EXPOSURE TO HERBICIDES BY OPERATORS USING AIR-CONDITIONED TRACTOR CABS

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Summary: The strong growth in the use of herbicides is discussed in relation to usage of other pesticides. Some health problems with herbicide use, as perceived by farmers are discussed, together with the results and implications of limited monitoring work with wheatbelt farmers. Specific reference is made to exposure to herbicides by farmers using air-conditioned tractor cabs.

INTRODUCTION

Herbicide usage in Western Australia has become a growth industry. In 1982 about $19 million worth were sold, rising to $47 million worth in 1983, and estimates of around $60-70 million for 1984, based on sales to date. All other pesticide groups combined account for less than $4 million per year. Most of this increased usage is taking place in the wheatbelt for weed control, both pre- and post-planting in cereals. With increasing herbicide usage of this magnitude is hardly surprising that some people are voicing doubts about the safe use of these chemicals. Concerns have been expressed regarding their safety to the operator, to the consumer and to the environment. While I believe that these fears are ill-founded, they are real and must be addressed.

In this paper I propose to examine the question of operator safety in more detail, using examples of studies carried out in Western Australia.

THE SAFETY SITUATION

The Australian Bureau of Statistics compiles annual figures relating to the number of poisoning cases admitted by public hospitals in each State. In Western Australia, in recent years, very few deaths (less than 1 per year on average and relatively few morbidities (less than 100 per year on average) can be attributed to poisoning by pesticides. Unfortunately, the statistics do not show separate figures for herbicides, but records of the Health Department of W.A. show that almost all the cases are a result of insecticide poisonings, mostly by children. This means that the number of reported occupational poisonings by herbicides is likely to be very low. The unanswered question is, how many farmers and/or operators are chronically poisoned, and are not aware of it, or do not report it?

Some clues to the answer of this question are given by a survey of almost 100 farmers at field days in the central wheatbelt in 1983. While the survey would not stand up to rigorous statistical analysis, it provides a useful pointer to potential problems. Over 37 percent of the farmers reported headaches, over 9% reported blood noses, and a further 9% reported eye irritation during spraying operations. Of course, it is not possible to determine how many headaches, for example, are really caused by the herbicide.

AIR-CONDITIONED TRACTOR CABS

Over the last few years several cases have been reported of farmers becoming "ill" after applying herbicides while using air-conditioned tractor cabs. Unfortunately, none of the cases could be substantiated as the reports were anecdotal. However, these stories persisted, resulting in some publicity in the media and their inclusion on the agendas of one or two inter-departmental committees. Accordingly, in 1983 the Occupational Health Division of the Health Department of W.A. agreed to carry out some limited studies of herbicide levels in air-conditioned tractor cabs. The results of these studies are summarised below.

"Farmer 1" was monitored using DDT, but the results are consistent with the other results.

Farmer 1 (Merredin): Four air samples and one pair of paper overalls worn by the operator were submitted for analysis.

Chemical applied: DDT (250g L^{-1}) at 500g ha^{-1}, 90 ha sprayed in 6 hrs and 10 mins.

Paper overalls were worn at all stages of the operation, from handling concentrate to completion of job. Total surface area of overalls was 2.6m^{-3}.

The air samples were taken both inside and outside (two of each) the tractor cab, which was air-conditioned.

Samples	DDT µg m^{-3}
Inside (1)	0.1
Inside (2)	0.6
Outside (1)	6.0
Outside (2)	4.4
Overalls	13.2 mg total

The TLV/TWA of DDT (8 hr day, 40 hr week) is 1 mg m^{-3}.

TLV - Threshold Limit Value/TWA - Time Weighted Average.

Farmer 2 (Merredin): Similar condition of spraying and overalls as for Farmer 1.

Chemicals used: 2,4-D amine plus diuron, no rates supplied.

	Samples	2,4-D	Diuron µg m^{-3}
9/8/83	Inside	0.2	0.5
	Outside	1.2	7.0
11/8/83	Inside	3.0	0.4
	Outside	6.3	14.0
	Overalls (3)	3.1	25 mg total

The TLV/TWA of 2,4-D and diuron (8 hr day, 40 hr week) is 10 mg m^{-3}.

Farmer 3 (Katanning): Similar condition of spraying and overalls as for farmers 1 and 2.

Chemicals used:	Rate ha^{-1}
2,4-D	150g
Diuron	250g

A total of 20 ha were sprayed in 35 minutes.

Samples	2,4-D	Diuron ($\mu g\ m^{-3}$)
1. Personal on operator	1.7	< 0.1
2. Positioned inside cab	2.8	< 0.1
3. Outside cab near air inlet	1.3	< 0.1
Overalls	< 0.1	< 0.9 mg total

Air samples 1 and 3 were taken during preparation stages as well as spraying. Sample 2 was taken only during spraying.

TLV/TWA (in $mg\ m^{-3}$) for 8 hr day, 40 hr week is as follows:

2,4-D	10
DDT	1

A further three farms in the Corrigin area were surveyed, all of which were using the same herbicides as shown below:

	Farm 1	2	3
		$g\ ha^{-1}$	
paraquat	125	125	94
diquat	75	75	56
trifluralin	400	400	400

All three farmers were using boomspray equipment, towed by tractors. While all three tractors had fully enclosed cabs, only farmer 3 had, and used, air-conditioning.

In all cases the inside 'filter' sample was collected from a cellulose filter attached to the operator's shirt collar. The outside 'filter' sample was obtained from the top of the wheel arch just outside the door. In addition, farmers 2 and 3 were also equipped with resin filters (for trifluralin) both inside and outside the cab.

Results:

Farm	Sample type	Diquat	Paraquat	Trifluralin
			$\mu g\ m^{-3}$	
1	filter inside	<10	<10	-
1	filter outside	<10	<10	-
2	filter inside	< 1	< 1	-
2	filter outside	< 1	< 1	-
2	resin inside	-	-	2
3	filter inside	< 2	< 2	-
3	filter outside	< 2	< 2	-
3	resin inside	-	-	1
3	resin outside	-	-	2
3	water inside	< 2	< 2	-
3	water outside	< 2	< 2	-
T.L.V. - T.W.A. (NH&MRC)		500	100	-

In all six cases the levels of herbicide found were far below the Threshold Limit Value established by the National Health & Medical Research Council (NH&MRC). In addition, the levels of chemicals inside the cab were no higher, and in some cases much lower, than the levels outside the cab. This indicates that there is little danger of toxicity to the operator from a build-up of chemicals in the cab.

Some of the farmers in the studies reported chemical odour in the cab, particularly while travelling with the wind. In a closed cab there are only two ways in which chemical vapour can enter:

1. Through the air-conditioning unit. The filter in air-conditioners are only designed to prevent entry of particulate matter, ie. dust particles. However, the results from these studies (and from limited work conducted elsewhere) suggest that the levels of pesticide entering the cab through the air-conditioner are relatively low. It may be that the filter is effective in removing most chemical droplets from the air entering the cab. Other relevant factors are the position of the boom spray in relation to the intake duct, the wind speed and direction and the efficiency of individual filtering units. It should be noted that air-conditioned tractor cabs do not guarantee protection from chemical exposure. In addition, no suitable carbon filter is available for removing chemical vapour from the air entering the tractor cab.

2. On the operator's clothing. These studies, backed up with anecdotal evidence, suggest that operators may be contributing to the levels of chemical found in the cab by working in contaminated clothing. Further studies will be necessary to examine the work practices of farmers and operators to determine whether contamination of clothing is an important component of the levels of herbicides in cabs. In addition, the role of the air-conditioner filter needs further study.

In any event, operators can minimise their exposure to herbicides by

- not allowing their work clothes to become contaminated, and by changing them when necessary.
- wearing a respirator in the cab where necessary.