

Testing Service Report

Samples Received

For the 2002 resistance testing 895 samples were received, an increase of 50% on the previous year and four and a half times that received in 2000. This was the result of the Dow WeedSense (WS) program which provided 585 samples. The Farrer Centre (FC) received 310 samples direct from farmers or agents, this was 50% more than received in any other year.

The majority of these samples were annual ryegrass (735, 469 WeedSense and 266 Farrer Centre) but a large number of wild oat (126) and wild radish (21) samples were received (Table 1).

Wild oat sample receipts were 400% greater than any previous year, as were wild radish, this is mainly due to these weeds being included in WeedSense (wild oats - 93 and wild radish - 16) but also a result of increased resistance concerns with these species.

Table 1: Number of samples received since 1999

	1999	2000	2001	2002
Annual ryegrass	153	159	555	735
Wild oats	14	32	20	126
Wild radish		1	4	21
Brome grass	1	2		4
Others				9
Total	168	194	579	895

Summary of Results

The results obtained from the 2002 resistance screening differ markedly in some areas from years prior to 2001 as they did last year.

Prior to 2001 all samples received for testing were from paddocks where resistance was **suspected** and the testing was to confirm initial suspicions. In 2001 and 2002 a large number of samples were provided through the WeedSense program and while resistance would have been suspected in some of these paddocks in many cases the sample was provided for testing because the tests were provided **free** to the farmer upon meeting certain conditions.

Annual ryegrass

WeedSense provided 469 ryegrass samples and 266 were sent direct to the Farrer Centre. As a result 697 samples were tested to the standard cross-resistance test (Table 2). In addition, all WeedSense samples and a number of the Farrer Centre samples were tested for resistance to Roundup. Thirty-eight samples were tested to a herbicide or combination of herbicides other than the standard cross-resistance test.

Table 2: Number of samples tested to each of five herbicide groups

	1999	2000	2001	2002
A (fops)	158	149	537	722
A (dims)	146	147	531	734
B	121	132	357	722
C	110	126	330	690
D	112	125	342	683

Seventy-six percent of all samples tested to a 'fop' herbicide were classed as either resistant or developing resistance to that herbicide (Table 3). This is markedly below the results of years prior to 2001 but greater than 2001. However, 85% of samples provided direct to the Farrer Centre were either resistant or developing resistance to a 'fop', compared to 71% via WeedSense (Figure 1).

Nineteen percent of samples tested to a 'dim' herbicide were classed as resistant or developing resistance. The level of 'dim' resistance was six percent lower for WeedSense samples compared to Farrer Centre samples (16% compared to 22%) (Table 3, Figure 1).

Thirty eight percent of samples were resistant to Group B herbicides. This was higher among the Farrer Centre samples (46%) than the WeedSense samples (32%). No samples were resistant to simazine (Group C) while seven percent were resistant to trifluralin (Group D) (Table 3, Figure 1).

Table 3: Percentage of samples resistant or developing resistance to each of five herbicide groups

	1999	2000	2001	2002
A (fops)	95	98	65	76
A (dims)	20	15	34	19
B	41	32	31	38
C	2	1	1	0
D	19	10	8	7

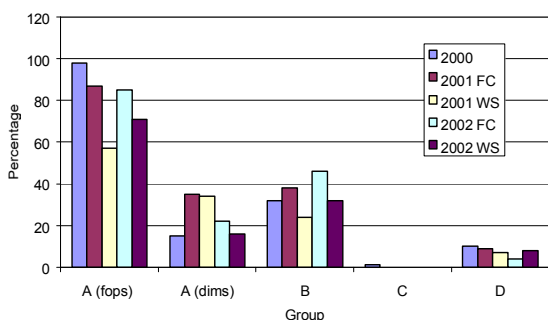


Figure 1: Percentage of samples resistant or developing resistance to each of five herbicide groups from two sample sources

Figure 1 shows that the level of resistance to both the 'fop' and 'dim' herbicides was lower in the WeedSense samples than in the Farrer Centre samples. This is different from 2001 when the level of 'dim' resistance detected was similar for both sample sources. While the level of 'fop' resistance of the Farrer Centre samples has remained constant the level detected in the WeedSense samples has increased from 57 to 71%.

Resistance to the 'dims' has decreased to the level found in 1999 and 2000 when approximately 20% of samples were resistant. However, last years results cannot be considered unusual as from 1996 to 1998 the level of 'dim' resistance detected was around 30%.

The level of group B resistance for samples from both sources was eight percent higher this year than last year. As was the case last year resistance to the Group B herbicides was lower in the WeedSense samples than in Farrer Centre samples. (Figure 1).

Cross and Multiple Resistance

The samples received can be divided into two categories (WeedSense or Farrer Centre cross-resistance) when determining the level of cross or multiple resistance.

697 samples were tested to five herbicide groups (WeedSense and Farrer Centre cross resistance

tests). 516 samples were also tested to Roundup in addition to the five herbicides, all WeedSense samples plus 47 Farrer Centre samples. Of the 697 samples, 40% were resistant or developing resistance to two or more herbicides with three samples resistant to four of the groups tested. These samples can be further divided into the two different tests with 469 samples in the Dow tests and 228 from the Farrer Centre tests (Table 4).

Table 4: Results of cross resistance screening showing percentage of samples resistant or developing resistance to different groups and number of tests in each group.

No. of groups	2000 (%)	2001		2002	
		FC (%)	WS (%)	FC (%)	WS (%)
6	0	0	0	0	0
5	0	0	0	0	0
4	2.5	0	0.9	0.4	0.4
3	10.8	10.8	11.4	10.5	7.9
2	35.8	46.0	28.1	40.4	27.3
1	48.4	36.0	30.6	41.2	48.2
0	2.5	7.2	28.4	7.5	16.2
No. of samples	120	111	229	228	469

The samples sent direct to the Farrer Centre had the highest level of cross-resistance with over half (50.9%) of samples resistant to two or more herbicide groups and only 7.5% of samples susceptible to all herbicide groups, figures similar to 2001. In comparison 35.6% of WeedSense samples were resistant to two or more groups a reduction of five percent from last year although less samples (16.2% compared to 28.4%) were susceptible to all herbicides.

State by State

Samples were received from four states with major increases in numbers received from three states (Table 5).

Table 5: Number of samples received from each state.

	2001			2002		
	FC	WS	Total	FC	WS	Total
NSW	84	117	201	100	165	265
Vic	36	113	149	36	147	183
SA	29	98	127	46	84	130
WA	2	72	74	84	73	157

The level of 'fop' resistance detected was similar for all states. Western Australia exhibited the highest

level of resistance for 'dim' and group B overall with slightly higher resistance levels than New South Wales which had double the resistance for these two groups as Victoria and South Australia. South Australia and Victoria had the greatest incidence of trifluralin resistance regardless of the source of the samples (Figure 2).

Regardless of the source of the samples there was minimal variation between the states in the level of resistance to 'fop' and group D herbicides. Samples from New South Wales and Victoria had marked increases in resistance for the Farrer Centre samples comparative to WeedSense samples for both 'dim' and group B herbicides in contrast to the Western Australian samples for which the level of resistance was higher when sourced via WeedSense. No samples from South Australia sent direct to the Farrer Centre were resistant to 'dims', and there was minimal difference between the two sources in the level of group B resistance (Figures 3, 4).

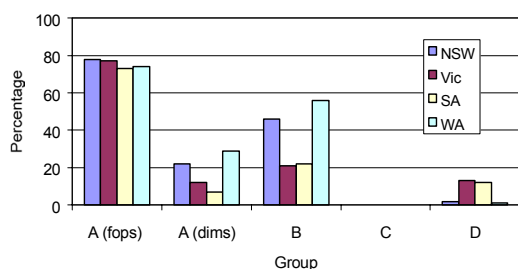


Figure 2: Percentage of samples resistant and developing resistance for each state.

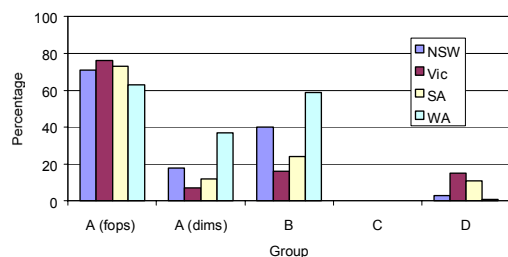


Figure 3: Percentage of WeedSense samples resistant and developing resistance for each state.

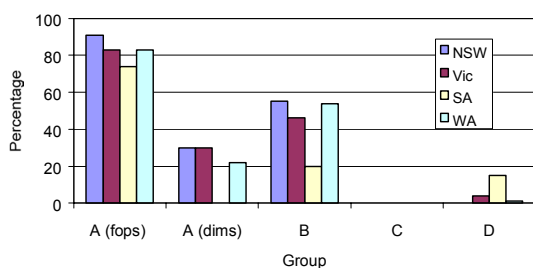


Figure 4: Percentage of samples sent direct to Farrer Centre resistant and developing resistance for each state.

Group A herbicides

The data below for Hoegrass and Verdict appear different. Previous Farrer Centre trials have shown **100% correlation** between Hoegrass and Verdict resistance in annual ryegrass. The difference here is the result of the different methods via which the samples were provided. All Hoegrass samples were provided direct to the Farrer Centre while all but eight Verdict samples came through WeedSense. A comparison of Figure 1 and Table 6 confirms this explanation.

While Hoegrass, Verdict and Select were the main herbicides tested, a number of samples were also screened to Sertin, Achieve, and Fusion. Single samples were screened to Targa (Sus), Spear (Res) and Falcon (Sus) (Table 6).

Table 6: Results for individual Group A herbicides showing percentage resistant (Res) or developing resistance (DR) to each herbicide.

	Tested	Res	DR	%	Susc
<i>'fops'</i>					
Hoegrass	243	192	14	85	37
Verdict	477	298	44	71	135
<i>'dims'</i>					
Select	675	48	52	15	575
Sertin	37	13	4	46	20
Achieve	21	17	2	91	2
<i>'fop' & 'dim'</i>					
Fusion	12	1	0	8	11

Group B herbicides

Glean, Logran, On Duty and Hussar were screened from the Group B herbicides with resistance detected to all but Hussar (Table 7).

Table 7: Results for individual Group B herbicides

	Tested	Res	DR	%	Susc
Glean	365	63	65	35	237
Logran	344	54	83	36	207
On Duty	12	3	2	42	7
Hussar	1	0	0	0	1

Other herbicides

Annual ryegrass samples were screened to four other herbicides, simazine, atrazine, trifluralin and Roundup. As these are low risk herbicides for the development of resistance the level of resistance was lower than for the Group A and B herbicides (Table 8).

Table 8: Results for other herbicides

	Tested	Res	DR	%	Susc
<u>Group C</u>					
Simazine	600	0	0	0	600
Atrazine	90	0	0	0	90
<u>Group D</u>					
Trifluralin	683	14	31	7	638
<u>Group M</u>					
Roundup	509	0	0	0	509

Wild Oats

There was a major increase in the number of wild oat samples received in 2002. 126 samples were received compared to the previous highest number of 32 received in 1999. Of the samples, 93 were provided via WeedSense and as such the possibility of resistance for these was expected to be lower as was experienced with the annual ryegrass (Table 9).

The level of 'fop' resistance among the Farrer Centre samples was 87%, an increase on previous years while only 23% of WeedSense samples had 'fop' resistance. Two samples were developing resistance to 'dim' herbicides, one each to Select and Sertin. No samples were found to be resistant to any of the other tested herbicide groups (C, D, E, K or M).

Table 9: Level of group A resistance (%) and number of wild oat samples since 2000 (FC = Farrer Centre, WS = WeedSense).

	2000	2001	2001	2002	2002
		FC	WS	FC	WS
	% (no.)	% (no.)	% (no.)	% (no.)	% (no.)
'fops'	77(27)	77(9)	0(8)	87(31)	23(93)
'dims'	4(25)	16(6)	0(6)	0(29)	2(93)

Other weed species

Twenty-six broadleaf weed samples (wild radish, wild turnip, Indian hedge mustard and corn gromwell) were provided for resistance screening in 2002. Wild radish samples resistant to group F (Brodal, 2 out of 20) and C (Simazine, 1 out of 16) were detected while one wild turnip sample was found to be resistant to group B herbicides (Logran and On Duty).

Four brome grass samples were received one of which was found to be resistant a Group A 'fop' herbicide (Verdict).

Final Observations

- Among the non WeedSense samples resistance levels remained similar to 2001 apart from the 'dims' which decreased to the level experienced in 1999 and 2000.
- As was the case in 2001 the level of 'fop' and SU resistance was lower among the samples provided via WeedSense compared to samples provided direct to the Farrer Centre.
- The level of 'fop' resistance was similar among the four states.
- The level of 'dim' and group B resistance was highest in Western Australia
- New South Wales and Western Australian samples exhibited at least double the level of resistance to 'dims' and group B compared to Victoria and South Australia.
- A low level of group B resistance in South Australia.
- Higher trifluralin resistance in South Australia and Victoria.
- The level of resistance in wild oats to group A 'fop' herbicides has remained constant in samples sent direct to the Farrer Centre.

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