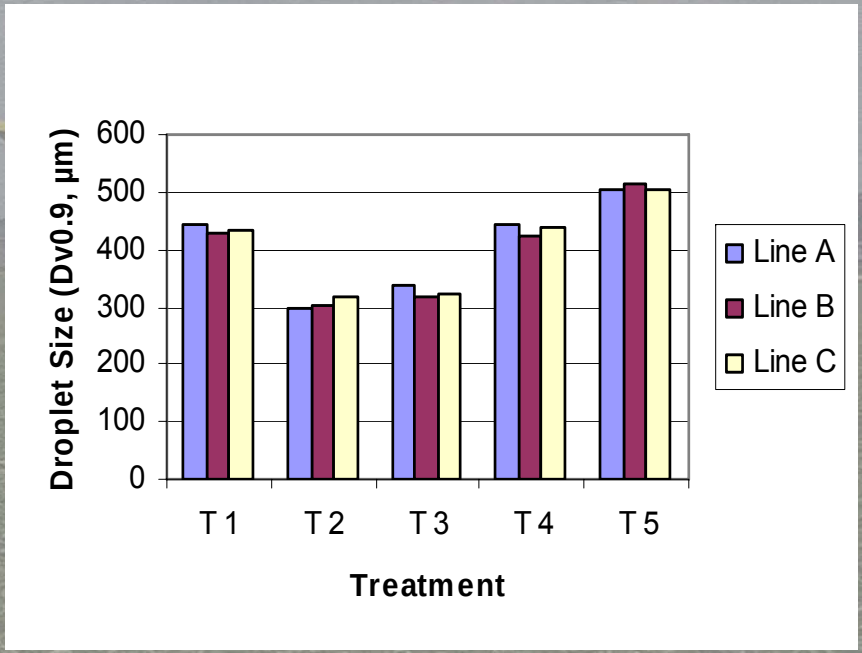


In-swath and downwind droplet size parameters (Dv0.5) as measured on the horizontal WSP cards

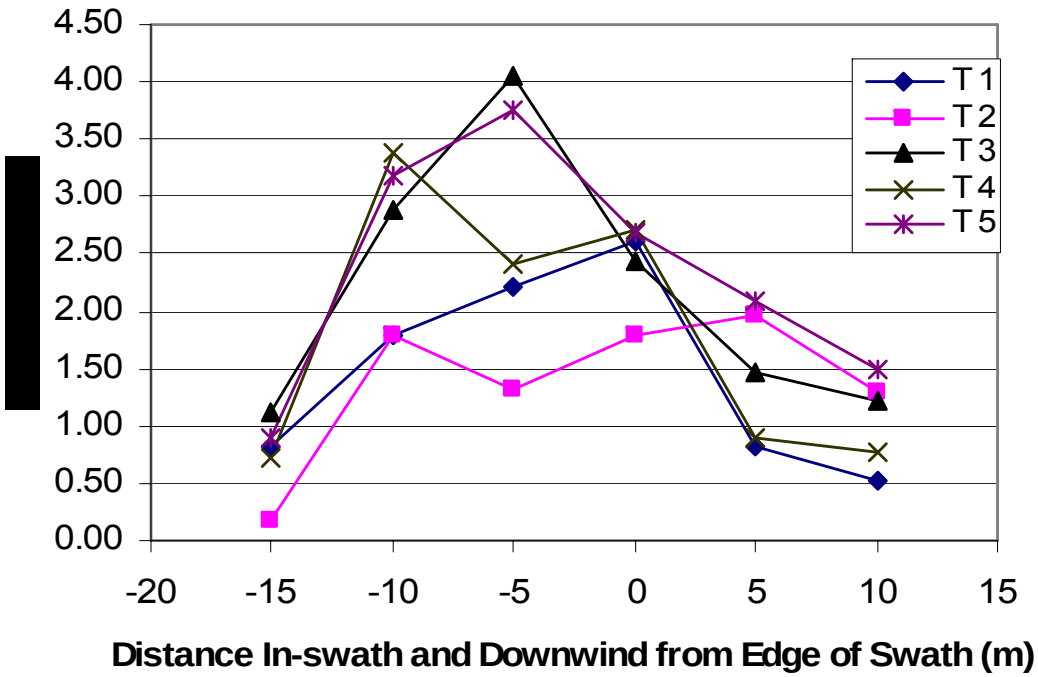


In-swath and downwind droplet size parameters (Dv0.1 and Dv0.9) as measured on the horizontal WSP cards

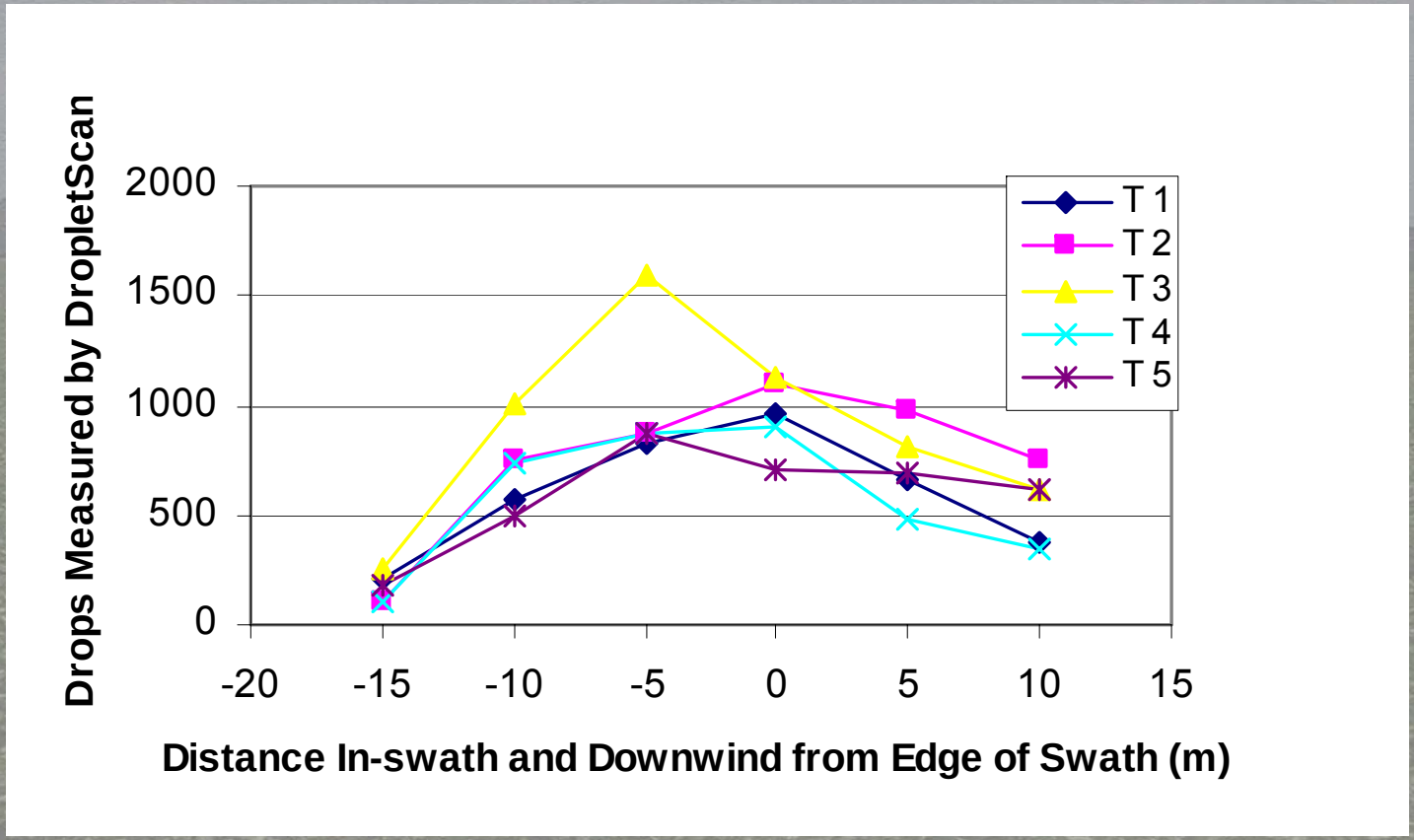




In-swath and downwind coverage as measured on horizontal WSP cards



In-swath and downwind number of drops as measured on horizontal WSP cards

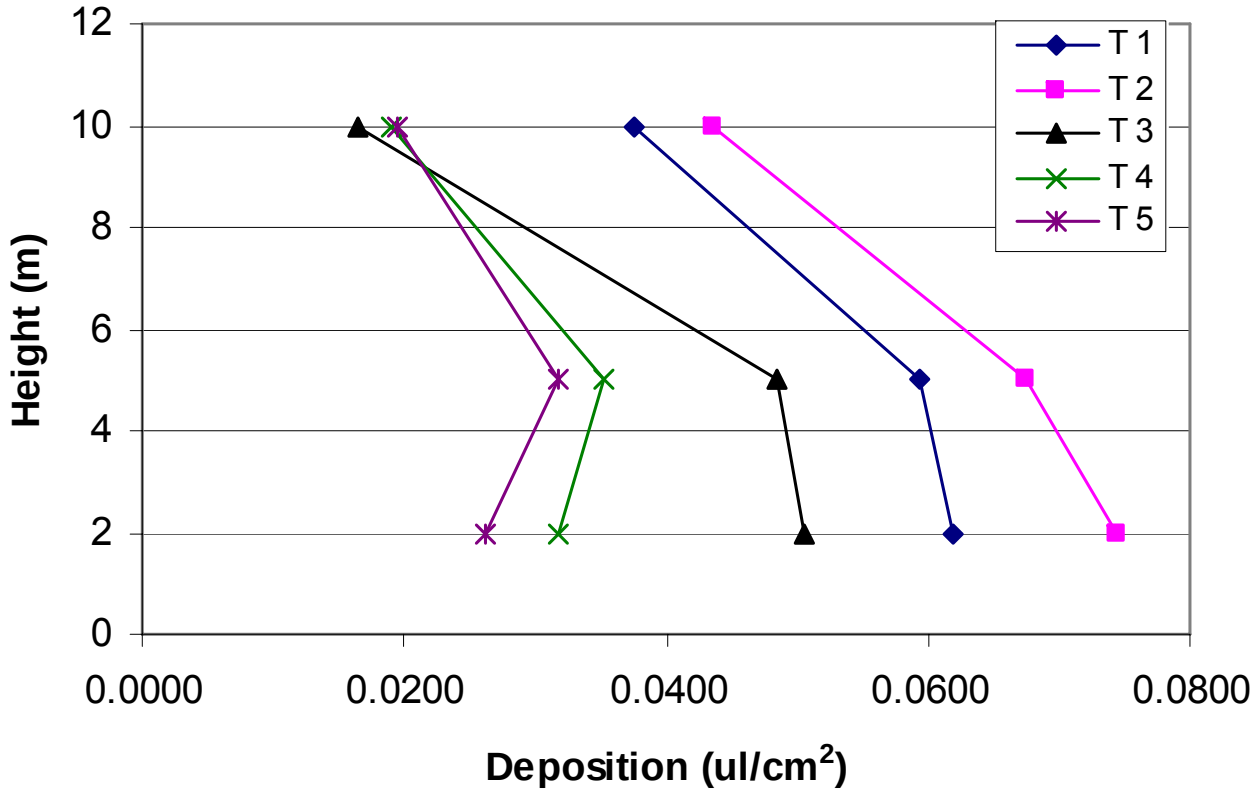


Duncan Tests

(same letter is not significantly different)

Treatment	Deposition	$D_{V0.5}$ (µm)	Percent Area Covered	Number of Drops
T1	dc	b	b	b
T2	d	c	b	ab
T3	ab	c	a	a
T4	bc	b	ab	b
T5	a	a	a	b

Deposition by treatment on monofilament lines placed 50 m downwind from the swath edge at three heights (2, 5, and 10 m)



Conclusions

- For in-swath and downwind deposition as measured by the mylar plates, there was essentially no deposition beyond 25 m (82 ft).

- Treatment and distance had significant effects on deposition, $D_{V0.5}$, percent area coverage, and number of drops, as measured by the WSP.

Conclusions
(continued)

- For deposition, all the treatments were significantly different from treatment 2 (EC blank)

- For VMD, treatments 1 (Array), 4 (Vector) and 5 (Control) were significantly different than treatment 2 (EC blank).

Conclusions
(continued)

- For percent area coverage, treatments 3 (In-Place), 4 (Vector) and 5 (Control) were significantly different than treatment 2 (EC blank).

- For number of drops measured, treatments 1 (Array), 3 (In-Place) and 5 (Control) were significantly different than treatment 2 (EC blank).

Conclusions
(continued)

- Deposition on the monofilament lines generally decreased as sampling height increased.

- Applicators should be cautious when selecting adjuvants to alter the performance of spray systems.

Conclusions
(continued)

- The first line of defense in reducing off target deposition and product efficacy should always be proper system setup and operation.
- The addition of adjuvants can alter spray performance such that the on and off target deposition, spray droplet size, and deposition characteristics are either lesser or greater than those would result from the same tank mixture without the adjuvant.

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-- Thank you --

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