

## Glyphosate Resistant Weeds in Australia.

Glyphosate resistance was first documented for annual ryegrass (*Lolium rigidum*) in 1996 in Victoria. Since then glyphosate resistance has been confirmed in another 13 weed species. Resistance is known in 8 grass species and 6 broadleaf species of which 4 are winter-growing weed species and 10 are non-seasonal or summer-growing weed species. The latter have been selected mainly in chemical fallows and on roadsides. Tridax daisy (*Tridax procumbens*), tropical polyploid weed of the Asteraceae family is the latest addition to the list. The tridax daisy came from an Indian sandalwood (*Santalum album*) plantation in the Ord River Irrigation Area in northern Western Australia. It accompanies awnless barnyard grass as the second glyphosate resistant species from the Ord.

Weed species	Year first documented	Number of confirmed populations
Annual ryegrass ( <i>Lolium rigidum</i> )	1996	678
Barnyard grass ( <i>Echinochloa colona</i> )	2007	102
Liverseed grass ( <i>Urochloa panicoides</i> )	2008	4
flaxleaf Fleabane ( <i>Conyza bonariensis</i> )	2010	65
Windmill grass ( <i>Chloris truncata</i> )	2010	11
Great brome ( <i>Bromus diandrus</i> )	2011	5
tall Fleabane ( <i>Conyza sumatrensis</i> )	2012	10
Wild radish ( <i>Raphanus raphanistrum</i> )	2013	2
Sowthistle ( <i>Sonchus oleraceus</i> )	2014	23
Red brome ( <i>Bromus rubens</i> )	2014	1
Sweet summer grass ( <i>Moorochloa eruciformis</i> )	2014	1
Prickly lettuce ( <i>Lactuca serriola</i> )	2014	1
Feathertop Rhodes grass ( <i>Chloris virgata</i> )	2015	4
Tridax daisy ( <i>Tridax procumbens</i> )	2016	1

The most number of resistant populations is for annual ryegrass followed by barnyard grass and then fleabane.

**Glyphosate-resistant annual ryegrass has occurred in the following situations:**

Situation		Number of sites	States
Broadacre cropping	Chemical fallow	34	NSW
	Winter grains	393	Vic, SA, WA, NSW
	Summer grains	1	NSW
	Irrigated crops	1	SA
Horticulture	Tree crops	10	NSW, SA
	Vine crops	25	SA, WA
	Vegetables	2	Vic
Other	Driveway	6	NSW, Vic, SA, WA
	Fence line /Crop margin	91	NSW, SA, Vic, WA
	Around buildings	2	NSW
	Irrigation channel /Drain	14	NSW, SA, Vic
	Airstrip	1	SA
	Railway	2	WA, NSW
	Roadside	95	SA, NSW, WA
	Pasture	1	WA

**Glyphosate-resistant flaxleaf fleabane has occurred in the following situations:**

Situation		Number of sites	States
Broadacre cropping	Chemical fallow	16	NSW, Qld
Horticulture	Vineyard	1	SA
Other	Around buildings	1	NSW
	Irrigation channel /Drain	10	NSW
	Railway	3	NSW
	Roadside	33	SA, NSW, Qld, Vic

Glyphosate-resistant tall fleabane was collected along highways and roads in southern NSW during a glyphosate resistant weed survey.

**Glyphosate-resistant awnless barnyard grass has occurred in the following situations:**

Situation		Number of sites	States
Broadacre cropping	Chemical fallow	99	NSW, Qld, WA
Other	Around buildings	1	NSW
	Irrigation channel /Drain	2	NSW, Qld

The glyphosate-resistant windmill grass populations are from chemical fallows (3) and roadsides (8). The glyphosate-resistant liverseed grass, sowthistle and sweet summer grass populations occurred in summer chemical fallow situations. Glyphosate resistant

great brome, red brome and wild radish have occurred in winter grain cropping. Glyphosate resistant feathertop Rhodes grass populations are from chemical fallows (2) and roadsides (2).

**Glyphosate-resistant annual ryegrass populations by states:**

State	Number of populations
NSW	185
SA	211
Vic	118
WA	164

**Glyphosate-resistant flaxleaf fleabane populations by states:**

State	Number of populations
NSW	38
QLD	13
SA	7
Vic	6

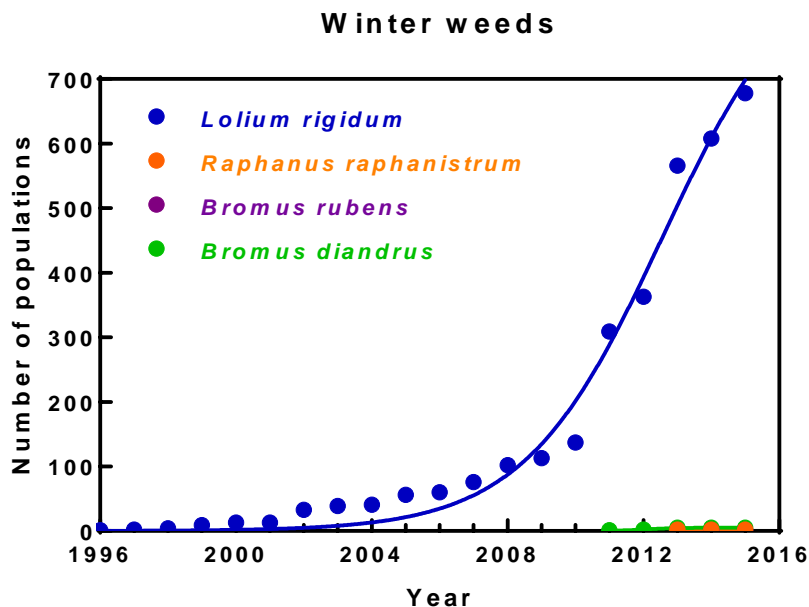
**Glyphosate-resistant barnyard grass populations by states:**

State	Number of populations
NSW	71
QLD	30
WA	1

**Glyphosate-resistant windmill grass populations by states:**

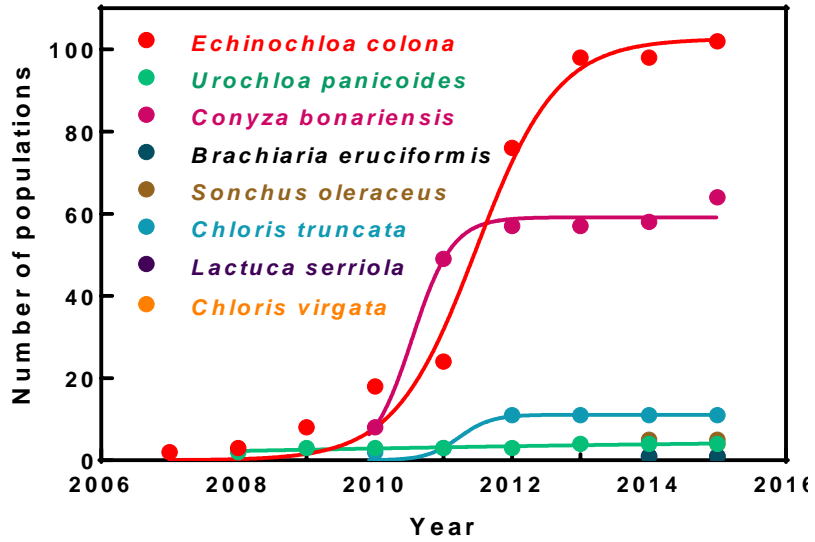
State	Number of populations
NSW	4
VIC	6
WA	1

The increase in confirmed cases of glyphosate resistance in winter weeds between 1996 and 2016 is:



The increase in confirmed cases of glyphosate resistance in summer weeds between 2007 and 2016 is:

### Summer weeds



All of the glyphosate resistant weed populations have occurred in situations where there has been intensive use of glyphosate, often over 15 years or more, few or no other effective herbicides used and few other weed control practices are used. This suggests the following are the main risk factors for the evolution of glyphosate resistance:

- Intensive use of glyphosate – every year or multiple times a year for 15 years or more
- Heavy reliance on glyphosate for weed control
- No other weed controls

Farming practices in chemical fallows the northern cropping region are heavily dependent on glyphosate for weed control. Therefore, it is highly likely that unconfirmed populations of glyphosate resistant summer and winter weeds are present in this system.

Farming practices under the vines in vineyards across Australia are heavily dependent on glyphosate for weed control. Therefore, it is highly likely that unconfirmed populations of glyphosate resistant annual ryegrass are present in this system.

These unconfirmed glyphosate-resistant populations are not recorded on the register of glyphosate resistant populations in Australia.

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