

## How do I reduce the risk of herbicide residues impacting new legume-based pastures?

Establishing new pasture legumes is expensive. Herbicides are an important tool in the lead-up to sowing new pastures, as competition from weeds is the main cause of establishment failure.

While herbicides play an important role in controlling weeds prior to pasture establishment, residues from previously applied herbicides can cause issues at establishment. This is particularly so for pasture legumes where herbicide residues may impact legume growth (particularly the roots), rhizobia survival and the formation of an effective symbiosis (the formation of nodules to fix nitrogen) between the legume and its rhizobia.

Where legume nodulation is reduced due to the presence of herbicide residues, the host legume becomes increasingly reliant on mineral nitrogen from the soil to satisfy its requirements for growth and, hence, can become a net user, rather than builder, of soil nitrogen. When there is complete nodulation failure due to the presence of herbicide residues, the host legume is completely reliant on soil nitrogen for its nutritional requirements and does not contribute to building soil nitrogen via nitrogen fixation.

One of the most common effects of herbicide residue is disruption of normal root growth. This is, in part, due to the impact of residues on rhizobia (the bacteria which support nodule development on the roots).

Herbicide residues impact rhizobia survival through direct toxicity or by impairing the function of rhizobia and its acquisition of nutrients. Mutations in rhizobia populations have also been reported as a consequence of herbicide residues.

Rhizobia are attracted to the host plant via a mutual signalling process. Once appropriate rhizobia are in the vicinity of the legume root system rhizosphere, they gain access through the fine root hairs. The residues left by some herbicides interfere with the development of fine root hairs on the host legumes, or healthy root hairs can be damaged when moving into the area of the soil profile where the residues persist. Damage to the root system can include thickening of the root hairs, and reduction in the number and length of root hairs. Such damage reduces the capacity of the host legume to form functioning nodules due to:

- reduced signalling between the legume and the rhizobia

- restriction or failure of the rhizobia to gain entry to the host plant due to increasing thickness of root hairs or their absence
- inability of the plant to access sufficient moisture and nutrients due to loss in root hair function and/or root length.



## How do I know whether herbicide residues are likely to impede nodulation and nitrogen fixation?

A number of factors can, singularly or in combination, influence the rate of breakdown of herbicides and their residues in the soil. These include (but are not limited) to:

- the herbicide used and its rate of application
- for some herbicides, specific characteristics of the soil to which it was applied (e.g. soil pH, organic matter content)
- time elapsed since application
- the amount of rainfall received since the application
- the need for particular soil conditions to be maintained for a specified period of time.

Some herbicides may carry no requirement for plant-back, but others may require one or more of the above factors to be observed. For example, for particular legume species, some herbicides will require a specific combination of factors to be adhered to before planting. These may include periods of elapsed time, amount of rainfall received, soil moisture content for a particular period of time and rates of breakdown on different soil types. It is important to keep accurate records, read herbicide labels carefully and follow the label recommendations.

### Need further help?

Talk to your local advisor or agronomist to develop a plan for optimising the response from pasture sowing.

Information: [mla.com.au/extension-training-and-tools/feedbase-hub/](https://mla.com.au/extension-training-and-tools/feedbase-hub/)

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## Which herbicides pose the greatest risk?

Many herbicides have residues which can reduce nodulation or result in complete nodulation failure. High-risk herbicides include the sulfonylureas (Group B) and some Group I herbicides, such as dicamba and clopyralid. More recent research has shown the growth and nodulation of some legumes is affected by the presence of some imidazolinone herbicides (Group B) herbicides.

## How do I manage the risk?

**Read the label:** Refer to and adhere to label requirements and consult with advisors if you are in doubt.

**Accurate records:** Keep records of herbicide usage, application date and rate, rainfall received, soil moisture conditions between applications and likely sowing date. For some herbicides it is also necessary to know the soil pH as it can affect the rate of breakdown. Refer to records of herbicides applied not just for the growing season immediately preceding anticipated sowing of new pastures, but for the years leading up to sowing, as some residues are highly persistent.

**Use herbicides correctly:** Industry surveys found up to 20% of producers were using Group B sulfonylurea herbicides in fallow sprays immediately prior to sowing pastures. This is a high-risk strategy and likely to result in significant damage to legumes during establishment, reducing their ability to provide you with free, biologically-fixed nitrogen and potentially compromising long-term persistence.

## Summary

Herbicides are an important tool for weed control leading up to the sowing of pastures. Be wise in the selection of herbicides used in the years leading up to sowing a new pasture and, where possible, choose herbicides likely to pose a low risk in forming persistent residue, particularly in the 12 months leading up to pasture sowing.

Meat & Livestock Australia  
Level 1, 40 Mount Street  
North Sydney NSW 2060  
Ph: 1800 023 100  
[mla.com.au](https://mla.com.au)

