

2009 NVT GM Canola Variety Trial Report

Summary

- GRDC, through the NVT program, conducted 150 canola trials across the canola cropping areas of Australia in 2009. Of these, 15 trials were GM canola trials. 12 GM canola trials were harvested with one trial considered too variable to be published.
- The yield ranking of varieties within and across herbicide tolerance groups varied across sites, reinforcing the need for significant numbers of trials across regions and years to provide the data required to make robust variety performance predictions.
- As a group, the Triazine tolerant (TT) varieties tended to yield lower than the Imidazolinone (Imi) and Roundup Ready (RR) herbicide groups. The difference between RR and Imi groups was less pronounced.
- In three trials (Greenethorpe NSW, Mt Barker WA and Gibson WA) the best overall variety was an Imi variety. In these trials the yield of the best Imi variety was significantly higher than the best performing Roundup Ready (GM) and TT varieties.
- In two trials (Culcairn NSW and Hamilton Vic) the best overall variety was a Roundup Ready (GM) variety. In these trials the yield of the best performing Roundup Ready (GM) variety was significantly higher than the best performing Imi and TT varieties.
- In five trials (Cullinga NSW, Milbrulong NSW, Horsham Vic, Shepparton Vic and Dudinin WA) there was no significant difference between the yields of the best performing varieties in each herbicide tolerance group.
- In one trial (Teesdale Vic) there was no significant difference in yield between the best performing Imi and Roundup Ready (GM) varieties. However, these varieties were significantly better than the best TT variety.

2009 NVT GM Canola Trials

GRDC, through the NVT program, conducted 150 canola trials across the canola cropping areas of Australia in 2009. Of these, 15 trials were GM canola trials.

GM canola trials contained varieties from the three herbicide tolerance groups:

- GM/Roundup Ready (RR) – tolerant to glyphosate
- Triazine Tolerant (TT) – tolerant to triazine herbicides
- Imi Tolerant (Imi) – tolerant to imidazolinone herbicide – also called Clearfield varieties

The Trial Sites

Five GM canola trials were conducted in each of the canola growing states where such trials were permitted. Trials were sown in NSW, Victoria and WA in close proximity to the following towns:

New South Wales	Victoria	Western Australia
Cullinga	Hamilton	Corrigin
Culcairn	Horsham	Dudinin
Greenethorpe	Lake Bolac	Frankland
Milbrulong	Shepparton	Gibson
Temora	Teesdale	Mt Barker

Of the 15 GM canola trials sown by the National Variety Trial program in 2009, 12 were harvested. Trials failed at the following sites:

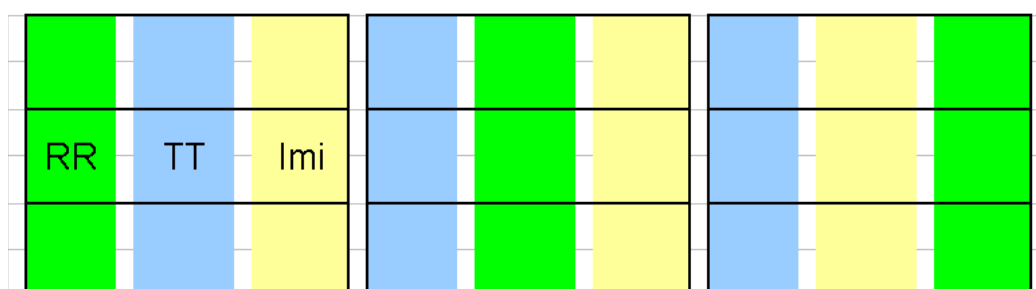
- Frankland – this trial was over-sown by a contactor in May who filled in the whole paddock.
- Lake Bolac – this trial was sown too close to an area where canola had been grown the previous season and was subsequently severely impacted by the disease blackleg.
- Temora – this trial established well but suffered drought conditions, making harvest futile.

Trial Design and Management

- GM canola trials were designed to allow a comparison of varietal yield within and across herbicide tolerance groups not the efficacy of each herbicide system.
- The trials were sown into farmer paddocks that were committed to be sown to Roundup Ready (GM) varieties of canola.
- As trials were placed within commercial Roundup Ready crops where weed control, and therefore herbicide application was required, Conventional varieties of canola could not be included in the GM trials.

The trials were managed in three blocks of three herbicide treatments with three replicates of each variety and each herbicide treatment. Each herbicide block received the corresponding herbicide at the recommended rate and timing. Careful spray application and the use of two buffer plots between each herbicide block removed any potential cross-spray damage.

Figure 1. Herbicide blocks (coloured) were separated by buffer plots. Each group of three like-coloured blocks, either vertical or horizontal, contained a full replicate of entries (blocked both ways).



Trial Outcomes

New South Wales

The NSW trials were well managed and looked good all year.

There were frost events at the Milbrulong trial that may have affected the relative performance of some varieties. However, these effects were not confined to maturity groups or to herbicide tolerance groups. Consequently, the results were included in the full data set. The Milbrulong trial was also quite variable, as indicated by the relatively high Coefficient of Variation (CV) of 14.68%. This high CV value indicates variation in ranking of the entries across trial replicates, with a lower figure preferred (below 10%). Consequently, the Milbrulong trial will have a lower influence in the overall analysis of results.

The variety rankings at the Culcairn trial were quite different to other NSW sites. However, there were no specific seasonal effects, such as a frost event at the site, which could account for the differences. Potentially, other unidentified seasonal conditions or site specific impacts were responsible for the result. The differences in varietal performance, from site to site and in response to variable seasonal impacts (i.e. frost), reinforces the requirement for multiple trials over multiple years in order to generate the best varietal predictions.

Victoria

The Victorian trials were quite variable:

The Hamilton trial experienced a wet year and long season and consequently was high yielding.

The Teesdale trial was initially wet, and dried out later in the season. Like the Hamilton trial it was high yielding.

The Horsham trial was the weediest of all of the trials, with poor weed control by the trial operator. The trial had ample rainfall throughout the season and varieties compensated by filling well. The trial variability and rankings were not unlike other trials and so the results were retained in the data set.

The Shepparton trial experienced a dry season through to the end when late rains allowed a reasonable yield.

Western Australia

These trials were all well managed trials beginning with May sowings and getting through the dry periods before spring.

The Corrigin trial looked much better than the site mean of 0.75 t/ha that was actually achieved. It is likely that the heat wave experienced in November before harvest reduced the yield potential of this trial. There was considerable variation in the ranking of varieties in each of the replicates, as indicated by the very high CV of 18.65%. Given the high CV, the results of this trial were not included in this report.

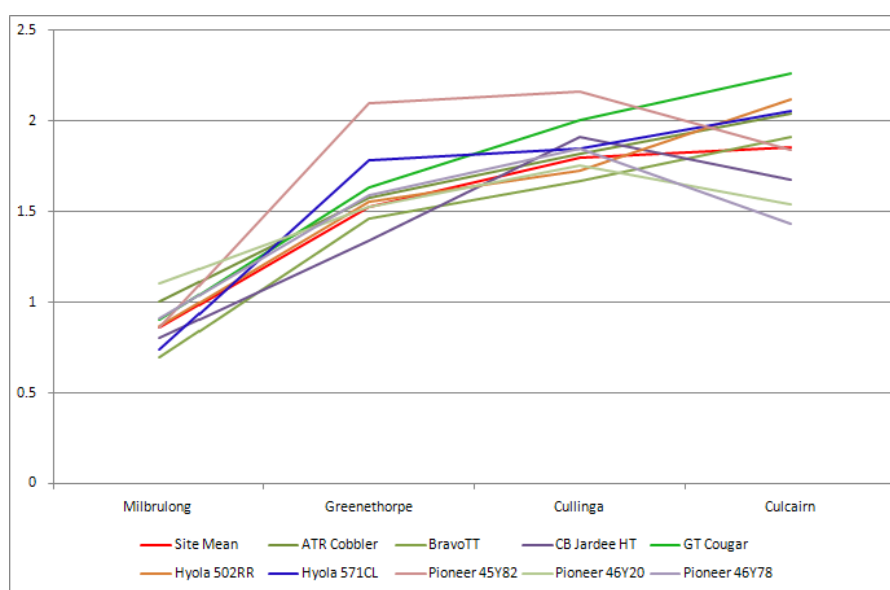
The other trials yielded well and gave adequate results, indicated by CV values between 10 and 12%.

Across Site/Year variation

There is often an inherent variability in the results of variety trials across locations and years. It is for this reason that multiple trials across a number of years are required to confirm a trend for any variety to be considered an upper or lower performer compared to its peers.

The graph in Figure 2 shows that the top two yielding varieties in each trial differ at each site, except that Pioneer 48Y82 is highest at two sites. Consequently, a considerable number of trials are needed to confirm the relative performance of varieties for any given area.

Figure 2. Variety yields ranked at each NSW site in 2009, with lines connecting variety yields at each site. Sites are organised by Site Mean yield order.

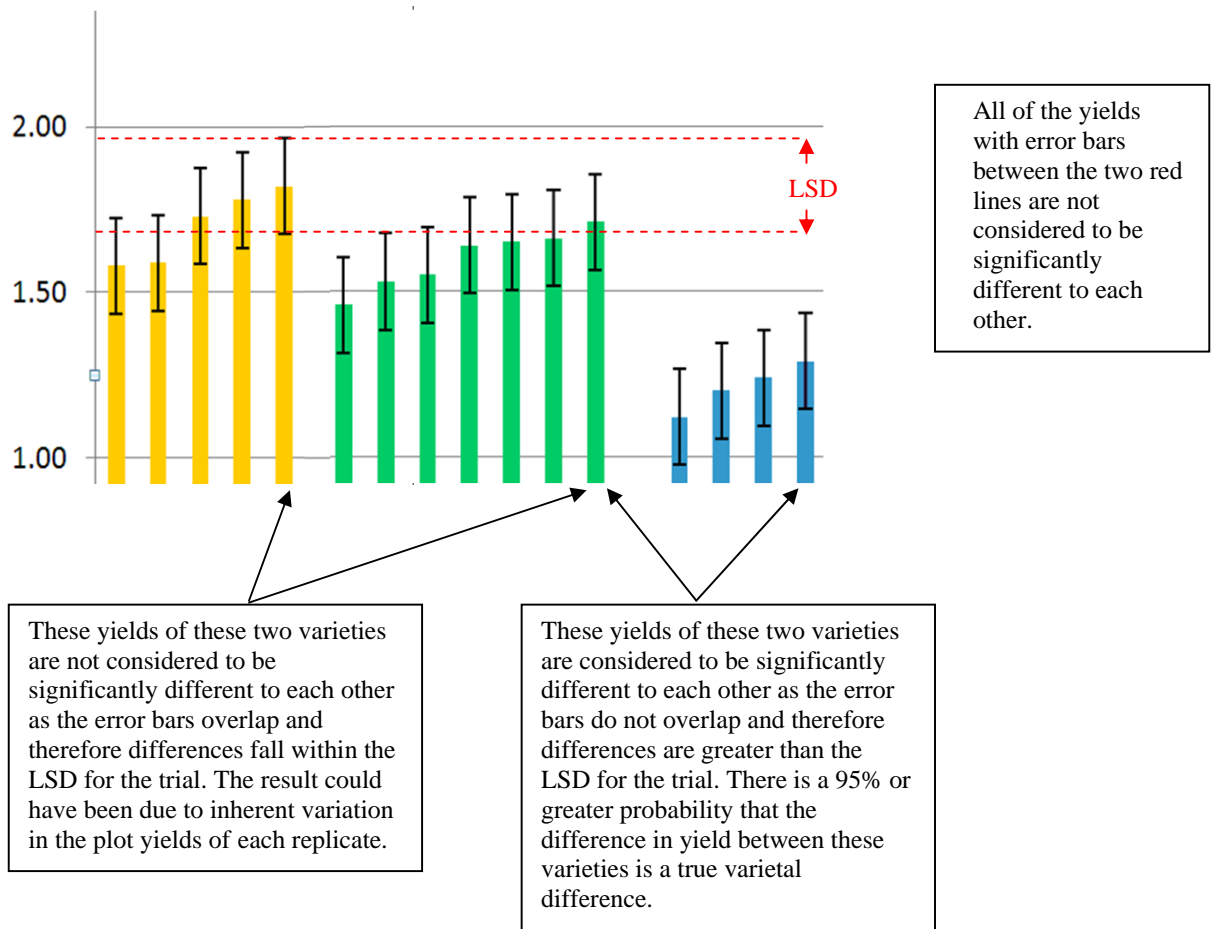


Interpreting the Trial Results

In order to draw meaningful conclusions about the performance of varieties in an NVT trial, an understanding of what constitutes a significant difference is required.

The biometricians who analyse NVT trials develop a measure called the Least Significant Difference (LSD). The LSD provides a measure of the statistical significance of yield differences between varieties in NVT trials. In this case it is the amount of yield that one variety must be higher than another variety for that yield difference to be considered different with 95% confidence.

In the graphs presented in this report, the LSD of each trial is indicated by error bars. The yields of varieties with overlapping error bars are not considered to be statistically different to one another.



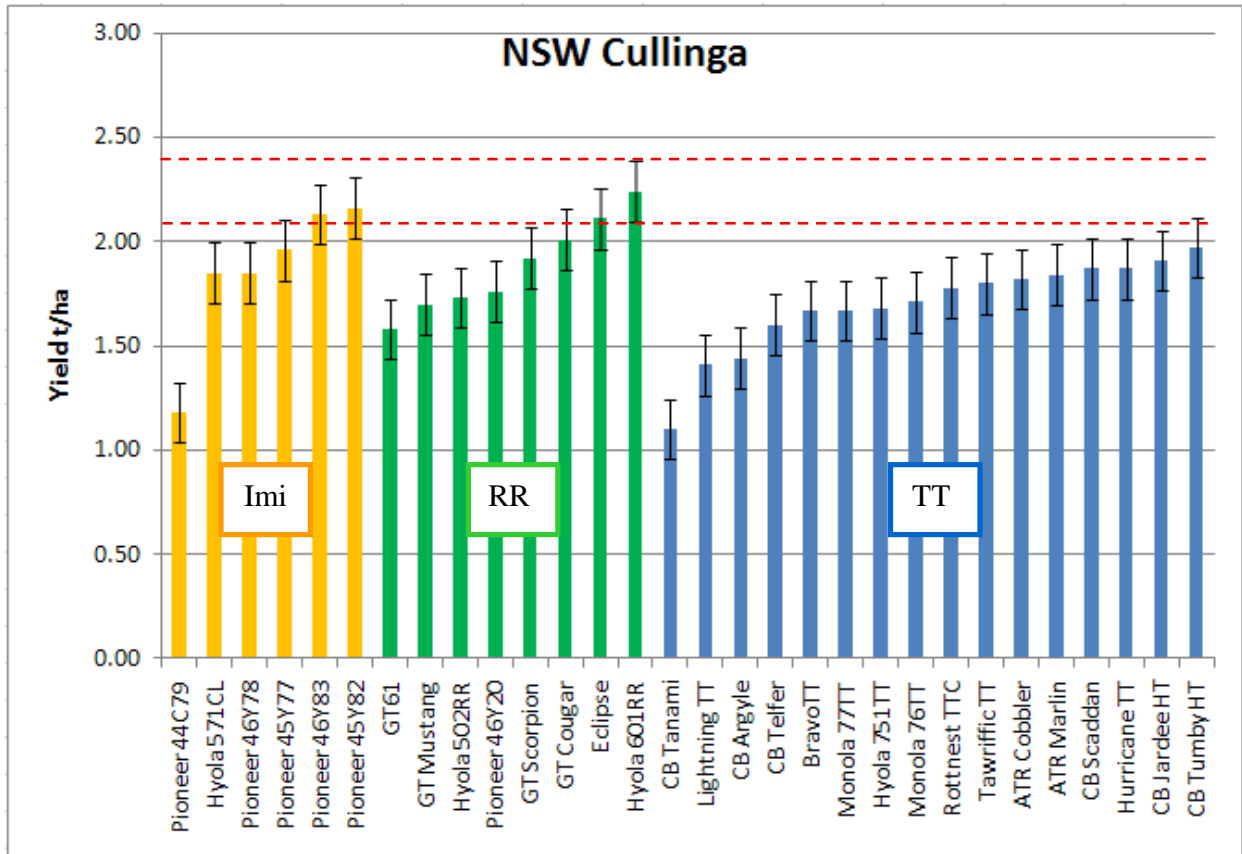
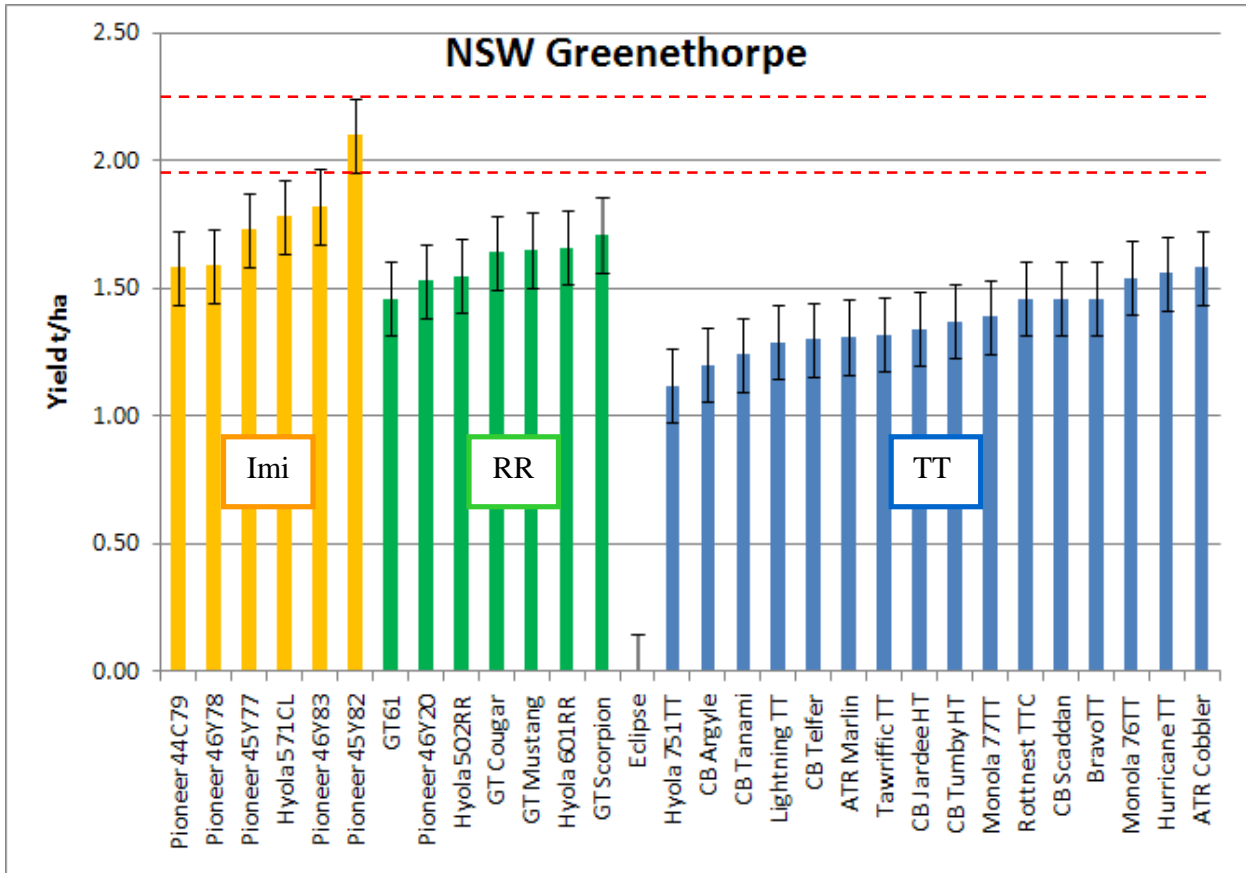
Examples:

1. The trial at Greenethorpe in NSW had a site mean yield of 1.53 t/ha and an LSD of 0.29 t/ha. Therefore, in this trial, varieties with yields that differ by less than 0.29 t/ha are not considered different. It is only those varieties that differ by more than 0.29 t/ha that are said to be better or worse than each other. Thus, in this trial, the best yielding Imi variety (Pioneer 45Y82) performed significantly better than the best yielding RR and TT varieties (GT Scorpion and ATR Cobbler, respectively). However, there was no significant difference in yield between GT Scorpion and ATR Cobbler as the yields of these two varieties differ by less than 0.29 t/ha (their error bars overlap).
2. The trial at Cullinga in NSW had a site mean yield of 1.80 t/ha with an LSD of 0.28 t/ha. Therefore, in this trial, varieties with yields that differ by less than 0.28 t/ha are not considered different. It is only those varieties that differ by more than 0.28 t/ha that are said to be better or worse than each other. In this trial there was no significant difference in yield between the best performing Imi, RR and TT varieties (Pioneer 45Y82, Hyola 601 RR and CB Tumby HT, respectively).

3. The trial at Culcairn in NSW had a site mean yield of 1.86 t/ha with an LSD of 0.27 t/ha. Therefore, in this trial, varieties with yields that differ by less than 0.27 t/ha are not considered different. It is only those varieties that differ by more than 0.27 t/ha that are said to be better or worse than each other. Thus, in this trial, the best yielding RR variety (GT Scorpion) performed significantly better than the best yielding Imi and TT varieties (Hyola 571CL and ATR Cobbler, respectively). However, there was no significant difference in yield between Hyola 571CL and ATR Cobbler as the yields of these two varieties differ by less than 0.27 t/ha (their error bars overlap).

Table 1. Results from the successful 2009 NSW Herbicide Tolerant Canola variety trials

	State	NSW	NSW	NSW	NSW
	Region	S/E	S/E	S/E	S/E
	Nearest Town	Greenethorpe	Cullinga	Milbrulong	Culcairn
	Crop Type	Canola	Canola	Canola	Canola
	Trial ID	CRRA09GRE E2	CRRA09CUL L2	CRRA09MIL B2	CRRA09CUL C2
Type	Variety Name	t/ha	t/ha	t/ha	t/ha
CL	Hyola 571CL	1.78	1.85	0.74	2.06
CL	Pioneer 44C79	1.58	1.18	0.53	1.69
CL	Pioneer 45Y77	1.73	1.96	0.71	1.56
CL	Pioneer 45Y82	2.10	2.16	0.86	1.84
CL	Pioneer 46Y78	1.59	1.85	0.91	1.44
CL	Pioneer 46Y83	1.82	2.13	1.30	1.56
RR	Eclipse	-	2.11	-	1.98
RR	GT Cougar	1.64	2.01	0.91	2.26
RR	GT Mustang	1.65	1.70	0.70	2.03
RR	GT Scorpion	1.71	1.92	1.26	2.39
RR	GT61	1.46	1.58	0.84	1.92
RR	Hyola 502RR	1.55	1.73	0.87	2.12
RR	Hyola 601RR	1.66	2.24	1.13	1.78
RR	Pioneer 46Y20	1.53	1.76	1.10	1.54
TT	ATR Cobbler	1.58	1.82	1.01	2.04
TT	ATR Marlin	1.31	1.84	0.76	1.61
TT	BravoTT	1.46	1.67	0.70	1.91
TT	CB Argyle	1.20	1.44	0.36	1.91
TT	CB Jardee HT	1.34	1.91	0.80	1.68
TT	CB Scaddan	1.46	1.87	0.69	1.60
TT	CB Tanami	1.24	1.10	0.56	1.87
TT	CB Telfer	1.30	1.60	0.88	1.89
TT	CB Tumby HT	1.37	1.97	0.84	1.68
TT	Hurricane TT	1.56	1.87	0.78	1.98
TT	Hyola 751TT	1.12	1.68	0.40	1.34
TT	Lightning TT	1.29	1.41	0.30	1.93
TT	Monola 76TT	1.54	1.71	0.72	1.53
TT	Monola 77TT	1.39	1.67	0.78	1.62
TT	Rottnest TTC	1.46	1.78	0.80	2.02
TT	Tawriffic TT	1.32	1.80	0.99	1.85
	Site Mean (t/ha)	1.53	1.80	0.86	1.86
	CV (%)	12.24	9.89	14.68	9.25
	LSD (t/ha)	0.29	0.28	0.25	0.27



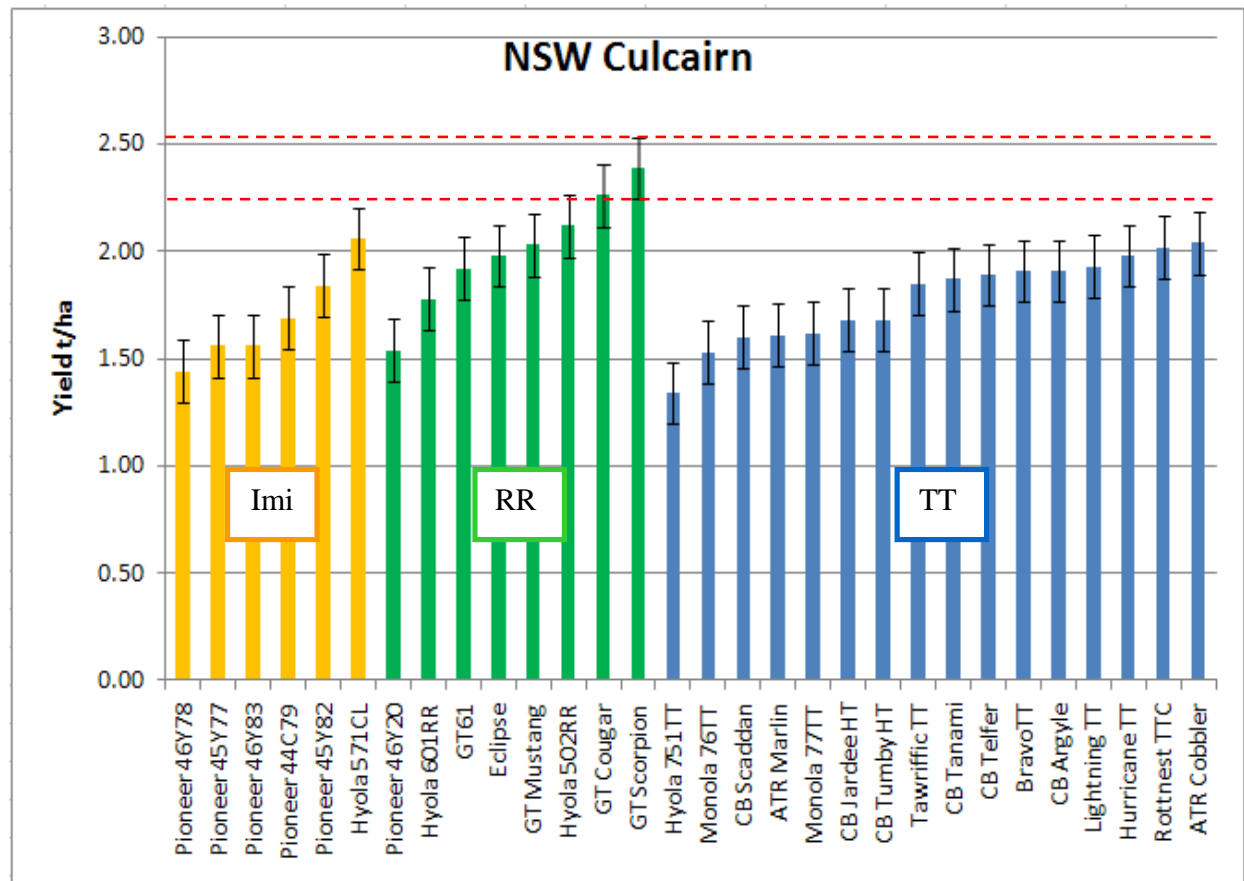
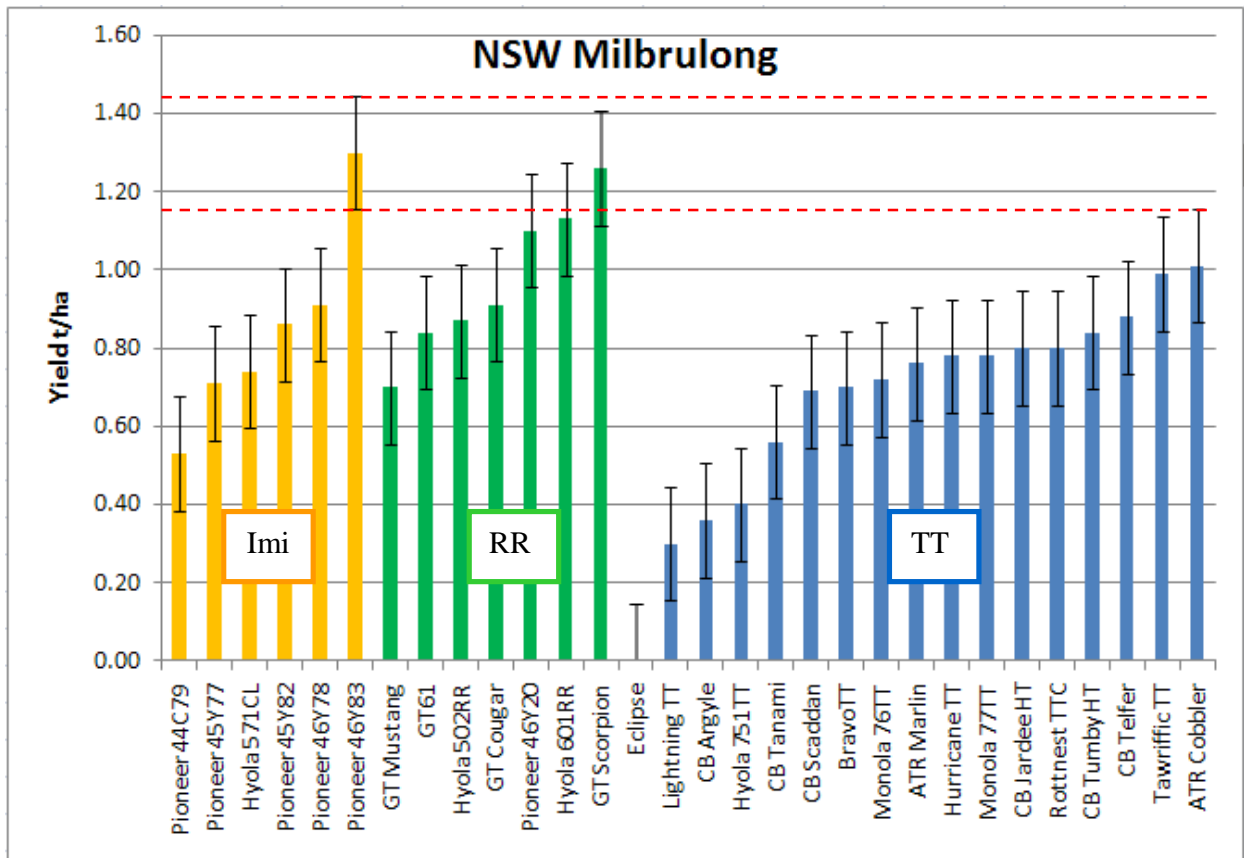
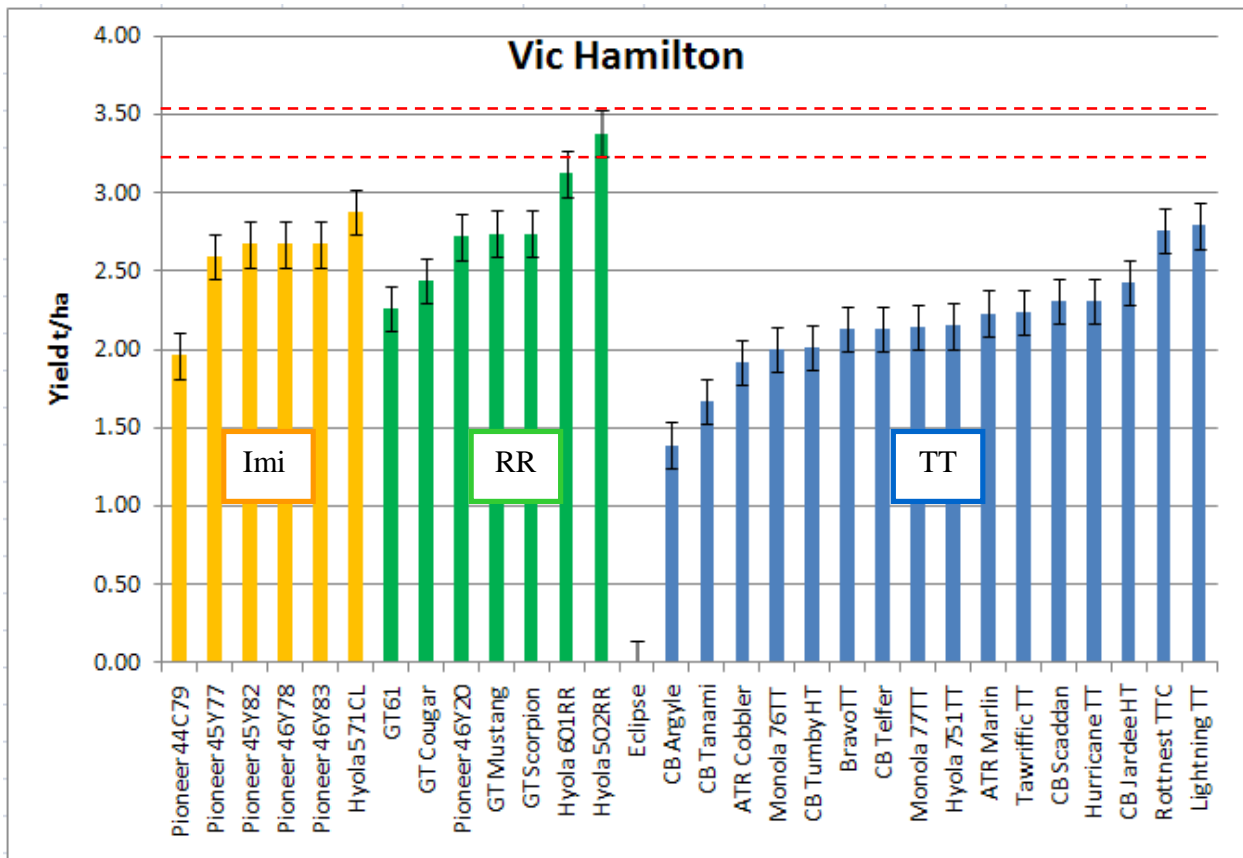
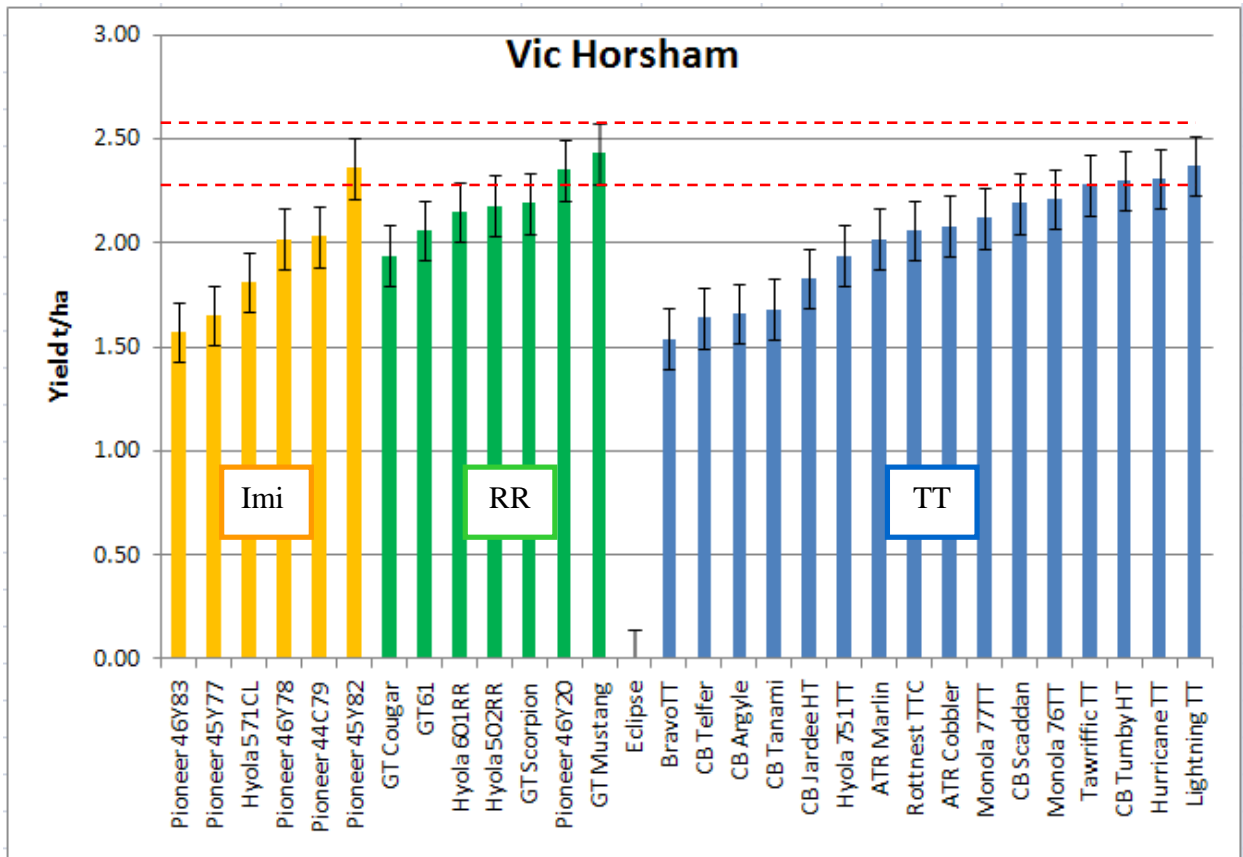


Table 2. Results from the successful 2009 Victorian Herbicide Tolerant Canola variety trials

	State	VIC	VIC	VIC	VIC
	Region	Wimmera	South West	South West	North East
	Nearest Town	Horsham	Hamilton	Teesdale	Shepparton
	Crop Type	Canola	Canola	Canola	Canola
	Trial ID	CRRA09HORS3	CRRA09HAMI3	CRRA09TEES3	CRRA09SHEP3
Type	Variety Name	t/ha	t/ha	t/ha	t/ha
CL	Hyola 571CL	1.81	2.88	2.26	0.72
CL	Pioneer 44C79	2.03	1.96	1.75	1.06
CL	Pioneer 45Y77	1.65	2.59	2.63	0.83
CL	Pioneer 45Y82	2.36	2.67	3.05	1.39
CL	Pioneer 46Y78	2.02	2.67	2.48	1.03
CL	Pioneer 46Y83	1.57	2.67	2.33	1.40
RR	Eclipse	-	-	2.58	0.98
RR	GT Cougar	1.94	2.44	2.56	1.04
RR	GT Mustang	2.43	2.74	2.76	0.91
RR	GT Scorpion	2.19	2.74	3.04	1.32
RR	GT61	2.06	2.26	2.67	1.17
RR	Hyola 502RR	2.18	3.38	2.51	1.00
RR	Hyola 601RR	2.15	3.12	2.42	1.21
RR	Pioneer 46Y20	2.35	2.72	2.24	1.13
TT	ATR Cobbler	2.08	1.92	2.67	1.10
TT	ATR Marlin	2.02	2.23	2.27	0.94
TT	BravoTT	1.54	2.13	2.29	1.02
TT	CB Argyle	1.66	1.39	2.46	0.64
TT	CB Jardee HT	1.83	2.43	2.42	1.17
TT	CB Scaddan	2.19	2.31	2.29	0.99
TT	CB Tanami	1.68	1.67	2.27	1.00
TT	CB Telfer	1.64	2.13	2.49	1.06
TT	CB Tumby HT	2.30	2.01	2.37	1.01
TT	Hurricane TT	2.31	2.31	2.26	1.04
TT	Hyola 751TT	1.94	2.15	1.76	0.70
TT	Lightning TT	2.37	2.79	2.30	0.66
TT	Monola 76TT	2.21	2.00	2.31	1.01
TT	Monola 77TT	2.12	2.14	2.22	0.94
TT	Rottnest TTC	2.06	2.76	2.55	0.96
TT	Tawriffic TT	2.28	2.24	2.16	1.06
	Site Mean (t/ha)	2.05	2.39	2.46	1.03
	CV (%)	11.14	10.71	10.00	12.76
	LSD (t/ha)	0.36	0.40	0.38	0.21



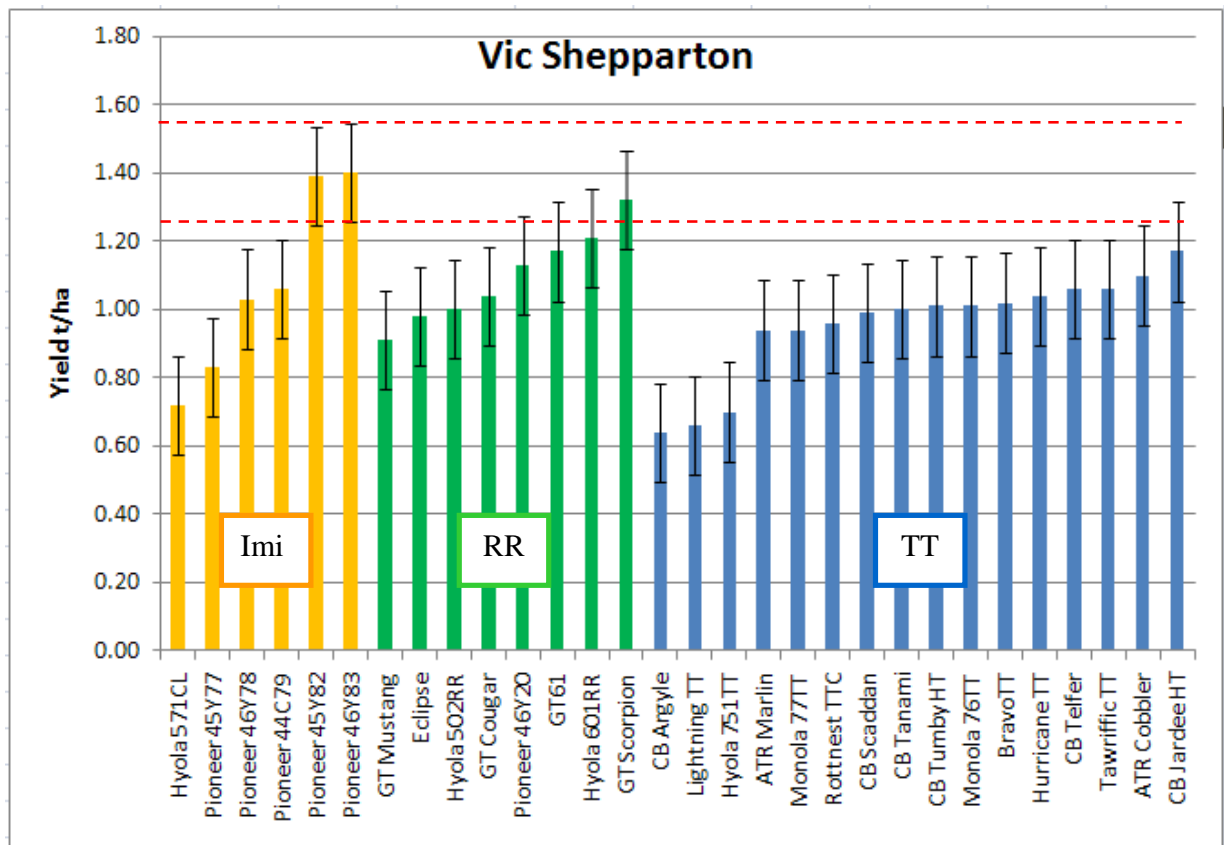
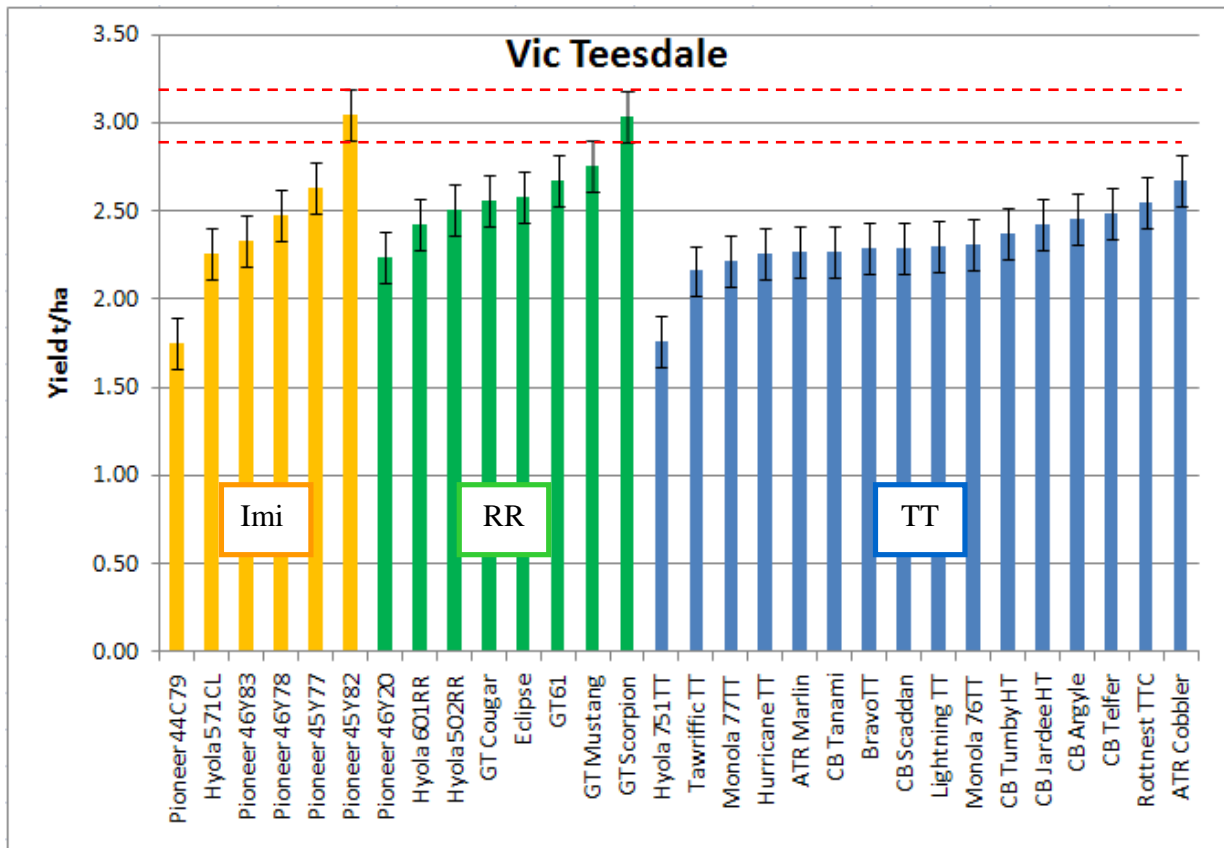


Table 3. Results from the successful 2009 Western Australian Herbicide Tolerant Canola variety trials

	State	WA	WA	WA
	Region	Agzone6	Agzone3	Agzone2
	Nearest Town	Gibson	Mt. Barker	Dudinin
	Crop Type	Canola	Canola	Canola
	Trial ID	CRRA09GIBS 6	CRRA09BARK6	CRRA09DU DI6
Type	Variety Name	t/ha	t/ha	t/ha
CL	Hyola 571CL	4.13	3.02	1.24
CL	Pioneer 44C79	3.14	2.37	1.04
CL	Pioneer 45Y77	3.28	3.07	1.18
CL	Pioneer 45Y82	4.29	3.02	1.51
CL	Pioneer 46Y78	3.52	3.31	1.25
CL	Pioneer 46Y83	3.74	3.84	1.45
RR	Eclipse	3.39	-	-
RR	GT Cougar	3.83	2.90	1.19
RR	GT Mustang	3.91	3.03	1.13
RR	GT Scorpion	3.80	2.58	1.06
RR	GT61	3.38	2.72	1.22
RR	Hyola 502RR	3.86	3.11	1.20
RR	Hyola 601RR	3.62	3.49	1.27
RR	Pioneer 46Y20	3.51	3.40	1.51
TT	ATR Cobbler	3.03	2.31	1.21
TT	ATR Marlin			
TT	BravoTT	2.74	2.57	1.18
TT	CB Argyle	2.92	2.52	1.10
TT	CB Jardee HT	3.12	2.50	1.26
TT	CB Scaddan	3.04	2.50	1.19
TT	CB Tanami	2.62	2.15	1.11
TT	CB Telfer	2.25	1.30	1.27
TT	CB Tumby HT	2.87	2.90	1.25
TT	Hurricane TT	3.56	2.41	1.21
TT	Hyola 751TT			
TT	Lightning TT	3.62	2.70	1.00
TT	Monola 76TT	3.17	2.64	1.40
TT	Monola 77TT			
TT	Rottnest TTC	3.30	2.46	1.25
TT	Tawriffic TT	3.50	2.62	1.14
	Site Mean (t/ha)	3.38	2.80	1.25
	CV (%)	10.68	10.11	11.92
	LSD (t/ha)	0.62	0.47	0.24

