

SUMMARY

- Cover crops can suppress weeds without herbicides - see the **Cover Crops for Australian Vegetable Growers** poster for cover crop options.
- Herbicides combined with cover crops can be an additional tool in your Integrated Weed Management strategy - see the **Herbicides Used on Cover Crops** section below for guidance.
- **Carryover** from herbicides applied to your vegetable crop can cause problems with cover crop establishment - see the **tables** on the reverse for guidance.
- Herbicides are a major cover crop termination tool and when combined with mechanical methods (mulching, rolling or cultivation) can reliably achieve a 100% kill rate - see the **Cover Crop Termination** guide.

The information provided is a GUIDELINE ONLY!
Always read and follow herbicide label instructions.
Consult your local agronomist for specific advice.

HERBICIDE CARRYOVER AND COVER CROPS

Having problems establishing your cover crop? Carryover of herbicide residue from your vegetable crop could be the problem.

Some pre- and post-emergent herbicides used in vegetable production remain in the soil and can affect the following cover crop. The potential risk varies between different herbicides and application rates, and the sensitivity of the cover crop.

The two tables below provide a starting point for identifying herbicides which may impact cover crop establishment.

The tables below summarise the potential carry over of commonly used pre- and post-emergence herbicides used on Summer Vegetables (Table 1) or Winter Vegetables (Table 2). The plant-back times indicate how long after herbicide application before herbicide residues should not be a problem for the following cover crop - see the **How long will herbicides last in your soil?** section below for guidance on how plant-back time varies

MANAGING HERBICIDE RESIDUE CARRYOVER – PRACTICAL OPTIONS

If you are concerned about herbicide residue carryover, here are four practical options to manage this risk:

1. **Choose a cover crop less sensitive** to the herbicide residue (see tables).
2. **Irrigate dry soils** to increase the rate of residue breakdown.
3. **Sow a cover crop mixture.** If your main cover crop may be sensitive to the herbicide, then consider adding another cover crop species which is less sensitive. This will reduce the risk of complete failure.
4. **Run a bioassay** to assess residuals and potential toxicity (see Bioassay box).

DON'T compromise your vegetable crop weed control to reduce the risk of cover crop damage. Instead use one of the options above to manage this risk.

COVER CROP HERBICIDE GUIDE

FOR AUSTRALIAN VEGETABLE GROWERS

HERBICIDES USED ON COVER CROPS

Establishing a cover crop can be a great time to get on top of a problem weed without herbicides. See the **Cover Crops for Australian Vegetable Growers** poster for suggestions for cover crops to suppress weeds through quick establishment and/or dense canopies.

Herbicides combined with cover crops can be an additional tool in your Integrated Weed Management (IWM) strategy.

A big benefit of grass or cereal cover crops is the ability to spray out broadleaves early with inexpensive, minimal soil residual herbicides like 2,4-D. Any weed suppression by the herbicide is usually enough to allow a high-seeded cover crop time to out compete the weeds until cover crop termination.

Broadleaf cover crops allow grasses to be suppressed or controlled with herbicides. However, because of resistance issues with Group A "fops" and "dime", the IWM strategy should be focused on pre-plant knockdowns and cover crop termination prior to viable seed set of grass weeds.

If you decide to apply Group A herbicides, use them wisely, use them early under ideal growing conditions (no frost or drought stress) and terminate the cover crop before weeds set seed.

There are many **pre-emergent** options for grass control in broadleaf cover crops, but rates, cost, seed placement, crop effect and soil residual must all be understood. Consult your local agronomist for advice.

Mixed species cover crops are much more challenging for herbicide options. Pre-sowing knockdowns and high seeding rates usually suppress and outcompete weeds sufficiently.

HOW LONG WILL HERBICIDES LAST IN YOUR SOIL?

The plant back period of herbicides shown in the tables will vary due to:

- Herbicide application **rate** on the vegetable crop
- Herbicide half-life and persistence in the soil
- Soil properties (amount and type of clays, organic matter, pH)
- Conditions throughout the growing season (rainfall, temperature, irrigation, cultivation).

FACTORS DECREASING PLANT-BACK PERIOD

Herbicide breakdown occurs largely due to soil microbes. Conditions which microbes like will speed up breakdown - think cultivated, warm, moist soil, with good fertility and pH.

FACTORS INCREASING PLANT-BACK PERIOD

Cool, dry soils will slow breakdown by microbes. Breakdown is also slowed when the soil "protects" the herbicide from the microbes - think high soil organic matter, clay and cation exchange capacity.

Use these factors with the plant-back Tables to give the best estimate of potential plant-back times for different herbicides and cover crops.

BIOASSAY - ASSESSING HERBICIDE CARRY OVER RISK ON COVER CROP ESTABLISHMENT

A bioassay allows you to check if germination and/or early growth is reduced by any herbicide residue. A simple biomass takes about three to four weeks and involves collecting some soil from areas suspected of having residual activity and from an area with no herbicide.

Bioassay steps:

1. Collect soil (0-10 cm) from areas suspected of having herbicide residues, and from an area free of herbicides but of a similar soil type. Collect enough soil from each area for four pots.
2. Into the eight pots (four from the suspected area and four from the herbicide-free area), sow your planned cover crop. Put the same number of seeds into each pot so that germination rate can be easily checked. You may choose to use a species which has a known susceptibility to the suspected herbicide, e.g., ryegrass for metazachlor. This will be a more sensitive bioassay.
3. Assess the seedlings about one to two weeks after germination for germination rate, stunting, yellowing and abnormal growth, including the roots.
4. If the seedling in the suspected herbicide area is similar to those in the herbicide free area, then there should be little risk to your cover crop.

COVER CROP HERBICIDE GUIDE FOR AUSTRALIAN VEGETABLE GROWERS

KEY

	Residual should not be a problem for cover crop – check label, consider bioassay
	1 to 2 month plant-back possibly required – check label, consider bioassay
	3 to 9 month plant-back possibly required – check label, consider bioassay
	At least 12 month plant-back likely – check label, consider bioassay

TABLE 1. HERBICIDES USED IN SUMMER VEGETABLE CROPS (CUCURBITS, CORN, SOLANACEAE) AND THE POTENTIAL PLANT-BACK TIME TO REDUCE THE RISK OF HERBICIDE DAMAGE TO THE FOLLOWING COVER CROP

SUMMER VEGETABLE CROPS		WARM SEASON COVER CROPS						COOL SEASON COVER CROPS					
Group	HERBICIDE ACTIVE INGREDIENT	Sorghum	Buckwheat	Cowpea	LabLab	Soybean	Sunn hemp	Cereals	Ryegrass	Brassicas	Field Peas	Clover	Faba bean
I	2,4-D AMINE												
G	ACIFLUOFEN												
C	ATRAZINE												
C	BROMOXYNIL												
A	BUTROXYDIM												
D	CHLORTHAL-DIMETHYL												
A	CLETHODIM												
Q	CLOMAZONE												
C	CYANAZINE												
I	DICAMBA												
K	DIMETHENAMID-P												
A	FLUAZIFOP-P												
I	FLUROXYPYR												
B	HALOSULFURON-METHYL												
A	HALOXYFOP-P												
C	LINURON												
I	MCPA												
K	METOLACHLOR												
C	METRIBUZIN												
K	NAPROPAMIDE												
D	PENDIMETHALIN												
K	PROPACHLOR												
A	QUIZALOFOP-P												
A	SETHOXYDIM												
C	SIMAZINE												
K	S-METOLACHLOR												
C	TERBUTHYLAZINE												
I	TRICLOPYR												
D	TRIFLURALIN												

TABLE 2. HERBICIDES USED IN WINTER VEGETABLE CROPS (BRASSICAS, SPINACH, BEETS, LETTUCE) AND THE POTENTIAL PLANT-BACK TIME TO REDUCE THE RISK OF HERBICIDE DAMAGE TO THE FOLLOWING COVER CROP

WINTER VEGETABLE CROPS		WARM SEASON COVER CROPS						COOL SEASON COVER CROPS					
Group	HERBICIDE ACTIVE INGREDIENT	Sorghum	Buckwheat	Cowpea	LabLab	Soybean	Sunn hemp	Cereals	Ryegrass	Brassicas	Field Peas	Clover	Faba bean
A	BUTROXYDIM												
D	CHLORTHAL-DIMETHYL												
A	CLETHODIM												
I	CLOPYRALID												
C	CYANAZINE												
J	ETHOFUMESATE												
A	FLUAZIFOP-P												
B	FLUMETSULAM												
A	HALOXYFOP-P												
C	LINURON												
K	METAZACHLOR												
K	METOLACHLOR												
C	METRIBUZIN												
K	NAPROPAMIDE												
G	OXYFLUROFEN												
D	PENDIMETHALIN												
C	PHENMEDIPHAM												
K	PROPACHLOR												
D	PROPYZAMIDE												
C	PYRAMIN												
A	QUIZALOFOP-P												
A	SETHOXYDIM												
K	S-METOLACHLOR												
D	TRIFLURALIN												