

Canola tolerance to clethodim

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Key findings

- Grain yield losses were caused by clethodim at particular rates and application timings.
- Early application timings were the best to avoid crop damage.
- Variation does exist between herbicide tolerant canola types (conventional, Clearfield and triazine tolerant).

Why do the trial?

In 2013 and 2014 trials were established at Hart to assess the level of yield losses that may occur from the use of high clethodim rates in canola (Zerner 2014). Observed crop damage symptoms included delayed flowering, distorted flower buds and grain yield suppression. Symptoms were more severe from later application timings. Another key finding was that variation existed between herbicide tolerant crop types (conventional, Clearfield and triazine tolerant) and their level of sensitivity to clethodim.

In the past four years we have seen a number of new canola varieties become commercially available. In 2017 clethodim damage was reported by a large number of consultants and growers. The current trial aimed to:

1. assess new canola varieties for their tolerance to clethodim and
2. demonstrate to growers the potential yield losses that may result from high and late applications of clethodim.

How was it done?

| | | | |
|---------------------|---------------------------|-------------------|---|
| Plot size | 1.75 m x 10.0 m | Fertiliser | DAP (18:20) + Zn 2% @ 100 kg/ha |
| Seeding date | 15 th May 2018 | | UAN (42:0) @ 95 L/ha on 5 th July UAN (42:0) @ 55 L/ha on 2 nd Aug |

The trial was established as a split-plot design with three replicates. Three canola varieties were used; Nuseed Quartz (conventional), Hyola 559TT (triazine tolerant) and Pioneer 44Y90 (CL) (Clearfield) to investigate the influence of clethodim rate and timing. Seven clethodim treatments were applied to each variety (Table 1).

Spray treatments for each growth stage were applied on the same day for each variety. As a result the exact growth stage at the time of application for each variety may have differed slightly, despite all varieties used in this trial being of very similar maturity. All plots were assessed for grain yield at harvest.

Table 1. Clethodim treatments applied at Hart during 2018.

| Clethodim rates applied |
|---|
| 1. Untreated control |
| 2. 0.5 L/ha applied at 4-leaf growth stage |
| 3. 1.0 L/ha applied at 4-leaf growth stage |
| 4. 0.5 L/ha applied at 8-leaf growth stage |
| 5. 1.0 L/ha applied at 8-leaf growth stage |
| 6. 0.25 L/ha applied at 4-leaf and 8-leaf growth stages (0.5 L/ha in total) |
| 7. 0.5 L/ha applied at 4-leaf and 8-leaf growth stages (1 L/ha in total) |

**Application of clethodim at 1 L/ha is not a registered rate and was undertaken for experimental purposes.*

Results and discussion

Overall canola crop damage was less severe compared to the damage reported in 2013 and 2014. This can be attributed to a range of factors including; environmental conditions at time of application, the absence of the late clethodim application timing (bud initiation) this season and the use of alternative canola varieties. A range of damage symptoms were observed in-season (Figure 1). There were no visual changes in overall crop biomass or any significant change in NDVI between treatments in this particular trial (data not shown). As the crop further developed to reach flowering the damage symptoms become more evident. Flower buds become distorted and failed to open up fully leading to poor pod development (Figure 1). In these plots flowering date was also delayed.



Figure 1. Pioneer 44Y90 (CL) canola displaying damage symptoms caused by 1.0 L/ha clethodim at 8-leaf growth stage. Distorted flowers did not fully open and form pods.

Observed clethodim damage resulted in grain yield losses in some varieties (Table 2). Overall there was no interaction between variety, clethodim rate and application timing. However, individually these management factors impacted canola grain yield. Of the varieties tested the conventional variety Nuseed Quartz and triazine tolerant Hyola 559TT showed a greater level of tolerance to clethodim. The Clearfield variety 44Y90 (CL) on average incurred a 11% (ranged from 7 – 29%) yield loss from application of clethodim. This finding is consistent with previous research (Zerner 2014) where the Clearfield variety Hyola 474 CL was the most sensitive to clethodim.

Application rates of 0.5 L/ha were relatively safe in this trial and were not significantly different from the unsprayed control for any variety. Where rates were increased to 1.0 L/ha the average yield reduction across all three varieties was 9%. Application of clethodim at 1.0 L/ha is not a registered rate and was undertaken for experimental purposes.

Early sprays (4-leaf growth stage) had no significant implications on grain yield (Table 2). Yield reductions (average 12%) were observed at the 8-leaf growth stage. In previous research (Zerner 2014) the effect of clethodim at the 8-leaf application was inconsistent. In 2013 damage was observed at the 8-leaf growth stage however, in 2014 this timing did not cause any significant yield reduction. The split application appeared to improve the safety of the 1.0 L/ha treatment (Table 2) when it was applied over two applications rather than in one.

Table 2. Effect of clethodim applied at different timings and rates on the grain yield of canola at Hart, 2018. (LSD $P \leq 0.05$ variety 5.5; clethodim rate 4.5; and timing 5.5).

| Application timing | Clethodim rate | Hyola 559TT | Nuseed Quartz | 44Y90 (CL) |
|-----------------------|-----------------------|--------------------------|---------------|------------|
| Untreated | | 1.09 | 1.31 | 1.17 |
| | | grain yield % of control | | |
| 4 leaf | 0.5 L/ha | 100 | 97 | 93 |
| | 1.0 L/ha | 94 | 97 | 91 |
| 8 leaf | 0.5 L/ha | 95 | 94 | 90 |
| | 1.0 L/ha | 89 | 86 | 71 |
| Split 4 leaf + 8 leaf | 0.25 L/ha + 0.25 L/ha | 100 | 100 | 100 |
| | 0.5 L/ha + 0.5 L/ha | 99 | 98 | 90 |

Summary

Increased application rates of clethodim have created concern due to crop damage in canola, which is the most sensitive crop of those registered for clethodim use. Care should be taken to apply clethodim at correct growth stages and application rates on label.

Applications exceeding 0.5 L/ha are at high risk of causing yield reductions in most canola varieties. Variation does exist between herbicide tolerant canola types (conventional, Clearfield and triazine tolerant). From the trial results it is evident that the early application at 4-leaf growth stage of canola was the safest on the crop but this may not be always the best time of application for targeting weed control.

References

Zerner M (2014) Canola tolerance to clethodim. Hart Trial Results book, page 59 – 61.