HERBICIDE SPRAY DRIFT DAMAGE IN THE MERREDIN DISTRICT WESTERN AUSTRALIA 1984.

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INTRODUCTION AND BACKGROUND INFORMATION

Reports of widespread damage caused by herbicide use in the wheatbelt gained wide circulation in Western Australian newspapers in July 1984. The reports in the city daily papers suggested health risks to operators and the public as well as damage to the environment and inferred negligent use of herbicides.

The problems caused by herbicide drift became more evident in 1984 than in previous years because of the widespread use of the knockdown herbicides Spray-Seed[1] and Roundup[2] and their use late in a protracted planting season when many crops were already out of the ground. Farmers were under extreme pressure to complete their cropping programmes with wet conditions and large weed growth. The use of knockdowns increased from about 1 million ha in 1983 to about 2.1 million ha treated in 1984 in response to the weed problems at seeding. Associated with this increased use of knockdowns was operator inexperience. Many were unaware that significant spray drift could occur from boom sprays and not only from misters and aircraft. Most operators were also unaware of the conditions which pre-dispose drift, wind speed, boom height, line pressure and atmospheric inversions.

EXTENT OF THE PROBLEM

Inspections and reports of crop damage in the Merredin area in 1984 were requested by 14 growers and covered 17 sites. 1370 ha of crop was inspected. The inspection of this area of damaged crop should be seen in the light of plantings in the Merredin area of 1.5 million ha of which 1.3 million ha are wheat. The area inspected constitutes about 0.1% of total plantings. These reports cover incidents where a grower identified damage and thought it was severe enough to make a successful claim, usually against a neighbour's or a contractor's insurance company. Other instances of drift within the farm or where claims were not contemplated went unreported.

Most herbicide drift damage was done to crops down wind from spray sites as a result of fine droplets being blown on the wind. Only three of the incidents appear to have been the result of spraying in an atmospheric inversion.

AERIAL APPLICATION

The most obvious inversion caused spray drift resulted from aerial application of SpraySeed^{R} 1 L ha^{-1} + 2,4-D Amine 500 ml + Spraying oil (1%) in 15 L ha^{-1} water on a paddock at the top of a slope on 31st May, 1984. Air temperature was 20^{o} C, wind 5km hr^{-1} from the north east, and there were no clouds. Spraying was done from 3pm to 6pm. The night of 31st May/1st June was the coldest of that

1 paraquat/diquat
2 glyphosate.

period, falling to 6° C at Merredin. Spray damage covered 400 ha on two properties, north west of the sprayed paddock, and could be traced down slope from the site of application, through young crop and volunteer pasture and onto an extensive area of flat country where it flowed out as would water. There were no signs of Spray-Seed^{R} droplet damage higher than 1.5m above ground. No trees were affected.

The largest area of damage caused by wind drift was also the result of aerial application of SpraySeed^{R} 1.5 L ha^{-1} + 2,4-D Amine 500 ml ha^{-1} in 15 L ha^{-1} water. Spraying was done on a paddock near the top of a hill on the 2nd June, 1984, starting at 7 am and finishing at noon. Wind was 4km hr^{-1} from the north east. There was no cloud, and the temperature reached 18°C. SpraySeed^{R} spotting could be seen on crop 4 km from the site of spraying, but eucalypt leaf spotting could be found 6.5 km from the sprayed paddock. Damage did not follow low lying country but moved up slope and down slope and moved directly down wind. Damage was also evident to the top of Eucalypt trees (15m), indicating a deep blanket of moving air carrying droplets. The area of damage (366 ha) would have been greater had more crop been out of the ground.

GROUND SPRAY APPLICATION

Boom spray drift was more common but usually involved smaller areas and did not cause leaf spotting on trees. The only large areas of boom spray drift covered 160 ha and 120 ha down wind of the application of SpraySeed^{R} in high winds. Other cases of boom spray caused drift ranged from 3 ha to 50 ha and in winds as light as 5 km hr^{-1} and water rates as high as 80 L ha^{-1} with most applications in the range of 30-40 L ha^{-1}.

Damage caused by Roundup^{R} drift was investigated on four properties. 8 ha of wheat and 20 ha of lupins were re-sown.

Subsequent inspection of crops has shown that it is no longer possible to pick the effect of SpraySeed^{R} or Roundup^{R} drift damage. Harvest yield assessments may show the effect of spray drift damage.

OVERCOMING THE DRIFT PROBLEM

It is necessary to educate spray users about the possible effects of herbicides on non-target species. The likelihood of spray drift in various atmospheric conditions is not well understood, but it appears from experiences in 1984 that drift has occurred from boom sprays and aircraft in quite light winds. Spraying in atmospheric inversion conditions seems to be potentially the most damaging, and these conditions are harder to predict. Inversions are pre-disposed by an active high pressure system, clear skies (and loss of heat from the soil surface) and calm conditions.

It has been suggested that the Bureau of Meteorology could predict when conditions are unsuitable for spraying. Investigations in 1984 showed that conditions of wind speed and direction can vary widely over short distances so predictions from a remote centre seem impractical. Observations of conditions in the paddock at the time of spraying is more useful, and education will play a large part in helping operators to read the spraying conditions accurately.

Post Script - As a result of fears of contamination of water supplies by drift of SpraySeed^{R} samples were collected. A sample from an open public water supply tank contained less than 0.004 mg L^{-1} paraquat or diquat. Sampling from a tank on a roof catchment in an area of extensive spray drift contained less than 0.004 mg L^{-1} paraquat or diquat. The maximum residue levels for paraquat and diquat in potable water are 0.04 mg L^{-1} and 0.05 mg L^{-1}, respectively.

APPENDIX

Aircraft:

DATE	AREA (ha)	MODE	HERBICIDE	RATE (ha)	WATER (ha)	WIND
25.5.84	140	Drift	SpraySeed Glean	500 ml 12 g	15 L	* NW 5 km hr^{-1}
31.5.84	350+ 50	Inversion	SpraySeed 2,4-D Amine Spraying Oil	1 L 500 ml	15 L	* NE 7 km hr^{-1}
2.6.84	366	Drift	SpraySeed	1.5 L	15 L	* NE 5 km hr^{-1}

Boom:

28.5.84	28	Drift	Roundup	1 L	35 L	* NW 5 km hr^{-1}
29.5.84	20	Drift	Roundup 2,4-D Amine	1.25 L 500 ml	32 L	* NW
31.5.84	5	Drift	Roundup	1 L	80 L	** SE 1 km hr^{-1}
2.6.84	15	Drift	SpraySeed	1.25 L	50 L	* SW light
3.6.84	10	Drift	SpraySeed	750 ml	36 L	* N light
3.6.84	160	Drift	SpraySeed Reglone	2 L 500 ml	25 L	* NW 20 km hr^{-1}
7.6.84	120	Drift	SpraySeed Spraying Oil	1.5 L	40 L	* NW 10-20 km hr^{-1}
7.6.84	3	Drift	Roundup	1 L	30 L	* SE light
9.6.84	7	Drift	Roundup	1 L	40 L	* NW 1-10 km hr^{-1}
11.6.84	32	Drift	SpraySeed 2,4-D Amine	1 L 500 ml	30 L	* W
13.6.84	46	Drift	SpraySeed Spraying Oil	1 L	25 L	* NW

Micronair:

2.7.84	7.5	Drift	SpraySeed 2,4-D Amine Spraying Oil	500 ml 250 ml	15 L	** E 25 km hr^{-1}
5.7.84	5	Inversion	SpraySeed 2,4-D Amine Spraying Oil	500 ml 250 ml	15 L	** NE 4 km hr^{-1}

* Operator's Data

** Merredin Research Station Data.