

Samples Received

The testing service screened 327 samples in 2005. This is 25% lower than the number of samples received last year.

The majority of these samples were annual ryegrass (241) but a number of wild oat, wild radish and brome grass samples were received (Table 1).

The number of wild oat samples received compared to last year doubled, consisting 17% of all samples. This is the highest proportion of wild oat samples received in any year.

This report compares this years results with those of previous years for the non WeedSense samples only unless otherwise stated.

Table 1: Number of samples received since 2002 (includes WeedSense receivals).

	2002	2003	2004	2005
Annual ryegrass	735	643	387	241
Wild oats	126	86	28	56
Wild radish	21	30	15	21
Brome grass	4	4	8	6
Others	9	6	6	3
WeedSense	607	585	-	-
Direct to CSU	288	184	444	327
Total	895	769	444	327

Summary of Results

The results obtained from the 2005 resistance screening are similar in the majority of cases to the results from previous years for samples sent direct to the testing service.

Annual ryegrass

This year, 241 annual ryegrass samples were received, of which 215 were tested to the standard cross-resistance test (Table 2). Fourteen of these samples were also tested to one to three additional herbicides. In addition, 15 samples were tested to glyphosate. Twenty-six 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 (non WeedSense samples only)

	2001	2002	2003	2004	2005
A (fops)	144	253	118	374	214
A (dims)	137	263	136	378	250
B	137	256	129	341	239
C	110	224	125	363	215
D	121	224	117	362	217

Ninety percent of all samples tested to a 'fop' herbicide were classed as either resistant or developing resistance to that herbicide (Table 3). This is slightly higher than the results of the previous four years for samples sent direct to the Farrer Centre.

Twenty seven percent of samples tested to a 'dim' herbicide were classed as resistant or developing resistance (Table 3). This is an increase on the last two years, however a large number of samples were tested to Achieve, on the request of the agronomist, which normally has a higher level of resistance when compared to Select.

Eighty-eight percent of samples were resistant to Group B herbicides. This was highest level recorded since the testing service commenced in 1991. No samples were resistant to simazine (Group C) and nine percent were resistant to trifluralin (Group D) (Table 3).

Table 3: Percentage of samples resistant or developing resistance to each of five herbicide groups (excluding WeedSense samples)

	2001	2002	2003	2004	2005
A (fops)	86	85	81	77	90
A (dims)	34	22	17	10	27
B	43	47	38	48	88
C	0	0	1	0	0
D	8	4	4	13	9

Cross and Multiple Resistance

Of the 215 samples submitted for the standard cross resistance test, 84% were resistant or developing resistance to two or more herbicides, double the level recorded last year. This reflects the major increase in the level of resistance to the group B herbicides. Two samples were resistant to four of the groups tested (Table 4).

Table 4: Results of cross resistance screening showing percentage of samples resistant or developing resistance to different groups.

No. of groups	2001 (%)	2002 (%)	2003 (%)	2004 (%)	2005 (%)
5	0	0	0	0	0
4	0	0.4	0	1.9	0.9
3	10.8	10.5	6.6	8.2	22.8
2	46.0	40.4	32.2	32.0	60.0
1	36.0	41.2	47.1	45.6	13.0
0	7.2	7.5	14.1	12.3	3.3
No. of samples	111	228	121	366	215

The number of samples susceptible to all tested herbicide groups was lower than all years since 2000 when only 2.5% of samples were susceptible to all herbicide groups.

#### Herbicide Groups

Among all samples there were major differences between the various groups and in some cases within the different herbicide groups.

#### Group A herbicides

While Hoegrass and Select were the main herbicides tested, a number of samples were also screened to Verdict, Targa, Tristar, Correct, Sertin, Achieve, Aramo and Fusion (Table 6).

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

	Tested	Res	DR	%
<u>'fops'</u>				
Hoegrass	197	166	11	<b>90</b>
Verdict	9	7	1	<b>89</b>
Targa	1	1	0	<b>100</b>
Tristar	2	2	0	<b>100</b>
Correct	1	1	0	<b>100</b>
<u>'dims'</u>				
Select	199	12	16	<b>14</b>
Sertin	3	1	1	<b>66</b>
Achieve	43	31	4	<b>81</b>
Aramo	2	0	1	<b>50</b>
<u>'fop' &amp; 'dim'</u>				
Fusion	3	0	2	<b>66</b>

#### Group B herbicides

Glean, Logran and Hussar were the major herbicides screened from the Group B herbicides with resistance detected to all herbicides (Table 7). Other Group B herbicides screened in limited numbers were On Duty and Oust.

Compared to previous years the level of resistance to both Glean and Logran increased markedly (Table 8). Ninety four percent of samples were resistant to Glean compared to 56% last year and 97% of samples were resistant to Logran (23% in 2004). The testing for both these herbicides was repeated to remove the possibility that the findings were the result of an experimental error, but the results in the second screening were the similar to the first. The data from both screenings were combined to calculate the resistance status of the samples.

Table 7: Results for ryegrass samples screened to individual Group B herbicides

	Tested	Res	DR	%	Susc
Glean	142	112	22	<b>94</b>	8
Logran	35	29	5	<b>97</b>	1
On Duty	18	6	4	<b>66</b>	8
Hussar	38	24	5	<b>76</b>	9
Oust	3	0	0	<b>0</b>	3

Table 8: Level of resistance to Glean and Logran since 2001 (percentage of samples tested)

	2001	2002	2003	2004	2005
Glean	31	35	42	56	94
Logran	22	36	45	23	97

#### Other herbicides

Annual ryegrass samples were screened to four other herbicides, simazine, atrazine, trifluralin and Roundup. The observed incidence of resistance to these herbicides was lower than the resistance to the higher risk Group A and B herbicides (Table 9).

Table 9: Results for ryegrass samples screened to other herbicide groups.

	Tested	Res	DR	%	Susc
<u>Group C</u>					
Simazine	196	0	0	<b>0</b>	196
Atrazine	18	0	0	<b>0</b>	18
<u>Group D</u>					
Trifluralin	212	12	7	<b>9</b>	193
<u>Group M</u>					
Roundup	15	1	0	<b>7</b>	14

Another sample was found to be resistant to Roundup making five that have been identified by the testing service since the first case of Roundup resistance was identified in a sample provided to the testing service in 1996. There are approximately 40 confirmed cases of annual ryegrass resistance to Roundup in Australia.

## State by State

Samples were received from four states with major decreases in numbers received from South Australia and Western Australia; however Western Australia and Victoria each provided 36% of the samples (Table 5).

Table 5: Number of ryegrass samples received from each state.

	2003	2004	2005
NSW	29	70	60
Vic	17	68	86
SA	48	101	9
WA	37	148	86

With the very low number of samples received from South Australia the data for that state has not been analysed separately. The level of 'fop' resistance detected was similar for the other three states (Figure 1). This is different to previous years in which the level of resistance has varied to some degree between the states.

Victoria had the highest level of 'dim' resistance with 40% of samples resistant, however the majority of the resistant samples had been screened to Achieve. When only samples tested to Select are considered all states had a similar level of resistance recorded (Figures 1 and 2).

Unlike the last two years, Western Australia did not have the highest group B resistance overall. This year 94% of samples from NSW were resistant to group B herbicides compared to 88% from Western Australia and 82 % from Victoria. When only the sulfonylurea herbicides are considered New South Wales and Victoria had the highest level of resistance (98 and 97%) compared to Western Australia with 92% of samples resistant (Figures 1 and 2).

Compared to previous years the level of group B resistance has increased markedly. As a result of this all Glean and Logran samples were retested to confirm the results. The reason for this is unknown however the availability and use of the newer group B (On Duty, Hussar and Atlantis) herbicides may be a factor although more than one years data is needed to determine an accurate reason.

As has been the case in previous years Victorian (15%) samples have had higher level of resistance to group D than samples from New South Wales or Western Australia. No samples were resistant to group C herbicides (Figure 1).

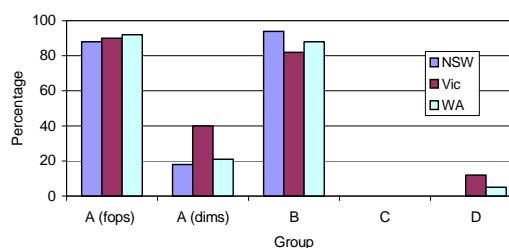


Figure 1: Percentage of ryegrass samples resistant and developing resistance for each state.

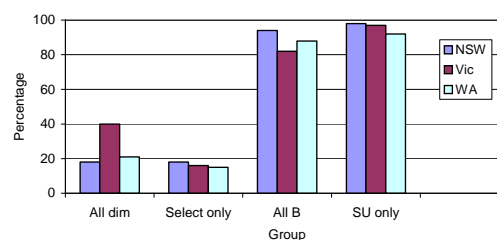


Figure 2: Percentage of ryegrass samples resistant and developing resistance for each state within two groups.

## Wild Oats

The number of wild oat samples (56) received doubled this year compared to last year. Although the number is less than was received in 2002 and 2003 wild oats made up a larger proportion of the samples received this year (Table 10).

Table 10: Number of wild oat samples received and percentage of total samples

	2002	2003	2004	2005
Total	895	769	444	327
Wild oats	126	86	28	56
Percentage	14.1	11.2	6.3	17.1

The level of 'fop' resistance among the samples was 92%, similar to previous years (Table 11). While the majority of samples were screened to Hoegrass samples were also screened to Verdict, Topik, Targa, Tristar and Wildcat. All five additional herbicides had samples resistant to them.

Of the 'dim' herbicides three samples were found to be resistant to Achieve and none to Select. No samples were found to be resistant to herbicides from groups B, E or M.

Table 11: Group A resistance percentage for wild oat samples since 2002 (number tested in brackets - 2002 and 2003 non WeedSense only)

	2002 % (no.)	2003 % (no.)	2004 % (no.)	2005 % (no.)
'fops'	87(31)	88(24)	96(29)	93 (51)
'dims'	0(29)	5(20)	4(26)	7 (50)
K	4 (24)	0 (18)	9 (23)	14 (28)

However, four samples out of 28 tested were confirmed as resistant to Mataven (Table 11). This adds to the first case of resistance to Mataven in Australia confirmed in 2003 in a sample provided to this service in 2002 and two more last year. All of the samples resistant to Mataven this year were also resistant to a 'fop' herbicide.

Other grass species

Six brome grass samples were received, three of which were found to be resistant to 'fops' (Verdict). One sample was resistant to the 'dim', Aramo.

One sample of barley grass was received which was susceptible to SpraySeed.

Broadleaf species

Twenty-three broadleaf weed samples (twenty wild radish and two wild turnip) were provided for resistance screening.

Resistance was observed in wild radish samples to two Group B herbicides (Table 12). Two samples were found to be resistant to Brodal (13 tested) and one to 24-D Amine (11 tested). No samples were found to be resistant to Simazine (20), MCPA Amine (9), Ester 80 (1) or Roundup (5).

Table 12: Results for broadleaf species screened to Group B herbicides (number in brackets denotes samples tested)

	Tested	WR	WT	%
Glean	17	6 (15)	2 (2)	<b>47</b>
Logran	4	0 (4)	-	<b>0</b>
On Duty	2	1 (2)	-	<b>50</b>

Both wild turnip samples were also found to be resistant to the Glean (Table 12). One sample was tested to each of Simazine, Brodal and Roundup, with no resistance detected.

Final Observations

- One ryegrass sample was found to be resistant to Roundup.
- Four wild oat samples were resistant to Mataven, all four samples were also resistant to 'fops'.
- There was a reduction in the number of samples received compared to last year. However the number was higher than any year other than 2004 when the Dow WeedSense samples are not considered.

- For ryegrass samples the level of resistance increased for 'fops', 'dims' and Group B but declined slightly for Group D.
- The variation in the level of 'fop' resistance between states was reduced compared to previous years.
- A large difference was observed in the level of resistance to the 'dim' herbicides, Select and Achieve
- The level of Group B resistance increased dramatically. There were minimal differences between the states in the level of resistance to group B herbicides.
- Highest trifluralin resistance was in samples from Victoria.
- The level of resistance in wild oats to group A 'fop' herbicides has remained constant in samples sent direct to Charles Sturt University.
- Resistance was found to most herbicide groups (B, F and I) tested in wild radish samples.

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