

## **Pesticide residues on Australian wool**

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### **Summary**

*The wool industry has an annual survey for pesticide residues on fleece wool. Organophosphate (OP) and synthetic pyrethroid (SP) residues on the national clip are steadily declining, with mean residues for each class of pesticide now less than 2 mg/kg greasy wool. Cyromazine residues fluctuate in a band from 5-10 mg/kg greasy wool, depending on seasonal conditions and hence susceptibility to flystrike. Dicyclanil residues are low but increasing, with mean residues on fleece wool during 2000/01 of 0.4 mg/kg. Diflubenzuron and triflumuron residues have increased over the last four years, with mean residues on fleece wool during 2000/01 of 5.4 and 8.6 mg/kg greasy wool respectively.*

*A spot survey of lambs wool during 1999/00 found that SP and triflumuron residues were much lower than on fleece wool, diflubenzuron residues were slightly lower, and OP and cyromazine residues were about double those on fleece wool. This reflects known treatment patterns, with a lower proportion of lambs treated for lice but greater susceptibility of young sheep to flystrike.*

*A spot survey of pieces wool during 2000/01 found that all classes of residues other than cyromazine were lower on pieces wool than on fleece wool. This was especially so for the SPs, diflubenzuron and triflumuron and presumably reflects pesticide dispersion, with products applied along the back more concentrated on the fleece than on piece wool.*

### **Keywords**

Pesticide residues, wool residues

### **Fleece wool**

Each year since 1992/3 the Australian wool industry has undertaken a survey of pesticide residues on the national wool clip. Approximately six hundred fleece wool samples, stratified by state of origin, have been tested for pesticide residues each year. Up to and including 1998/9, fifty samples were collected each month. Since 1999/00 the samples have also been stratified by month of pre-sale testing by AWTA. This change was to avoid over-representation of autumn-shorn wool in the survey.

For the first two years, the analytical profile covered only the organophosphate (OP) and synthetic pyrethroid (SP) pesticides. Cyromazine was added to the analytical profile in 1994/5, diflubenzuron and triflumuron were added in 1996/7 and dicyclanil was added in 1999/00. Table 1 shows mean pesticide residues on fleece wool for each year since the start of the survey. Table 2 shows the range of pesticide residue concentrations on fleece wool tested during 2000/01.

Since establishment in 1999 of the National Residue Survey (NRS) laboratory proficiency evaluation program for pesticide residues on wool, participation in the NRS program with demonstrated competence has been a mandatory requirement for the testing laboratory.

**Table 1. Mean pesticide residues on Australian fleece wool (mg/kg greasy wool).**

Year	OPs	SPs	Cyromazine	Dicyclanil	Diflubenzuron	Triflumuron
1992 / 93	10.2	5.8				
1993 / 94	9.0	6.6				
1994 / 95	4.3	5.7	5.2			
1995 / 96	4.4	5.5	6.3			
1996 / 97	4.5	3.8	8.7		1.2	3.5
1997 / 98	5.8	3.3	5.8		3.6	6.1
1998 / 99	2.4	1.6	7.4		3.5	7.6
1999 / 00	2.2	2.0	5.1	0.1	2.9	9.0
2000 / 01	1.6	1.4	10.2	0.4	5.4	8.6

**Table 2. Mean pesticide residues by number of lots (% lots) and contribution to total pesticide load (% load) of Australian fleece wool (2000-01) for each concentration range.**

Concentration (mg/kg)	OP		SP		Cyromazine		Dicyclanil		Diflubenzuron		Triflumuron	
	% lots	% load	% lots	% load	% lots	% load	% lots	% load	% lots	% load	% lots	% load
<1.0	74	5	92	2	69	-	97	-	85	-	69	-
1.0 – 9.9	22	41	5	11	10	5	<1	3	5	3	10	5
10.0 – 24.9	3	24	1	12	7	11	2	37	5	15	7	14
25.0 – 49.9	1	16	-	-	8	29	1	23	3	19	10	41
≥50.0	<1	14	1	76	6	55	1	38	3	62	5	40

### **Organophosphates**

Organophosphate (OP) residues on the national clip are steadily declining, mainly because there are progressively fewer clips with very high residues. This is consistent with declining use of OPs for long-wool jetting to control flies, due to both resistance to OPs in field strains of *Lucilia cuprina* flies and concern about occupational health and safety aspects of OP use. Most of the OP residues on the national clip are diazinon.

### **Synthetic pyrethroids**

Synthetic pyrethroid (SP) residues on the national clip have also steadily declined. This is mainly because of resistance to SPs in field strains of sheep lice and a shift in market share for lice treatments from SPs to diflubenzuron and triflumuron.

SP residues are almost exclusively alphacypermethrin/cypermethrin (the laboratory test procedures do not distinguish between the two chemical forms.)

One percent of fleece samples contribute more than three quarters of the total SP residue load on the national clip. These are wool samples contaminated with more than 50 mg/kg cypermethrin, and are almost certainly from sheep treated with cypermethrin whilst in long-wool. There is currently only one SP product registered for use as a long-wool treatment (Vanquish). If long-wool treatment with SPs ceased, mean SP residues on the national clip would be expected to fall to about a quarter of their current levels.

### **Cyromazine**

Cyromazine residues have fluctuated in a band from 5-10 mg/kg greasy wool, with residue levels changing largely in response to seasonal conditions and hence susceptibility to flystrike. With cyromazine coming off patent and the registration of lower priced generic products during 2000, it is likely that cyromazine residues on the national wool clip will increase over the next few years.

### **Dicyclanil**

In the two years that dicyclanil has been in the analytical profile, dicyclanil residues have been low but increasing. This reflects a slowly increasing market share for dicyclanil.

### **Diflubenzuron**

From 1996/7 to 1999/00, diflubenzuron residues were relatively stable, with mean residues on the national clip in the range of 2.9-3.6 mg/kg greasy wool. This increased to 5.4 mg/kg in 2000/01. The increase was partly due to one sample that was extremely heavily contaminated with diflubenzuron; a line of 29 bales of fleece wool that tested 700 mg/kg diflubenzuron, 170 mg/kg triflumuron and 4 mg/kg diazinon! Another reason for the increase in diflubenzuron residues is increased jetting with diflubenzuron for fly control during late 2000 and early 2001, when cyromazine was not readily available.

### **Triflumuron**

Triflumuron residues on the national clip increased each year from 1996/7 to 1999/00. However, the steady increase in triflumuron residues appears to have plateaued, with mean residues in 2000/01 of 8.6 mg/kg greasy wool.

### **Low-residue wool**

In the survey, wool has been nominally classified as 'low-residue' if it meets the following criteria:

- Organophosphates < 1.0 mg/kg;
- Synthetic pyrethroids < 0.5 mg/kg;
- Cyromazine < 10.0 mg/kg;
- Dicyclanil < 10.0 mg/kg;
- Dflubenzuron < 1.0 mg/kg; and,
- Triflumuron < 1.0 mg/kg.

This classification is intended only as a guide. In some markets these criteria may be unduly tough. For example, higher diflubenzuron or triflumuron residues may not cause concern. However there are other markets, such as niche markets for eco-wool, where wool that meets the criteria listed above may still be unacceptable.

The proportion of fleece wool samples classified as 'low-residue' wool was 38% in 1999/00 and 32% in 2000/01 (Table 3).

**Table 3. Proportion of samples classified as 'low-residue' wool.**

Survey year	2000-01		1999-00	
	Fleece wool	Pieces wool	Fleece wool	Lambs wool
'Low residues' samples	192/593	151/385	225/586	167/390
% 'low-residue' samples	32%	39%	38%	43%

### **Lambs' wool**

During 1999/00 a spot survey of lambs' wool was undertaken in conjunction with the annual fleece wool survey. The sampling schedule was stratified by state of origin and month of pre-sale testing by AWTA. The results of the lambs' wool survey are shown in Table 4.

**Table 4. Mean pesticide residues (mg/kg greasy wool) on Australian wool, by wool type.**

Survey year Wool type	2000-01		1999-00	
	Fleece wool	Pieces wool	Fleece wool	Pieces wool
No. of samples (n)	593	385	586	390
OP	1.6	1.4	2.2	4.3
SP	1.4	0.4	2.0	0.5
Cyromazine	10.2	11.0	5.1	11.7
Dicyclanil	0.4	0.2	0.1	0.0
Diflubenzuron	5.4	1.6	2.9	1.9
Triflumuron	8.6	1.1	9.0	1.4

SP and triflumuron residues were much lower in lambs' wool than in fleece wool. Diflubenzuron residues were slightly lower than in fleece wool. OP and cyromazine residues were about double those in fleece wool. These results reflect known treatment patterns, with a lower proportion of lambs treated for lice but greater susceptibility of young sheep to flystrike.

### **Pieces wool**

During 2000/01 a spot survey of pieces wool was carried out in conjunction with the annual fleece wool survey. The sampling schedule was stratified by state of origin and month of pre-sale testing by AWTA. The results of the pieces wool survey are also shown in Tables 3 and 4.

The survey of pieces wool found all classes of residues other than cyromazine were lower than on fleece wool. This was especially so for the SPs, diflubenzuron and triflumuron, and presumably reflects pesticide dispersion with products applied along the back more concentrated on the fleece than on pieces wool.