

Samples Received

The testing service screened 104 samples in 2009. This was a similar number to last two years, but less than had been screened in other years since 1996. Every year from 1997 to 2006 had seen at least 150 samples received.

As is always the case the majority of these samples were annual ryegrass (69) but several wild oat and wild radish samples were received (Table 1).

Unlike last year, but similar to other years, twice as many wild oat samples were received compared to wild radish (Table 1).

Table 1: Total number of samples received since 2006

	2006	2007	2008	2009
Annual ryegrass	265	66	79	69
Wild oats	55	32	13	23
Wild radish	23	9	15	11
Brome grass	5	0	0	0
Others	2	3	2	1
<b>Total</b>	<b>350</b>	<b>110</b>	<b>109</b>	<b>104</b>

Summary of Results

The results obtained from the 2009 resistance screening are similar in the majority of cases to the results from previous years.

Annual ryegrass

This year, 69 annual ryegrass samples were received, of which 65 were tested to the standard cross-resistance test (Table 2). Of these samples, eight were also tested to an additional herbicide. A total of seven samples were tested to glyphosate and two samples to Axial. Only four 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

	2005	2006	2007	2008	2009
A (fops)	214	246	61	67	63
A (dims)	250	264	68	78	70
B	239	268	59	71	67
C	215	238	51	76	65
D	217	241	57	75	65

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 within the normal range experienced in previous years.

Sixteen percent of samples tested to a 'dim' herbicide were classed as resistant or developing resistance (Table 3). This was a decrease on the previous two years but equal to the levels found in the previous years. Two samples were tested to Sertin (both susceptible), three to Achieve (all resistant), one to Factor (susceptible) and two to Axial (both resistant).

Ninety one percent of samples were resistant to Group B herbicides. This was a similar level to the last three years results which were over double the level of previous years. No samples were resistant to simazine (Group C) and 12% were resistant to trifluralin (Group D) a slight decrease on 2008 but still higher than 2006 and 2007 (Table 3).

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

	2005	2006	2007	2008	2009
A (fops)	90	97	91	93	90
A (dims)	27	16	41	58	16
B	88	87	81	85	91
C	0	0	0	0	0
D	9	5	7	19	12

Cross and Multiple Resistance

Of the 65 samples submitted for the standard cross resistance test, 81% were resistant or developing resistance to two or more herbicides, a similar level to that recorded the last three years. This reflects the major increase in the level of resistance to the group B herbicides since 2005.

Compared to last year there was a decrease in the number of samples resistant to three herbicide groups; this reflects the decrease in the level of 'dim' resistance as a result of the level of Select resistance returning to 2006 levels and the low numbers of samples tested to Sertin and Achieve. No 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	2005 (%)	2006 (%)	2007 (%)	2008 (%)	2009 (%)
5	0	0	0	0	0
4	0.9	0.4	0	6.7	0
3	22.8	12.1	32.7	40.0	21.5
2	60.0	69.0	50.9	38.7	60.0
1	13.0	17.4	16.4	13.3	16.9
0	3.3	1.1	0	1.3	1.6
No. of samples	215	245	55	75	65

Only one sample tested to the five herbicide group cross resistance test was susceptible to all herbicides.

### 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, Sertin, Achieve, Factor and Axial (Table 5).

### Group B herbicides

Glean was the major herbicide screened from the Group B herbicides (Table 6). Small numbers of samples were also screened to Logran, Hussar and On Duty.

Table 5: Results for ryegrass samples showing percentage resistant (Res) or developing resistance (DR) to individual Group A herbicides.

	Tested	Res	DR	%	Susc
<u>'fops'</u>					
Hoegrass	60	52	3	<b>92</b>	5
Verdict	3	2	0	<b>67</b>	1
<u>'dms'</u>					
Select	64	4	4	<b>12</b>	56
Sertin	2	0	0	<b>0</b>	2
Achieve	3	3	0	<b>100</b>	0
Factor	1	1	0	<b>100</b>	0
<u>'den'</u>					
Axial	2	2	0	<b>100</b>	0

The level of resistance to Glean was similar to last three years results, despite the level of resistance comparative to previous years increasing markedly in 2005 (Table 7).

Table 6: Results for ryegrass samples screened to individual Group B herbicides

	Tested	Res	DR	%	Susc
Glean	63	57	0	<b>93</b>	4
Logran	2	1	0	<b>50</b>	1
Hussar	1	0	0	<b>0</b>	1
On Duty	1	1	0	<b>100</b>	0

Table 7: Level of resistance to Glean and Logran (percentage of samples tested), \*\* too few samples tested

	2005	2006	2007	2008	2009
Glean	94	91	84	98	93
Logran	97	83	89	70	**

### Other herbicides

Annual ryegrass samples were screened to four other herbicides, simazine, trifluralin, Dual Gold 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 8).

No samples were found to be resistant or developing resistance to Roundup. However there are more than 40 confirmed cases of annual ryegrass resistance to Roundup in Australia and this herbicide needs to be treated carefully due to its importance in Australian agriculture.

One sample was classed as developing resistance to Dual Gold. This sample was classed as developing resistance because the level of control was different to that of the known susceptible control although the plants were significantly affected by the herbicide. However, under field conditions the level of control experienced would probably have been sufficient for full control of the population

Table 8: Results for ryegrass samples screened to other herbicide groups.

	Tested	Res	DR	%	Susc
<u>Group C</u>					
Simazine	65	0	0	<b>0</b>	65
<u>Group D</u>					
Trifluralin	64	6	2	<b>12</b>	56
<u>Group K</u>					
Dual Gold	2	0	1	<b>50</b>	0
<u>Group M</u>					
Roundup	7	0	0	<b>0</b>	7

### State by State

Samples were received from five states in similar numbers to last year, with the exception of Victoria which provided significantly less samples this year compared to 2008. For the second consecutive year samples were received from Tasmania (Table 9).

Table 9: Number of ryegrass samples received from each state.

	2005	2006	2007	2008	2009
NSW	60	122	23	22	32
Vic	86	48	3	22	6
SA	9	3	3	3	2
WA	86	92	37	26	27
Tas	0	0	0	6	2

With the very low number of samples received from South Australia and Tasmania the data for these states has not been analysed separately (Figure 1).

Thirty two percent of samples from Western Australia were resistant to 'dim' herbicides compared to three percent from New South Wales and none from Victoria. All Western Australian samples were resistant to Group A 'fop' and Group B herbicides. Samples from Western Australia also had more than double the incidence of Group D resistance compared to New South Wales samples (Figure 1).

Similar to the last four years but in comparison to the prior to 2005 the level of group B resistance has increased markedly. 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. Another reason could be that the failure of a Group B herbicide is now acting as a critical factor in the decision to supply a sample for resistance testing.

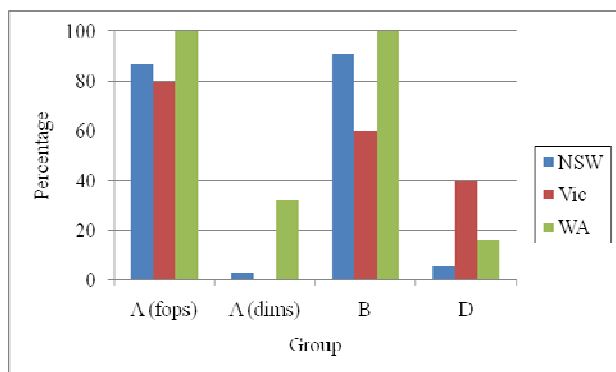


Figure 1: Percentage of ryegrass samples resistant and developing resistance for each state.

### Wild Oats

The number of wild oat samples (23) received was higher than in 2008 and on a percentage of total samples basis also higher than both 2005 and 2006 (Table 10). Fourteen samples came from New South Wales, six from Queensland and three from Western Australia.

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

	2005	2006	2007	2008	2009
Total	327	350	110	109	104
Wild oats	56	55	32	13	23
Percentage	17.1	15.7	29.1	11.9	22.1

The level of 'fop' resistance among the samples was 27%, significantly lower than any year since 2006 (Table 11). There was a difference between the two 'fop' herbicides tested. None of the eleven samples screened to Verdict were classed as resistant compared to six of eleven samples screened to Wildcat.

Some of the samples screened to Verdict had significant survival levels at half the recommended rate but were well controlled at the recommended rate and therefore classed as susceptible. Investigations are being undertaken to examine any differences in efficacy of Verdict in glasshouse trials compared to field evaluations.

For the 'dim' herbicides, none of the samples were resistant to Select (21 samples) or Axial (3 samples). One sample was classed as developing resistance to Atlantis (Table 11).

Seven of twenty two samples were found to be either resistant or developing resistance to Mataven, formerly Group K now a Group Z herbicide (Table 11).

Table 11: Group A resistance percentage for wild oat samples since 2004 (number tested in brackets)

	2006 % (no.)	2007 % (no.)	2008 % (no.)	2009 % (no.)
'fops'	77 (51)	100 (22)	69 (13)	27 (22)
'dims'	5 (42)	15 (33)	14 (14)	0 (24)
B	0 (13)	8 (13)	0 (1)	11 (9)
Z	9 (22)	13 (15)	30 (10)	32 (22)

### Other grass species

One sample of phalaris was received. It was resistant to Verdict and Select but susceptible to Atlantis.

### Broadleaf species

Eleven wild radish samples were provided for resistance screening. Ten of the wild radish samples were from Western Australia with the other sample from New South Wales.

All samples were resistant to Group B herbicides with seven samples screened to Glean and four to Logran. No samples were found to be resistant to Brodal (10 tested) or Simazine (6 tested), but for

both 24D Amine (6 tested) and Ester (4 tested) one sample was found to be resistant. Three of the four samples tested to bromoxynil were classified as resistant.

### **Final Observations**

- The number of samples received was similar to last year but markedly lower than years prior to 2007 showing the extent and degree of the drought.
- Samples of annual ryegrass were received from five states (NSW, Vic, Tas, SA and WA) and wild oats from three (NSW, Qld and WA).
- For ryegrass samples the level of resistance remained constant for 'fops' and Group B but decreased for the 'dims'. The level of resistance to the 'dims' is similar to that found between 2002 and 2006.
- The level of Group B resistance has not changed over the last four years; all four years were markedly higher than prior to 2005.
- The level of trifluralin resistance in Western Australia was markedly higher than in previous years.
- The level of resistance in wild oats to group A 'fop' herbicides was significantly lower than in 2007, with all samples screened to Verdict susceptible.
- The number of wild oat samples resistant to Mataven continues to increase.
- Wild radish samples were resistant to two of the herbicide groups (B and I) tested.
- All wild radish samples were resistant to a Group B herbicide.

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