

# Summer weeds within the Western Australian wheatbelt - a three year GRDC survey

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## Key messages

The most common roadside summer weed species surveyed were African love grass, windmill grass, fleabane and wild radish.

The four most common species in each region varied between years. This implies that they also may vary in your paddock making it necessary to inspect weeds every year before spraying.

Some prominent summer weeds are also winter weeds (like wild radish and wild oats). IWM programs to control these species need to manage cohorts throughout the year.

## Aims

Summer weeds carry disease, impede crop sowing and utilise stored soil moisture or nutrients that may otherwise be available to the subsequent crop (Cameron & Storrie, 2014). Identifying summer weeds informs growers of the major weed issues in different agronomic regions and provides direction for future research on emerging weed species. A GRDC funded project has surveyed roadside summer weeds in the Western Australian (WA) wheatbelt in the summer of 2014/2015, 2015/2016, and 2016/2017. This project aimed to determine the prevalence and density of emerging summer weeds, and highlight the variation between years.

## Method

A survey was conducted over all main roads within the WA wheatbelt during February to April 2015, 2016 and 2017. In 2015, a total of 244 sites were selected approximately every 10 km, where weeds were visible on the roadside. In 2016 and 2017, 138 and 238 sites were revisited. At each site, weed species were identified along a 20 m long transect. Weed density (seed head or tillers for grass weeds and plant numbers for broadleaf weeds) was determined by visual assessment. Density for each species was recorded as low (0-10 plants/m<sup>2</sup>), medium (11-50 plants/m<sup>2</sup>) or high (>50 plants/m<sup>2</sup>). Photos were taken to allow later identification of ambiguous species. Some species could not be differentiated. For example, native grasses were placed in a single category as they are difficult to accurately identify and are generally not weeds. Native grass species that are common weeds (i.e. windmill grass) were not included in this generic 'native grass' category. Several species could not be accurately identified as they were at the seedling stage. These unidentified weeds were removed from the data set, as plants that are at the seedling stage over late summer/autumn are likely to be autumn/winter weeds rather than summer weed species.

## Results

The survey identified a total of 144 separate species (or genera where species were grouped at the genus level) at 244 sites evenly distributed throughout the wheatbelt. A total of 76, 72 and 129 species were identified in 2015, 2016 and 2017. However, only 58 weeds were found at greater than 1% of sites and only 19 weeds were found at greater than 10% of sites (Table 1).

**Table 1: Summer weed species found at greater than 10% of sites surveyed in the WA wheatbelt from 2015 to 2017, the percent of sites each species was found at in each year, and the percent of sites each species was found at averaged over all years.**

Common name	Scientific name	2015	2016	2017	Average
African lovegrass	<i>Eragrostis curvula</i>	48	70	59	57
Windmill grass	<i>Chloris truncata</i>	30	55	46	42
Fleabane	<i>Conyza</i> sp.	40	36	37	38
Wild radish	<i>Raphanus raphanistrum</i>	27	43	45	38

Stinkgrass	<i>Eragrostis cilianensis</i>	20	30	50	34
Sowthistle	<i>Sonchus oleraceus</i>	22	34	40	31
Wild oats	<i>Avena</i> sp.	15	22	37	25
Roly Poly	<i>Salsola australis</i>	16	29	19	20
Capeweed	<i>Arctotheca calendula</i>	15	22	22	19
Couch	<i>Cynodon dactylon</i>	16	20	21	19
Afghan thistle	<i>Solanum hoplopetalum</i>	13	25	13	16
Stinkwort	<i>Dittrichia graveolens</i>	15	20	13	16
Panic grass	<i>Panicum</i> sp.	11	22	16	15
Afghan melon	<i>Citrullus lanatus</i>	12	11	21	15
Mulla mulla	<i>Ptilotus polystachyus</i>	5	18	24	15
Caltrop	<i>Tribullus terrestris</i>	11	17	12	13
Goosefoot	<i>Chenopodium</i> sp.	4	12	22	13
Button grass	<i>Dactyloctenium</i> sp.	8	13	14	11
Prickly paddy melon	<i>Cucumis myriocarpus</i>	11	7	13	11

The most common species varied by year. Over the entire wheatbelt, African lovegrass was the most common roadside species in every year. Windmill grass was always in the top three most common species. However, in 2015, fleabane was one of the three most common species, to be replaced by wild radish in 2016 and stinkgrass in 2017 (Table 2). By region, African lovegrass was always the most common species in the central and southern wheatbelt, but in the north, fleabane was the most common species in 2015 and 2017, and windmill grass in 2016. Sowthistle was one of the three most common weeds in the south in every year. Stinkgrass was apparent in the central and southern wheatbelt in 2017.

**Table 2: The first, second and third most common weed species in each region of the WA wheatbelt, and the three most common weeds species over the entire wheatbelt (with percent of sites each species was found at), in each survey year.**

Year	Location	First weed	Second weed	Third weed
2015	North	Fleabane	African lovegrass	Couch
	Central	African lovegrass	Windmill grass	Wild radish
	South	African lovegrass	Fleabane	Sowthistle
	Total	African lovegrass (48%)	Fleabane (40%)	Windmill grass (30%)
2016	North	Windmill grass	African lovegrass	Wild radish
	Central	African lovegrass	Windmill grass	Wild radish
	South	African lovegrass	Windmill grass	Sowthistle
	Total	African lovegrass (70%)	Windmill grass (55%)	Wild radish (43%)
2017	North	Fleabane	African lovegrass	Wild radish
	Central	African lovegrass	Windmill grass	Stinkgrass
	South	African lovegrass	Sowthistle	Stinkgrass
	Total	African lovegrass (59%)	Stinkgrass (50%)	Windmill grass (46%)

In all years, most summer weeds were present at low density. There were only 10%, 24% and 16% of sites with high weed density in 2015, 2016 and 2017 (Table 3).

**Table 3: The percent of roadside sites in each year with weeds at low, medium or high density. Note that some sites had multiple weed species at different densities, and some sites had no weeds, so the total of sites with low, medium or high density species will not sum to 100% for each year.**

Weed species	Density (%)		
	Low	Medium	High
2015	27	18	10
2016	46	34	24
2017	52	27	16

## Conclusion

Wild radish, fleabane, windmill grass, roly poly, afghan melon, caltrop, button grass, stinkgrass and sowthistle have been identified as problematic weeds in prior surveys (Michael *et al.*, 2010). As a result, they are the subject of current integrated weed management projects in WA (GRDC projects UA00149, UA00156 and DAW00257). Wild radish, in particular, is common in the northern region, and has dramatically increased in the central region over the past 15 years, possibly due to the spread of resistant populations (Borger *et al.*, 2012; Owen *et al.*, 2015). Wild radish and wild oats are the second and third most expensive weeds to manage in Australia (after annual ryegrass) (Llewellyn *et al.*, 2016). The prevalence of these species in both summer and winter surveys highlights the need for integrated management programs that control these weeds throughout the year. Summer weed cohorts of wild radish or wild oats will not produce as much seed as the winter cohorts, but the seed from summer cohorts will still refresh the seed bank. Wild radish seed in particular can remain dormant for over five years, making it vital that no additional seed enters the seed bank (Cheam, 2006). However, applying herbicides to wild radish or wild oat cohorts in summer as well as winter will exacerbate the development of resistance, which is a major issue in both species (Owen & Powles, 2009; Owen *et al.*, 2015). Future research is required to develop cost effective and practical management programs to eradicate these species throughout the year.

African lovegrass is a major summer weed on WA wheatbelt roadsides and is also a weed of long term pastures, although it is not a common weed of cropping systems. This species may require further research to adequately control it. However, there has been considerable research into the control of this species in the Eastern States, some of which is applicable to WA (NSW Department of Primary Industries, 2015). Couch and stinkgrass were also major weeds in the northern and southern agricultural zones of WA and may require further research for optimal control.

Goosefoot and stinkwort infestations may be increasing on the WA roadside, as these species were more common in the current survey than the summer weed survey by Michael *et al.* (2010). Species like capeweed, couch, Afghan thistle, panic grass, mulla mulla and prickly paddy melon remain prevalent on the WA roadside (Michael *et al.*, 2010).

While most of the weeds recorded in this survey have the capacity to invade cropping regions, they will not all become major problems. In cropping fields, summer weed growth is related to rainfall, but this survey highlights that on the roadside summer weed growth is not related as strongly to rainfall (Cameron & Storrie, 2014). For example, rainfall was exceptionally high and widespread in the summer of 2016/2017 (Bureau of Meteorology, 2016). However, while this increased the total number of weed species identified (i.e. 129 compared to 76 and 72 in prior years), it did not significantly increase the number of sites with weeds at medium or high density compared to the previous year. Therefore, there are a range of factors limiting summer weed growth on the roadsides other than rainfall (i.e. competition with native plants). However, while a roadside survey cannot highlight all the weed problems that growers will need to address in the field, it can identify species that may be an issue in future and require further investigation.

While changing seasonal/rainfall conditions did not reliably affect summer weed density, it did influence species type. The most prominent species varied from year to year, and this variation is also likely to be observed in field conditions. Further, the high rainfall and cooler weather evident in the summer of 2016-2017 allowed a greater diversity of species to emerge. It is clearly important that growers assess the species to be targeted for summer weed control, rather than using whatever chemical is left in the shed from prior years.

## Key words

Summer weed survey, African lovegrass, wild radish, fleabane, windmill grass, sowthistle, stinkgrass.

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