

## Weed species present in cereal crops in southern New South Wales

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**Summary** A field survey of 192 cereal crops in southern New South Wales collected data on the weed species present and their levels of infestation. Fourteen of the 192 paddocks had no weeds present, while 30 had only one species recorded. Two weed species were recorded in 52 paddocks, three in 35, four in 28, five in 20 and six in ten paddocks while three of the paddocks contained seven weed species. The species most commonly found were annual ryegrass and wild oats, in 66% and 63% of paddocks respectively. No other species of grass weed were present in more than 20% of paddocks. The most common broadleaf weed species was milk thistle (*Sonchus oleraceus*) which was present in 23% of the surveyed paddocks, capeweed (*Arctotheca calendula*), wireweed (*Polygonum aviculare*) and paterson's curse (*Echium plantagineum*) were the only other species found in more than ten percent of the paddocks.

**Keywords** Weed species, survey, annual ryegrass, wild oats.

### INTRODUCTION

Weeds have a major impact on crop and pasture production in Australia. The impact can be through direct costs of control such as herbicides, cultivation or labour, or indirectly through yield losses from decreases in production or quality (Sinden *et al.* 2003).

The level of losses in Australian crops and pastures as a result of weeds was estimated to be approximately \$3 billion of which approximately \$2 billion was due to indirect losses (Combella 1989). This had increased by \$3.5 billion in 2003 of which about \$1 billion was in direct costs to crops (Sinden *et al.* 2003).

Jones *et al.* (2005) estimated yield losses to weeds remaining after control totaled \$280 million. Three weed species were responsible for about 90% of these yield losses: annual ryegrass (*Lolium rigidum* gaud.), wild oats (*Avena* spp.) and wild radish (*Raphanus raphanistrum*). However the importance of these weeds varied depending upon the region with wild oats most important in the north, wild oats and annual ryegrass in the south and annual ryegrass and wild radish in the east (Jones *et al.* 2005).

Knowledge of which weed species are present in a region enables both the research conducted and extension messages to be better targeted for that area. With the last weed species survey in southern New South Wales conducted in 1993 (Lemerle *et al.* 1996) and with changes in management practices (D'Emden *et al.* 2006) and herbicide resistance levels (Broster *et al.* 2011a; b) the relative importance of some weed species may have changed.

### MATERIALS AND METHODS

**Survey** Cereal crop paddocks in southern New South Wales were surveyed in November and December of 2010 prior to the commencement of harvest. Paddocks were randomly selected at ten kilometre intervals, alternating left and right hand side of the survey transects where possible. This resulted in 192 paddocks being visited, of these 154 were wheat, 37 were barley and one triticale. The location of all sites was recorded using a GPS unit.

The paddocks were surveyed by two people walking across them for a ten to fifteen minute period. While the main aim of the survey was to collect samples of annual ryegrass and wild oat seed for herbicide resistance screening, the incidence and density of these species and any other species was recorded. In total 192 paddocks were visited, of which fourteen had no weeds present.

The density of weeds in the sampling area was visually assessed by the samplers along their sampling path. Upon leaving the paddock an estimated average density for the area was agreed upon using similar categories to Llewellyn *et al.* (2009) for annual ryegrass. In addition to the four classes used by Llewellyn *et al.* (2009) of: Low (<1 plant m<sup>-2</sup>), Medium (1–10 plants m<sup>-2</sup>), High (>10 plants m<sup>-2</sup>) and Very High (>10 plants m<sup>-2</sup> and dominating crop) this survey used an additional class: Very Low (occasional plant).

The classes were modified according to average mature biomass production per plant for each species. Species larger than annual ryegrass had lower thresholds for each class while those smaller had higher thresholds. This was to allow for the difference



University (J. Broster unpublished data). Significant levels of resistance to several herbicides were found in the annual ryegrass samples collected during this survey (J. Broster unpublished data). Herbicide resistant populations of two of the three next most commonly found grass species, barley grass and brome grass (*Bromus diandrus*), have also been found in southern New South Wales.

The majority of both annual ryegrass and wild oats populations were of very low or low density. This

is despite significant levels of herbicide resistance in the annual ryegrass populations (wild oats yet to be screened). Fifty-six percent of the annual ryegrass populations were resistant to diclofop-methyl, 53% to chlorsulfuron and 32% to tralkoxydim (J. Broster unpublished data). This is a similar finding to that of Llewellyn *et al.* (2009) who found that despite high levels of herbicide resistance in a 2003 survey over half the annual ryegrass populations were rated a low density (<1 plant m<sup>-2</sup>).

Wild radish (*Raphanus raphanistrum*) was found in a similar proportion of paddocks (3.5%) as compared to the 1996 survey (Lemerle *et al.* 1996). This was despite it being ranked by agronomists in 1996 only behind annual ryegrass as a serious problem in the future (Lemerle *et al.* 1996).

This survey was undertaken during a very wet spring, with portions of many surveyed paddocks underwater. This may have influenced both: what species were present and their level of infestation. However, while some species may be less common in drier seasons, the potential was there for large increases in seed bank levels enabling these species to still be present in future years when conditions again become favourable.

Both this survey and the Lemerle *et al.* (1996) survey were done late in the growing season after most, if not all, herbicide applications. Any weeds present have therefore either germinated after the herbicide applications or are survivors of the herbicide application (escapes or resistant). Several

**Table 2.** Broadleaf weed species found in surveyed paddocks.

Species	Common name	Number of paddocks	% of paddocks
<i>Xanthium spinosum</i>	Bathurst burr	1	0.5
<i>Arctotheca calendula</i>	Capeweed	27	14.1
<i>Fallopia convolvulus</i>	Climbing bindweed	1	0.5
<i>Rumex</i> spp.	Docks	4	2.1
<i>Fumaria</i> spp.	Fumitory	1	0.5
<i>Sisymbrium orientale</i>	Indian hedge mustard	15	7.8
<i>Lythrum hyssopifoli</i>	Lesser loosestrife	10	5.2
<i>Sonchus oleraceus</i>	Milk thistle	44	22.9
<i>Echium plantagineum</i>	Paterson's curse	22	11.5
<i>Lactuca serriola</i>	Prickly lettuce	3	1.6
<i>Carthamus lanatus</i>	Saffron thistle	3	1.6
<i>Capsella bursa-pastoris</i>	Shepherds purse	3	1.6
<i>Chondrilla juncea</i>	Skeleton weed	19	9.9
<i>Emex australis</i>	Threecornered Jack	3	1.6
<i>Raphanus raphanistrum</i>	Wild radish	7	3.6
<i>Polygonum aviculare</i>	Wireweed	23	12.0

**Table 3.** Level of infestation for 14 weed species.

Species	Percentage of samples				
	V Low	Low	Med	High	V High
Annual ryegrass	28	44	13	7	7
Barley grass	21	70	9	0	0
Brome grass	6	50	22	17	6
Silver grass	17	25	8	33	17
Toad rush	0	11	33	44	11
Wild oats	21	58	15	5	1
Capeweed	7	89	4	0	0
Indian hedge mustard	13	53	13	20	0
Lesser loosestrife	0	30	30	30	10
Milk thistle	9	75	16	0	0
Paterson's curse	9	77	14	0	0
Skeleton weed	16	84	0	0	0
Wild radish	29	57	14	0	0
Wireweed	9	61	13	17	0

species may be therefore under-estimated as they may be present in large numbers early but are well controlled by herbicides.

Species present in higher numbers before herbicide application will have more individuals exposed to herbicides and therefore the risk of herbicide resistance is greater in these species than in a species with low numbers throughout the growing season. It is therefore important to also undertake these surveys prior to post-emergent herbicide application to see if any of the species less prevalent in this survey are present in higher numbers at that time.

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