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SPRAY DEPOSIT ANALYSIS - WINNIPEG MOSQUITO CONTROL PROGRAM - AUGUST 1977

by

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INTRODUCTION

At the request of the Environmental Protection Service, Winnipeg branch, the Chemical Control Research Institute was asked to analyse spray deposit collected from the aerial application of a Baygon formulation for the control of mosquitos in the city of Winnipeg, Manitoba in August, 1977. This report gives the results of deposit measurements in terms of density (drops/cm^2) and volume (liters/ha), and briefly discusses the results.

MATERIALS AND METHODS

SPRAY FORMULATION

The spray formulation used for the control program was a mixture of two Baygon formulations as follows:

Baygon	MOS	33.2%
Baygon	OSC	66.8%
Total		100.0%

This mixture was emitted from a DC-6B spray aircraft at the rate of 0.349 liters/ha (4.75 fl. oz/ac). Viscosity of the Baygon formulation was 52.9 cps at 20°C.

Sample Units

Spray droplets were collected on glass slides (50x75 mm) and a 7.5x10 cm dyed Kromekote® card. These units were placed at 125 meter (0.2 mile) intervals along both sides of an east-west running highway which was used as the sampling transect. Samples were designated N or S depending on whether they were placed on the north or south side of the sampling transect. Data from both samples placed at each station were averaged to indicate deposit at that point.

The southern part of the city of Winnipeg was sprayed a second time as mosquito mortality was considered inadequate after the first application. Samples were located only on one side of the road for this spray application Deposit from the dyed cards and glass slides were measured under a standard dissection microscope, using a graduated objective lens. Deposit, in terms of drops/cm^2 and recovered volume (l/ha) at each of the sample stations, was recorded in Table I.

TABLE I

WINNIPEG W.E.E. SPRAY - FIRST APPLICATION

Position	Drops/cm^2	Vol. l/ha	Position	Drops/cm^2	Vol. l/ha
0.0 N	0.600	0.00778	2.8 N	0.973	0.00975
S	0.467	0.00557	2.8 S	1.280	0.01314
0.2 N	1.120	0.01066	3.0 N	0.560	0.00522
S	0.707	0.00725	S	0.640	0.00607
0.4 N	0.293	0.00327	3.2 N	-	-
S	0.093	0.00109	S	0.213	0.00226
0.6 N	0.253	0.00423	3.4 N	-	-
S	0.560	0.00804	S	-	-
0.8 N	0.373	0.00496	3.6 N	0.587	0.00482
S	1.293	0.01659	S	0.253	0.00267
1.0 N	0.187	0.00237	3.8 N	0.507	0.00637
S	0.200	0.00145	S	0.373	0.00442
1.2 N	1.120	0.01499	4.0 N	0.213	0.00168
S	1.960	0.01960	S	0.067	0.00112
1.4 N	0.453	0.00498	4.2 N	2.160	0.01831
S	0.373	0.00348	S	0.280	0.00382
1.6 N	CARD UPSIDE DOWN - NO		4.4 N	CARD TAMPERED WITH-NOT COUNTED	
S	MEASUREMENT POSSIBLE		S	0.067	0.00075
1.8 N	0.720	0.01081	4.6 N	1.640	0.01281
S	0.467	0.01081	S	0.680	0.00716
2.0 N	0.653	0.00572	4.8 N	0.413	0.00204
S	0.307	0.00306	S	0.667	0.00632
2.2 N	0.200	0.00276	5.0 N	0.187	0.00135
S	0.680	0.00894	S	0.080	0.00082
2.4 N	0.293	0.00306	5.2 N	0.333	0.00279
S	0.640	0.00715	S	0.147	0.00131
2.6 N	0.160	0.00116	5.4 N	-	-
S	0.093	0.00073	S	0.893	0.00927

TABLE I cont'd

WINNIPEG W.E.E. SPRAY

Position	Drops/cm^2	Vol. l/ha	Position	Drops/cm^2	Vol. l/ha
5.6 N	0.507	0.00421	8.4 N	2.933	0.03402
S	0.213	0.00233	S	2.240	0.03262
5.8 N	0.333	0.00404	8.6 N	0.573	0.00609
S	0.173	0.00241	S	0.387	0.00577
6.0 N(A)	0.160	0.00164	8.8 N	0.173	0.00182
N(B)*	0.253	0.00256	S	0.173	0.00285
6.2 N	0.667	0.00683	9.0 N	0.147	0.00328
S	0.707	0.00888	S	0.147	0.00374
6.4 N	0.187	0.00177	9.2 N	0.160	0.00177
S	0.067	0.00078	S	0.320	0.00404
6.6 N	0.400	0.00412	9.4 N	NO READING POSSIBLE	
S	1.987	0.02032	S	0.160	0.00153
6.8 N	0.960	0.00236	9.6 N	0.093	0.00107
S	0.720	0.00559	S	0.080	0.00035
7.0 N	0.240	0.00258	9.8 N	0.107	0.00159
S	0.160	0.00171	S	0.480	0.00456
7.2 N	0.547	0.00523	10.0 N	0.227	0.00192
S	0.600	0.00642	S	0.293	0.003
7.4 N	0.227	0.00289			
S	0.160	0.002781			
7.6 N	0.080	0.00108			
S	0.373	0.00405			
7.8 N	0.573	0.01147			
S	0.787	0.00998			
8.0 N	0.227	0.00166			
S	0.280	0.00363			
8.2 N	0.440	0.00396			
S	0.813	0.00783			

* Both samples were marked N - they were remarked N(A) and N(B) to distinguish one from the other

RESULTS AND DISCUSSION

Drop Size and Distribution

Droplet distribution along the sampling transect appears very uniform with drop densities ranging from 0.067 drops/cm^2 to a maximum of 2.93 drops/cm^2. (Table I). This is a very low deposit, however, with densities well below those recorded during a similar mosquito control operation in Winnipeg in 1975 (Zylstra 1975).

Drop sizes recorded appear to be very large as no drops below 60 µm were detected on either the glass slides or the cards. This does not mean, however, that no smaller droplets were produced than 60 µm, only that they could not be detected on the sampling surfaces being used. It should be pointed out that the sample units used were designed to collect data on dyed material and thus are not well suited to the collection of data from the undyed Baygon formulation. There are a number of possible reasons why the smaller droplets were not visible on the samples:

1. The drop volume was too small to lift the dye from the dyed cards.

2. Drops too small to impinge on the flat surface (i.e. small wind currents carry drops over the surface, not allowing them to land).

3. As the samples were placed at the edge of a main road, wind currents created by passing motor vehicles could possibly have carried drops past the samples.

4. Smaller droplets could have been screened out by overhanging foliage of surrounding trees.

These reasons are only possible answers as there is no way of determining exactly why no small drops were collected.

Deposit from the second application over the city of Winnipeg was the same as that from the first application, i.e. deposit low, but evenly distributed and large drops. (Table II).

Due to the low deposit recovered on the cards, there was a correspondingly low deposit in terms of volume/acre. Deposited volumes ranged from 0.00073 l/ha to a high of 0.034 l/ha. The average deposits (volume) across the sampling transect was 0.00555 l/ha. This represents approximately 1.6% recovery of the emitted volume of 0.34926 l/ha.

TABLE II

WINNIPEG W.E.E. SPRAY - 2ND APPLICATION

Position	Drops/cm^2	Vol. l/ha	Position	Drops/cm^2	Vol. l/ha
0.0	0.5999	0.00738	5.8	0.520	0.00542
0.2	1.6401	0.01952	6.0	0.413	0.00357
0.4	0.2666	0.00300	6.2	1.213	0.00725
0.6	0.1465	0.00153	6.4	0.5733	0.00376
0.8	0.6267	0.00468	6.6	1.0266	0.00846
1.0	0.2932	0.00307	6.8	1.5998	0.01322
1.2	0.7201	0.01004	7.0	1.2266	0.00617
1.4	0.5067	0.00701	7.2	1.4265	0.01061
1.6	0.3867	0.00313	7.4	1.0266	0.00661
1.8	0.1600	0.00070	7.6	1.1467	0.00668
2.0	0.5199	0.00333	7.8	0.5199	0.00385
2.2	0.7733	0.00644	8.0	0.7333	0.00501
2.4	0.1599	0.00221	8.2	1.3866	0.00832
2.6	0.5067	0.00467	8.4	0.4668	0.00328
2.8	0.133	0.00005	8.6	0.400	0.00409
3.0	0.2267	0.00212	8.8	1.467	0.00959
3.2	1.0933	0.00467	9.0	0.507	0.00391
3.4	1.4266	0.00748	9.2	CARD IS MISSING ------	
3.6	1.2666	0.00551	9.4	0.507	0.00314
3.8	0.3867	0.00791	9.6	1.600	0.00861
4.0	CARD WAS MISSING -----		9.8	0.387	0.00245
4.2	0.907	0.00695	10.0	0.080	0.00126
4.4	0.800	0.00548	10.2	NO VISIBLE DEPOSIT	
4.6	0.800	0.00587	10.4	NO VISIBLE DEPOSIT	
4.8	0.813	0.00429			
5.0	0.267	0.00320			
5.2	0.987	0.00754			
5.4	1.120	0.00867			
5.6	CARD IS MISSING ------				

A mass median diameter (MMD) and number median diameter (NMD) were not calculated because the total number of drops recovered does not adequately represent the true droplet spectrum. This is again caused by the absence of small droplets.

CONCLUSIONS

1. Although droplet distribution appears very uniform, it is also very light.

2. The droplet spectrum, as collected on the dyed Kromekote samples, appears very coarse due to absence of smaller drops, (< 60 µm).

RECOMMENDATIONS

1. Since future spraying for mosquito control appears to be a possibility in southern Manitoba, it would be advantageous of person(s) involved in the project take the time to develop a sample unit designed specifically to collect drops from undyed oil-based spray formulations. The present system is not designed for this and yeilds only marginal data.

   A system using ink-encapsulated recording paper or the possibility of using a fluorescent tracer in the formulation should be investigated if monitoring of future control programs is planned.

Acknowledgements

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References

1. ZYLSTRA, B.F. 1975; Report on monitoring the Aerial Application of Baygon for the Control of Culex Tarsalis, Manitoba, 1975. CCRI File Report #13. August 1975.