

Nodules knocked by herbicide application

Herbicides are essential in intensive farming systems, particularly with the move toward reduced tillage. Legumes also play a vital role in farming systems through their ability to fix nitrogen. This article outlines early research into the impact of herbicides on legume function, in particular their ability to develop nodules and produce valuable nitrogen.

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Herbicides which cause yellowing in pulses and medics also could be reducing nitrogen fixation in these legumes, according to CSIRO research.

Several herbicides recommended for use with legumes reduced nodulation and nitrogen fixation of pea and medic in the low-rainfall areas of the Murray Mallee and Eyre Peninsula, South Australia.

Researchers aim to identify which herbicides put legumes at risk to enable farmers to make more informed herbicide choices.

Herbicide trials

During 2002 and 2003, CSIRO researchers investigated the effect of commonly used herbicides on nodulation and nitrogen fixation in peas and medic at several sites across southern Australia.

At Minnipa, SA, diuron treatments were applied one day after sowing, imazethypr and metribuzin were applied one month after sowing while all other herbicide treatments were applied two months after sowing.

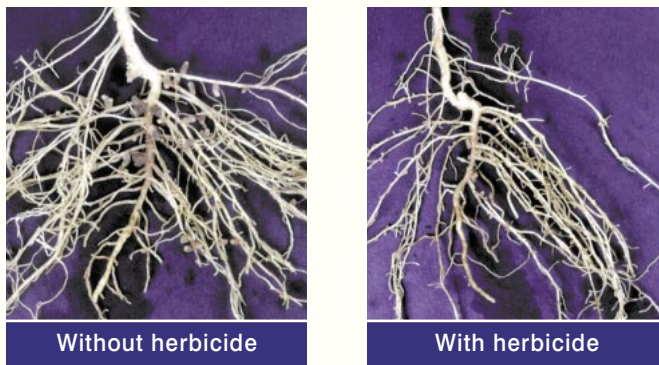
Peas and herbicides

Post-emergent applications of flumetsulam in peas resulted in early crop yellowing, stunted growth and reduced yields during 2003.

Single applications of imazethypr, metribuzin and clethodim also caused yield reductions at Minnipa.

Some broadleaf and grass herbicides reduced nodule number significantly in peas (see Table 1 and Figure 1). This is likely to translate to a reduction in nitrogen fixation by

FIGURE 1 How some herbicides affect nodulation in legume crops



Some herbicides recommended for use with legume crops and pastures have been shown to reduce effective nodule number and seed yield. For example, the pea plant on the right was sprayed with flumetsulam at six weeks and suffered a significant reduction in nodule number 10 days after application.

Source: CSIRO Land and Water.

the legume and less carry-over nitrogen benefit to the following wheat crop.

Medic yields reduced

Sown and regenerated medic plots also suffered crop yellowing and stunting 10 days after spraying with MCPA amine, 2-4-D ester, MCPA plus diflufenican and flumetsulam.

The 2-4-D ester caused yield reductions of more than 50 per cent (0.2 tonnes per hectare) compared with unsprayed control plots (0.4t/ha).

Flumetsulam and MCPA amine resulted in yield reductions of 30% (0.3t/ha) in regenerated medic.

Spray time

The impact of herbicides on crop growth was more severe during the 2003 trial than similar trials during 2002 at Minnipa.

During 2002 only diuron, when sprayed late, reduced seed yields significantly.

For the 2002 trial, most herbicides were applied either post-emergent or at the five-node stage, while during 2003, most herbicides were applied at the 12-node stage.

Late spraying probably delayed flowering which, followed by a rapid end to the season, resulted in poor grain filling and yields.

Further research will continue to investigate how spray time influences the impact of herbicides on nitrogen fixation.

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At a glance

- Common herbicides could be reducing nodulation and nitrogen fixation in legume crops and pastures.
- Other herbicides reduced dry matter production and yield significantly.
- Timing of herbicide application and seasonal conditions appear to influence herbicide-legume interactions.

TABLE 1 Impact of herbicides on nodulation, growth and final yield of peas

Herbicide	Nodule score (/5)	Dry matter (t/ha)		Yield (t/ha)
		Pre-flowering	Flowering	
Control	3.9	1.6	2.2	0.46
Flumetsulam	2.9*	1.5	1.9	0.17*
Diflufenican	3.2*	1.7	2.4	0.44
Diuron	3.4*	1.6	2.6	0.42
Metribuzin	2.3*	1.1*	2.6	0.37
Clethodim	2.8*	1.5	2.7	0.38
Imazethypr	2.9*	1.3*	2.2	0.19*
Haloxypop	3.1*	1.6	2.5	0.38

* The values are significantly lower than untreated control plots.

Source: CSIRO Land and Water and Minnipa Agricultural Centre.