

Samples Received

The testing service screened 62 samples in 2011. This was a decrease compared to last years of approximately 50%, and less than had been screened in other years since 1996. Every year from 1997 to 2006 had seen at least 150 samples received and from 2007 at least 100 samples.

As is always the case the majority of these samples were annual ryegrass (42) but several wild oat and wild radish samples were received (Table 1).

Table 1: Total number of samples received since 2007

	2008	2009	2010	2011
Annual ryegrass	79	69	89	42
Wild oats	13	23	28	11
Wild radish	15	11	12	8
Brome grass	0	0	0	0
Others	2	1	1	1
Total	109	104	130	62

Summary of Results

The results obtained from the 2011 resistance screening are similar in the majority of cases to the results from previous years.

Annual ryegrass

This year, 42 annual ryegrass samples were received, of which 36 were tested to the standard cross-resistance test (Table 2). Of these samples, 17 were also tested to an additional herbicide. Of the 17 samples, 15 were tested to Roundup, and one to atrazine and one to Roundup and Sprayseed. 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

	2007	2008	2009	2010	2011
A (fops)	61	67	63	70	36
A (dims)	68	78	70	79	42
B	59	71	67	70	35
C	51	76	65	71	39
D	57	75	65	71	39

Eighty eight 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.

Forty five percent of samples tested to a 'dim' herbicide were classed as resistant or developing resistance (Table 3). This was a slight increase on the last two years but similar to both 2007 and 2008. All but one of these samples were screened to Select, the other sample was screened to Achieve and was resistant to that herbicide. One sample was screened to Axial which was resistant.

Seventy four percent of samples were resistant to Group B herbicides. This was a slightly lower level compared to the last four years results however still high. No samples were resistant to simazine (Group C), and 3% were resistant to trifluralin (Group D) lower than the last three years (Table 3).

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

	2007	2008	2009	2010	2011
A (fops)	91	93	90	90	83
A (dims)	41	58	16	26	43
B	81	85	91	93	74
C	0	0	0	1	0
D	7	19	12	13	3

Cross and Multiple Resistance

Of the 36 samples submitted for the standard cross resistance test, 72% 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 slight decrease in the number of samples resistant to three herbicide groups; this combined with the higher number of samples resistant to only one herbicide, reflects the slight decrease in Group B resistance levels. 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	2007 (%)	2008 (%)	2009 (%)	2010 (%)	2011 (%)
5	0	0	0	0	0
4	0	6.7	0	1.4	5.6
3	32.7	40.0	21.5	27.0	19.4
2	50.9	38.7	60.0	56.8	47.2
1	16.4	13.3	16.9	13.5	27.8
0	0	1.3	1.6	1.3	0
No. of samples	55	75	65	74	36

No 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, samples were also screened to Verdict, Achieve 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 and Intervix.

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	27	23	1	89	3
Verdict	9	5	1	67	3
<u>'dms'</u>					
Select	41	9	8	41	24
Achieve	1	1	0	100	0
<u>'den'</u>					
Axial	1	1	0	100	0

The level of resistance to Glean was lower than the last three years results, similar to that of 2007 (Table 7).

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

	Tested	Res	DR	%	Susc
Glean	25	15	4	76	6
Logran	7	3	2	71	2
Intervix	3	1	1	67	1

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

	2007	2008	2009	2010	2011
Glean	84	98	93	96	76
Logran	89	70	**	100	71

Other herbicides

Annual ryegrass samples were screened to four other herbicides, simazine, atrazine, trifluralin, Roundup and Sprayseed. The observed incidence of resistance to these herbicides was lower than the resistance to the higher risk Group A and B herbicides (Table 8).

One sample was found to be resistant or developing resistance to Roundup. This adds to the 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.

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

	Tested	Res	DR	%	Susc
<u>Group C</u>					
Simazine	33	0	0	0	33
Atrazine	6	0	0	0	6
<u>Group D</u>					
Trifluralin	39	1	0	2.6	38
<u>Group L</u>					
Sprayseed	1	0	0	0	1
<u>Group M</u>					
Roundup	23	0	1	4	22

State by State

A similar number of samples were received New South Wales this year compared to the last four years. The number of samples from Victoria and Western Australia were markedly lower than previous years and no samples were received from either South Australia or Tasmania (Table 9).

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

	2007	2008	2009	2010	2011
NSW	23	22	32	27	25
Vic	3	22	6	10	2
SA	3	3	2	1	0
WA	37	26	27	44	15
Tas	0	6	2	7	0

With the very low number of samples received from Victoria, South Australia and Tasmania only the data for New South Wales and Western Australia has been analysed separately (Figure 1).

Sixty percent of samples from Western Australia were resistant to 'dim' herbicides compared to 39% from New South Wales. All Western Australian samples were resistant to 'fop' herbicides and 90% were resistant to Group B herbicides. The only Group D resistant population also came from Western Australia (Figure 1).

Similar to the last five 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.

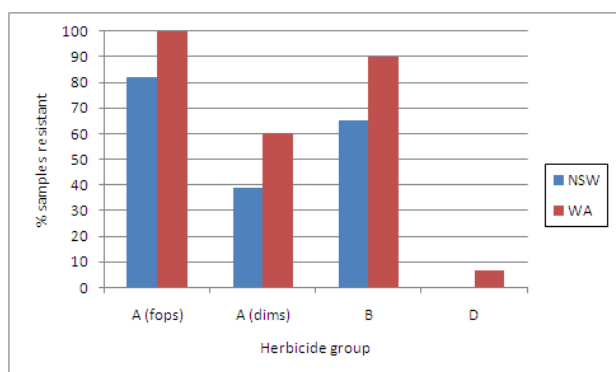


Figure 1: Percentage of ryegrass samples resistant and developing resistance for NSW and WA.

Wild Oats

The number of wild oat samples (11) received was slightly lower than three of the last four years on a percentage of total samples basis (Table 10). For the second consecutive year all wild oat samples came from New South Wales.

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

	2007	2008	2009	2010	2011
Total	110	109	104	130	62
Wild oats	32	13	23	28	11
Percentage	29.1	11.9	22.1	21.5	17.7

Unlike previous years the results for many samples are not complete at this stage. The current mouse plague has resulted in several instances of severe damage to samples in the glasshouses slowing down the screening process. The following data is for the samples for which screening has been completed.

The level of 'fop' resistance among the samples was 89%, similar to last year (Table 11). Five of the six samples tested to Wildcat were resistant as were all three samples tested to Verdict.

For the 'dim' herbicides, none of the eight samples tested were resistant to Select. Four samples were tested to Axial, three of which were resistant and four to Atlantis none of which were resistant (Table 11).

Eight samples were tested to Mataven. One of the eight was classified as 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 2008 (number tested in brackets)

	2008 % (no.)	2009 % (no.)	2010 % (no.)	2011 % (no.)
'fops'	69 (13)	27 (22)	84 (25)	89 (9)
'dims'	14 (14)	0 (24)	0 (25)	0 (8)
B	0 (1)	11 (9)	17 (6)	0 (4)
Z	30 (10)	32 (22)	14 (21)	13 (8)

Broadleaf species

Eight wild radish and one wild turnip sample were provided for resistance screening. Five of the wild radish samples were from Western Australia and three from New South Wales. The wild turnip sample was from New South Wales.

Forty four percent of samples were resistant to Group B herbicides with four samples screened to Glean (two resistant), one to Logran (resistant) and four to Intervix (two resistant). Samples were also resistant to the Group I herbicides MCPA Amine (one of two resistant) and Ester 680 (two of three resistant). No samples were found to be resistant to Brodal (seven tested), 24D Amine (one tested), Simazine (three tested) or Atrazine (two tested).

Final Observations

- The number of samples received decreased by 50% compared to last year, the lowest number since 1996. This shows the effect of the drought in Western Australia and the wet harvest period in the eastern states.
- Samples of annual ryegrass were received from only three states (NSW, Vic, and WA) with wild radish received from two states, NSW and WA and wild oats from NSW only respectively.
- For ryegrass samples the level of resistance remained constant for 'fops' and Group B but increased significantly (20%) for the 'dims'.
- The level of Group B resistance has not changed over the last five years; all five years were markedly higher than prior to 2005.
- The level of resistance in wild oats to group A 'fop' herbicides was similar to 2008 and 2010.
- The number of wild oat samples resistant to Mataven continues to increase.
- Wild radish samples were resistant to two herbicide groups (B and I) compared to three groups in 2010 (B, C and I).

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