Is Lontrel resistant vetch a possibility?

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Take Home Messages

- Two lontrel resistant biotypes have been identified in overseas vetch populations
- Risk of resistance in Australian farming systems is low, but management practices to avoid lontrel resistant vetch should be implemented.
- Be more wary of wild vetch populations as opposed to volunteer vetch.

The short answer

Is Lontrel resistant vetch a possibility? The short answer is “highly unlikely”. However, two Lontrel resistant weed biotypes have been identified (not in Australia), so it is important to understand why this has occurred and how to prevent it occurring in vetch populations within our farming system.

The long answer Lontrel

Lontrel (Archer, Victory) contains clopyralid (3,6-dichloropicolinic acid) which is a Group I herbicide. This group includes the phenoxys (eg. 24 D), the benzoic acids (eg. dicamba) and the pyridines (eg. Lontrel) (Table 1). These chemicals are synthetic forms of plant growth hormones. Lontrel disrupts plant growth processes by binding at receptor sites that are normally used by the plants natural growth hormones. Symptoms include twisted stems and shoots, stem thickening and elongation, leaf cupping, followed by yellowing, growth inhibition, wilting and eventually death. At low concentrations, leaf tips may develop narrow feather like extension to the mid vein. Lontrel is taken up by both shoot and root and is highly selective. The two plant families it has most activity on are the legume family and the thistle family.

Table 1: Group I herbicides (Disruptors of plant growth)

Sub-Group	Examples
Phenoxys	2,4-D Amine, 2,4 D Ester 2,4-DB,MCPA, MCPB
Benzoic acids	dicamba
Pyridines	clopyralid (Lontrel) picloram (Tordon) fluroxypr (Starane) triclopyr (Garlon)

Group I resistance

Group I herbicides are regarded as low risk for developing resistance but as with other low risk groups (Group M, Group K), resistant populations are starting to emerge. There are 24 Group I resistant weed species in the world, (half of these were identified in the last 15 years). They have generally occurred due to year in year out use of Group I chemicals over several years. Most of these biotypes are resistant to the phenoxys with varying degrees of cross resistance to other Group I chemicals. There are three biotypes reported as resistant to dicamba and two reports of Lontrel resistance. In Australia, there are at least four 2,4 D resistant wild radish populations in W.A and with more populations likely to arise in the near future.

Lontrel resistance was first detected in St Barnaby's Thistle (Centaurea solstitialis) in Washington, 1989, in a pasture that was frequently treated with Tordon over a ten year period. When tested in the glasshouse, the weed population was also cross-resistant to Lontrel, dicamba and Starane and had some tolerance to Garlon and 2,4D. The mechanism of resistance is unclear but is thought to be a combination of enhanced metabolism (i.e the resistant plant can break down the compound more easily) and target site mutation. Studies have shown that the resistance is conferred by a single recessive gene. No other resistant populations have been identified.

Lontrel resistant populations of Carpet Burweed (*Soliva sessilis*), also from the thistle family, have been identified in New Zealand on golf course turf which was routinely treated with pyridine type Group I herbicides. The first resistant population survived a 2,4D/Tordon mix in the field and survived Lontrel and Garlon in pot trials. There are 2 to 5 sites of Group I resistant carpet burweed in New Zealand. The mechanism of resistance or the means of genetic control has not been reported.

The points to note from these examples are:

- Cross resistance was evident within the pyridine group and between other sub-groups
- Sole reliance on Group I chemicals for control,
- Frequent use over a 10 year period, often with multiple applications in one season

Back home: Vetch population dynamics and control in Wimmera rotations

Vetch populations built up in Wimmera paddocks during the 1990s in the hey day of chickpeas, continuous cropping and vetch green manuring. In the last seven years, the percentage of pulses in crop rotations has declined, therefore, seed bank "blow outs" have been less and vetch control has been more frequent. This is illustrated in Table 2. Therefore, in theory, the vetch seed bank should have decreased. The exception will be in paddocks that still have a high proportion of lentils, beans in the rotation. As chickpeas return to the fold and if commodity prices favour pulses, vetch seed banks could again increase.

Table 2. Typical Wimmera crop sequences since the late 1980s and herbicide groups for vetch control. Grey boxes indicate phase where vetch seed bank may increase.

Typical Late 1980s- 1990s sequence										
Year	1	2	3	4	5	6	7	8	9	10
Sequence	Vetch Fallow	Canola	Wheat	Chickpea	Barley	Faba beans	TT Canola	Wheat	Chickpea	Barley
Herbicide groups for vetch control	M,**I**	**I***	B,**I***	C?	B,**I***	-	**I***,C	B,**I***	C?	B,**I***
Typical late 1990s-2000s sequence										
Sequence	Fallow	TT Canola	Wheat	Barley	Lentils	Wheat	Barley	Faba beans	IT Canola	Wheat
Herbicide groups for vetch control	M,**I**	**I***,C	B,**I***	B,**I***	F	B,**I***	B,**I***		**I***,B	**I***,C

*indicates Lontrel use

Lontrel plays a vital role in controlling vetch in a typical rotation (Table 3) and is often used 5 or 6 out of 10 years, but, in most cases it is used in combination with another herbicide that will has some activity on vetch. The exception is in conventional canola. One thing to note however, is that if the companion herbicide is always and only a Group I (particularly dicamba), there could be increased selection pressure for resistant individuals that may exist in a population.

Table 3: Typical vetch control options

Rotation phase	Vetch control options	Herbicide Group
Green manure or Fallow or pasture	*Glyphosate*+ **Surpass** or *Glyphosate* + **dicamba** (or **Lontrel**), grazing, hay, cultivation	M,I
Canola	**Lontrel**	I
TT Canola	*Atrazine* + **Lontrel**	C,I
IT Canola	*On Duty* + **Lontrel**	B,I
Cereals	*Ally* + **MCPALVE** + **Lontrel**; ***Barrel*** + **Lontrel**; **24 D amine + dicamba or Lontrel,** *Eclipse; Hussar*	B,I,C
Lentils	*Brodal (suppression)*	F
Chickpeas	*Tough (expensive), Glyphosate+* ***dicamba*** at least 14 days pre-sowing	C

There are two types of weedy vetch populations: the wild vetch or tares that are endemic in some paddocks or vetch that has been introduced as cultivated plant. The latter is likely to have less genetic diversity and therefore a lower frequency of resistant individuals. However, with any weed population that has been present for a long time, there could be sufficient genetic variability for resistant individuals to exist at low frequencies. Therefore, keeping populations low will play an important role in avoiding resistance. The higher the weed population, the more chance there is of having a significant number of resistant individuals.

So could a Lontrel resistant vetch population develop?

Yes, but the chances of Lontrel resistance developing appear low because:

- Lontrel resistance is rare with only two biotypes reported.
- Lontrel is rarely used in isolation for controlling vetch and in at least 5 out for 10 applications is used in combination with a non-Group I herbicide.
- Vetch populations appear to have reduced in the past five years due to a reduced emphasis on pulses.
- There are very few (if any) reported incidences of herbicide resistance in weeds from the legume family. (Not the case for members of the thistle family however).
- The genetic diversity within vetch is likely to be low (especially where vetch has only been recently introduced)

The odds of developing Lontrel resistance could shorten if:

- Lontrel or dicamba reliance increased with a reduced emphasis on other groups (e.g wheat-canola-wheat rotation).
- Vetch populations build up due to increased emphasis on pulses and a lack of control.
- Lontrel is continually used over a long period (>10 years).
- Group B resistance developed (this will happen first), thereby increasing the reliance on Group I herbicides.
- (It is more likely that Lontrel resistance would develop in milk thistle or prickly lettuce populations that were already resistant to Group B herbicides and therefore are reliant on group I herbicides for control).

How do we keep the risk low?

- Keep vetch numbers low, using rotation, hygiene on fence lines and channel banks, sensible paddock selection for pulses, utilising knockdowns before sowing pulses, sowing seed clean of vetch and gaining 100% control in cereals, canola and fallows.
- Ensure maximum efficacy of Lontrel by minimising environmental constraints such as water quality.
- Avoid reliance on Group Bs as resistance to this group can occur far more quickly. (E.g Keep Lontrel in the mix with On Duty or Hussar).
- Be aware of cross resistance within group I. Where possible use a chemical from another group in combination with Lontrel or dicamba.
- Don’t rely on chemical means alone.
- Don’t assume it won’t happen. Group I herbicides have previously been considered low risk, but resistant biotypes are emerging rapidly with resistance to 10 of the 14 herbicide groups in Australia.
- Be alert but not alarmed.
- Be more wary of wild vetch populations as opposed to volunteer vetch.

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