

Metribuzin tolerance of new wheat varieties

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Key messages

- Metribuzin 750 at 100g/ha rate as an early post-emergent is registered on all wheat varieties, whereas at 200g/ha rate as pre-emergent it is registered only on metribuzin tolerant wheat varieties Blade and EGA Eagle Rock.
- Metribuzin 750 at 100g/ha rate applied both as pre and post-emergent was tolerated well by all the wheat varieties with good crop safety margin.
- Metribuzin 750 at 200g/ha rate as pre and post-emergent was also tolerated well by all the varieties. However, Bonnie Rock and Mace registered a lower crop safety margin due to effects on yield at the higher rates of 400 and 600g/ha.

Note: Always follow label recommendations. The Department of Agriculture and Food WA, does not endorse the use of herbicides above the registered rate or off-label use of herbicides or off-label tank mixes. Crop tolerance and yield responses to herbicides are strongly influenced by seasonal conditions.

Aims

To identify metribuzin sensitivities of new and current wheat varieties with the view to reduce yield losses due to metribuzin damage.

Method

A total of four field trials were conducted during 2013 and 2014, two on sandy loam soil (pH CaCl_2 5.8-6.1 and OC 0.47-0.75%) at Mullewa Research Station and other two on loamy sand soil (pH CaCl_2 5.1-5.3 and OC 2.26-3.62%) at Katanning Research Station. The trials were laid out in criss-cross design with three replications. The six wheat varieties (Fig. 1-4) were sown in 12.5m long and 1.1m wide plots at 75kg/ha seed rate on 15 May 2013 and 22 May 2014 at Mullewa, and on 23 June 2013 and 16 June 2014 at Katanning, 3-4cm deep using knife points followed by press wheels. The soil moisture content at planting (0-10cm) was 6.9 and 6.7% at Mullewa and 20.3 and 22.3% at Katanning, during 2013 and 2014 respectively. The moisture content of the trial sites was determined by following the gravimetric method (on dry weight basis) at Mullewa and the volumetric method (moisture meter) at Katanning.

The metribuzin treatments (Fig. 1-4) were applied in 1.5m wide strips across the varieties, using spray rig fitted with air induction nozzles and shields on boom, and calibrated to deliver 75 -80L/ha water volume. Metribuzin treatments (5 different rates) were applied pre-emergent during 2013 on 14 May at Mullewa and on 21 June at Katanning, whereas during 2014, it was applied at the 2-3 leaf stage of the crop on 9 June at Mullewa and on the 16 July at Katanning. The varieties and herbicide treatments were randomised within each replicate. The herbicide plot centre to centre was 1.8m and there was a 70cm buffer between any two herbicide treatment plots. Every 5th herbicide plot was kept as an untreated control plot to check the spatial variability. The wheat varieties were evaluated for visual injury at 2-4 weeks after treatment application and again at crop anthesis using a 0 to 100% scale, where 0 = no visible injury and 100 = complete plant death.

The trials were harvested on 29 and 16 October at Mullewa and on 10 and 9 December at Katanning during 2013 and 2014, respectively. The net plot size ranged from 9.5 -11.2m x 1.1m at both the sites. However, to convert plot yield to hectare basis 1.8m plot width was used. Wheat grain yield data was subjected to REML analysis (spatial) using the Genstat program, and the least significant differences (Lsd $P = 0.05$) was calculated.

At Mullewa, the total rainfall from May to October was 109 and 195mm and it was 26% less during 2013 and 33% more during 2014 respectively, than the last 5 years' average rainfall of 147mm from May to October (2009-2013). During 2013, June was very dry (6mm) and rainfall in late August (26 Aug-12.2mm and 28 Aug -12.6mm) saved the trial. During 2014, the wheat plants were showing moisture stress in early August and rainfall events from 18-22 August (13mm) helped the crop to recover.

Similarly, total rainfall from May to October at Katanning was 353 and 372mm and it was 10 and 15% higher during 2013 and 2014, respectively, than the last 5 years average rainfall of the same period 323mm (2009-2013).

Crop safety margins: Higher than label rates of the herbicides were included in the trial to determine the crop safety margin of the herbicides at the maximum label rates. Good crop safety margin means that a herbicide at its maximum label rate and at the higher rate(s) was tolerated well by a crop variety. Whereas, low crop safety margin for metribuzin indicates that the variety tolerated the maximum label rate well, but at higher than the label rate(s) there was significant yield loss. A low crop safety margin implies that when spraying under less than optimal conditions, herbicide damage and yield loss may occur. For example, when overlapping herbicide; spraying under wet conditions (for soil active and residual herbicides); and /or there are stressed plants due to abiotic/biotic factors.

Results and Discussion

- Metribuzin 750 at 100g/ha as an early post-emergent is registered on all wheat varieties for control of toad rush (*Juncus bufonius*). However, Metribuzin 750 at 200g/ha as a pre-emergent is registered only on metribuzin tolerant wheat varieties Blade and EGA Eagle Rock for suppression/control of annual ryegrass, barley grass, brome grass, wild radish, capeweed, doublegee, etc.

- Wheat grain yield ranged from 1538 (Mace)–1757 (Calingiri) kg/ha at Mullewa and 2167 (Scout)–2770 (Mace) kg/ha at Katanning during 2013 in the untreated control plots (nil plots). At Katanning Calingiri had poor emergence across all the treatments (on an average 75% less plant population than the other varieties) and thus yielded only 1434 kg/ha. During 2014, grain yield ranged from 830 (Calingiri)–1393 (Mace) kg/ha at Mullewa and 3425 (EGA Eagle Rock)–3873 (Mace) kg/ha at Katanning.

Metribuzin 750 at 200g/ha resulted in visible (15%) necrosis across all the varieties at Mullewa during 2013. The intensity of these symptoms increased (25-35%) with the increase in metribuzin rates (400-600g/ha). Metribuzin at 400 and 600g/ha also caused 10-15% biomass reduction across all the varieties. These symptoms were out grown by the time crop reached anthesis. During 2014, only higher rates of metribuzin (400 and 600g/ha) caused necrosis (15-25%) at Mullewa. However, all metribuzin rates caused similar necrosis (15%) across the varieties at Katanning during 2014. No visible symptoms from any of the metribuzin rates were recorded at Katanning during 2013.

- All the varieties sprayed with metribuzin 750 at 100 and 200g/ha as pre (2013) and post-emergent (2014) yielded at par with untreated control plots across all the trials (Fig 1-4). These results are in line with previous trial work conducted on a range of soil types at Mullewa, Merredin and Eradu from 2003 to 2005, where even metribuzin sensitive varieties like Spear and Camm tolerated pre-emergent metribuzin 750 at 200g/ha. Interestingly, applied post-emergent, it caused significant yield loss in Spear on a sand soil at Eradu, but no significant yield loss in Camm on a clay soil at Merredin (Dhammu and Nicholson, 2006).

- Metribuzin 750 at 400g/ha was also tolerated well by all the varieties except it caused significant yield loss when applied as pre-emergent on Bonnie Rock at Mullewa during 2013 and as post-emergent on Mace at Katanning during 2014 (Fig 1- 4).

- Metribuzin 750 at 600g/ha applied pre-emergent caused significant yield loss in 50 -67% of the varieties at Mullewa and Katanning during 2013, respectively. However, its post-emergent application caused significant yield loss across all the varieties at Katanning and only in Mace at Mullewa during 2014 (Fig 1-4). This differential tolerance by wheat varieties to metribuzin could be attributed to light textured soil and more moisture/rainfall at Katanning as compared to Mullewa. The results are in line with the previous herbicide tolerance trials conducted during 1998 at Mullewa, Merredin and Newdegate which indicated that metribuzin (150g and 300g/ha) was damaging to wheat varieties at Mullewa on the lighter soil (loamy sand) with the higher rainfall as compared to other sites.

- Wyalkatchem seems to have better metribuzin tolerance than Mace and Magenta. (Fig 1-3).

Conclusion

- Metribuzin 750 at 100 and 200g/ha rates applied both pre and post-emergent was tolerated well by all the wheat varieties. However, Bonnie Rock and Mace registered a lower crop safety margin due to effects on yield at the higher rates of 400 and 600g/ha.

- Metribuzin tolerance by wheat varieties especially at higher rates seems to depend upon soil type and rainfall/moisture.

References

Dhammu, Harmohinder S. and Nicholson, David F. (2006) Metribuzin tolerance of EGA Eagle Rock Wheat. In "Proceedings of the 15th Australian Weed Conference". Adelaide, South Australia. (Eds C. Preston, J.H. Watts and N.D. Crossman) Pp. 355-58•

Key words

Wheat, metribuzin, tolerance, grain yield.

Acknowledgments

We gratefully acknowledge GRDC for funding this research work, Geraldton and Katanning RSU, Daniel Cox and Paul Bartlett for technical assistance.

GRDC Project Number: DAW00191

Paper reviewed by: John Moore and Dr David Bowran

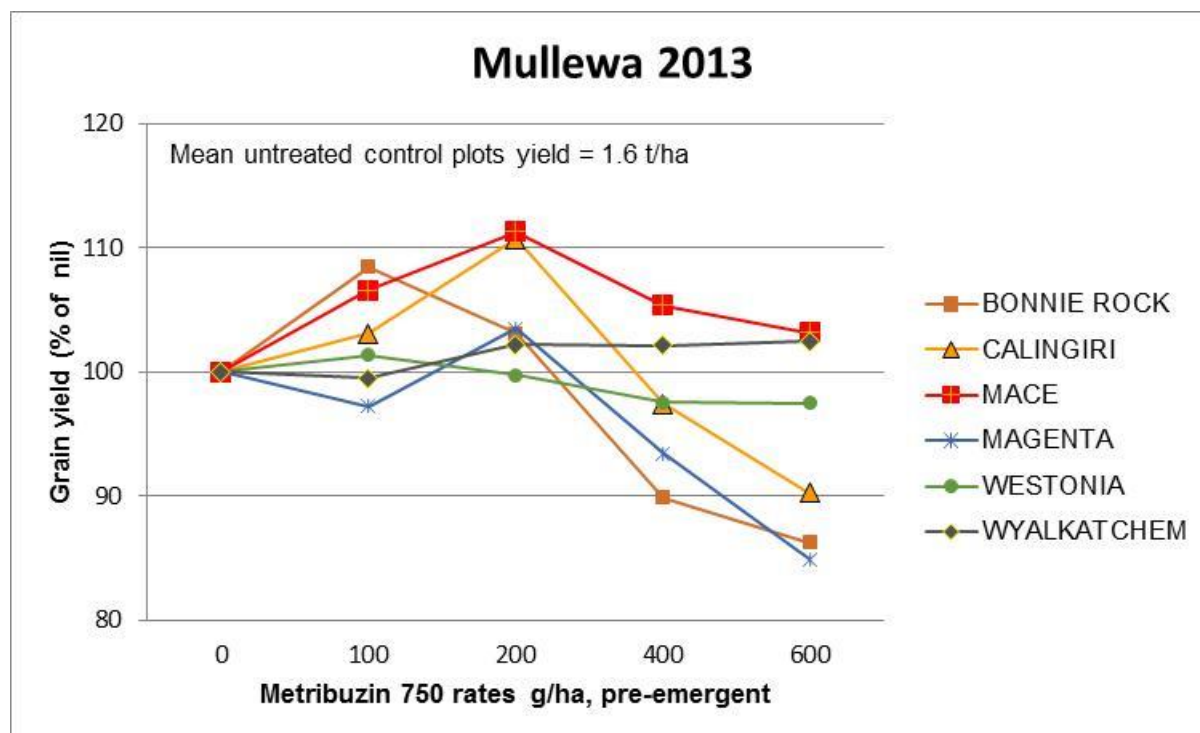


Figure 1: Effect of metribuzin on grain yield (% of untreated control) of six wheat varieties on sandy loam soil (pH CaCl₂: 6.1 and OC: 0.47%) at Mullewa during 2013. Gridlines are 1 Lsd (P=0.05) apart.

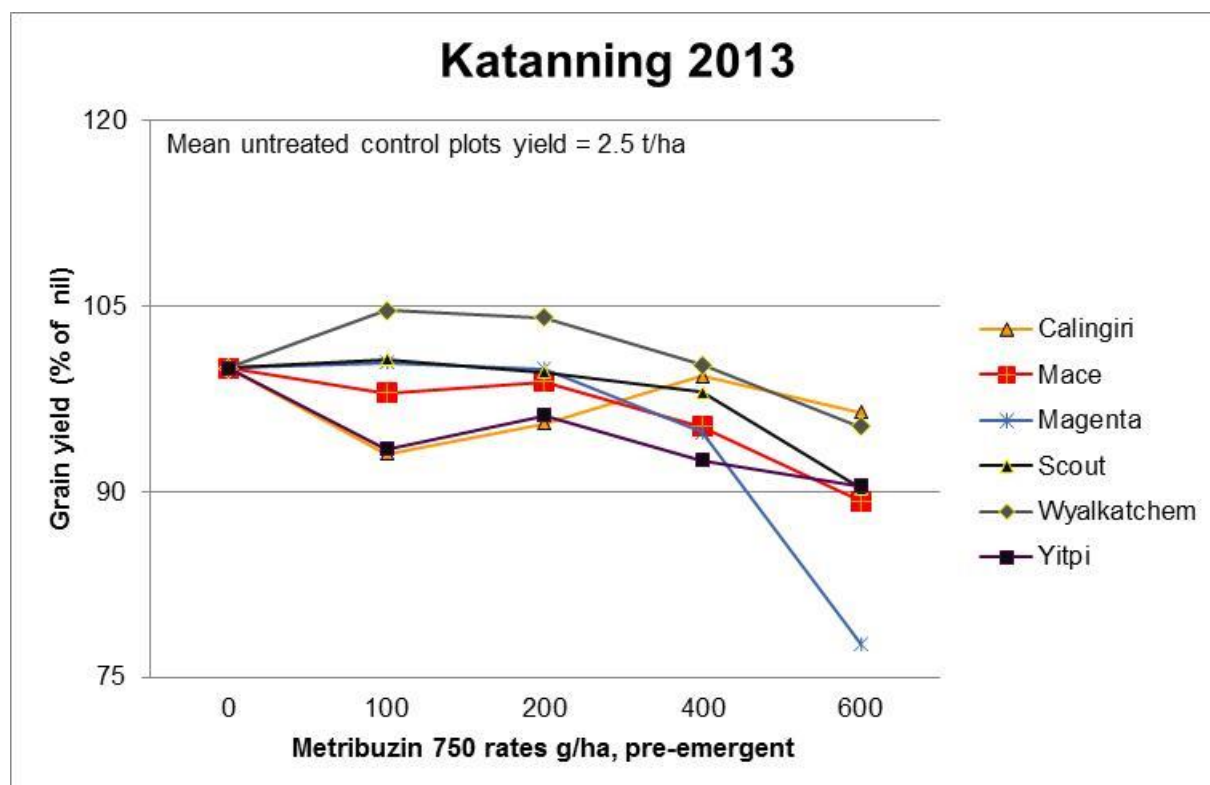


Figure 2: Effect of metribuzin on grain yield (% of untreated control) of six wheat varieties on loamy sand soil (pH CaCl₂: 5.3 and OC: 3.62%) at Katanning during 2013. Gridlines are 1 Lsd (P=0.05) apart.

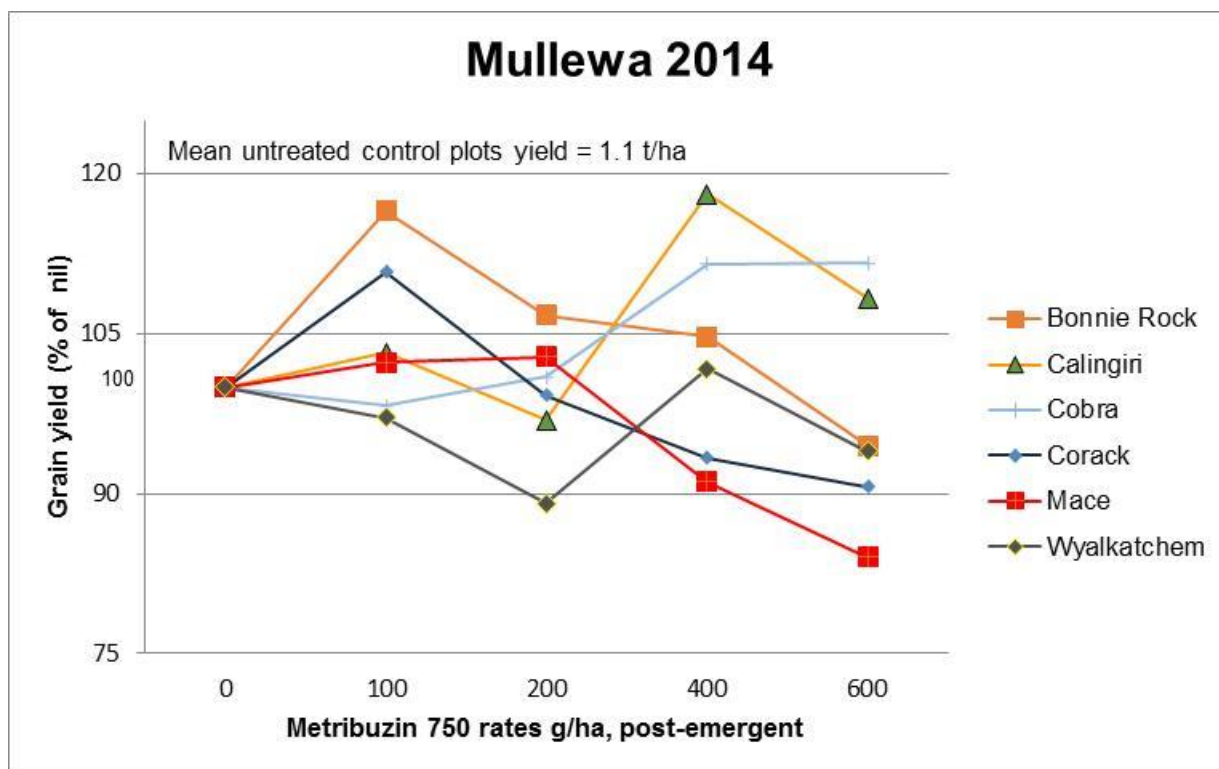


Figure 3: Effect of metribuzin on grain yield (% of untreated control) of six wheat varieties on sandy loam soil (pH CaCl_2 : 5.8 and OC: 0.75%) at Mullewa during 2014. Gridlines are 1 Lsd ($P=0.05$) apart.

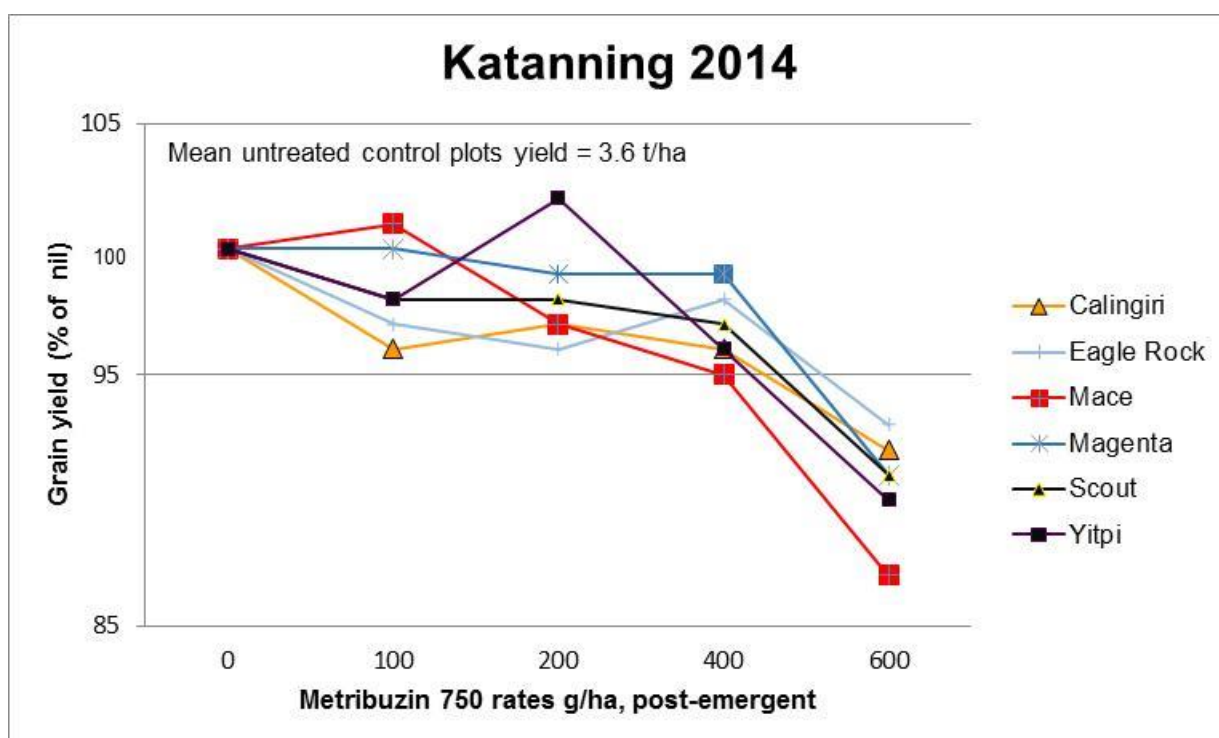


Figure 4: Effect of metribuzin on grain yield (% of untreated control) of six wheat varieties on loamy sand soil (pH CaCl_2 : 5.1 and OC: 2.26%) at Katanning during 2014. Gridlines are 1 Lsd ($P=0.05$) apart.