

# Hard to kill summer weeds

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# Why summer weeds are a concern?

- Summer weeds utilise soil water and nutrients
- Reduce the winter crop yield
- Developed resistance to glyphosate
- Green bridge
- Allelopathic
- Many emerging summer weeds are spreading within Western Australian Grainbelt
- Biomass can block the seeder
- Good source of livestock feed
- Prevent erosions

Summer weed frequency (%) occurred in >10% of roadside survey from 2015 to 2017

	<b>Common name</b>	<b>Scientific name</b>	<b>Frequency (% site)</b>
1	African lovegrass	<i>Eragrostis curvula</i>	57
2	Windmill grass	<i>Chloris truncata</i>	42
3	Fleabane	<i>Conyza sp.</i>	38
4	Wild radish	<i>Raphanus raphanistrum</i>	38
5	Stinking lovegrass	<i>Eragrostis cilianensis</i>	34
6	Sowthistle	<i>Sonchus oleraceus</i>	31
7	Wild oats	<i>Avena sp.</i>	25
8	Roly Poly	<i>Salsola australis</i>	20
9	Capeweed	<i>Arctotheca calendula</i>	19
10	Couch	<i>Cynodon dactylon</i>	19
11	Afghan thistle	<i>Solanum hoplopetalum</i>	16
12	Stinkwort	<i>Dittrichia graveolens</i>	16
13	Panic grass	<i>Panicum sp.</i>	15
14	Afghan melon	<i>Catullus lanatus</i>	15
15	Mullamulla	<i>Ptilotus polystachyus</i>	15
16	Caltrop	<i>Tribulus terrestris</i>	13
17	Goosefoot	<i>Chenopodium sp.</i>	13
16	Button grass	<i>Dactyloctenium radulans.</i>	11
19	Prickly paddy melon	<i>Cucumis myriocarpus</i>	11

# Region-wise predominance of weed species (roadside survey)

- Northern region - *flaxleaf fleabane and windmill grass*
- Southern region – *sowthistle/milkthistle*
- Central region – *stinkgrass (stinking lovegrass), windmill grass*
- **African lovegrass – common to all regions**

# summer weeds evolved resistance to glyphosate in Australia

- In Australia, glyphosate resistance is known in 17 weed species
  - **10** grass species and **7** broadleaf species
  - **6** are winter-growing weed species
  - **11 are summer-growing weed species**
  - In WA, barnyard grass, windmill grass, sowthistle, wild lettuce (Willow-leaved lettuce) developed resistance to glyphosate

What is the impact of summer weed on winter crop?

- Summer weed trial conducted at Merredin followed by a wheat crop
- Summer weed species: mainly caltrop (*Tribulus terrestris*) and some Afghan melon

Treatments	Abbreviation
Irrigation + weeding	I+ W+
Irrigation + no weeding	I+ W-
No irrigation + weeding	I- W+
No irrigation + no weeding	I- W-

**Summer rainfall:** 49 mm Feb 3<sup>rd</sup> wk, 12 mm Mar 4<sup>th</sup> wk, 22 mm Apr 2<sup>nd</sup> wk and 6 mm Apr 4<sup>th</sup> wk.

**Irrigation:** 55 mm Jan 20-23, 5 mm 8 Feb





Effect of no summer weed control on winter wheat at Merredin Research Station, DPIRD

**Reduction (%) in emergence of wheat compared to No irrigation + weeding** No irrigation + weeding treatment: wheat emergence 160 plants/m<sup>2</sup>

Treatments	Reduction (%) in wheat emergence (plants/m <sup>2</sup> )
No irrigation + weeding	0
Irrigation + weeding	15
Irrigation + no weeding	22



## Effect of irrigation and weeding on wheat grain yield and screenings.

Treatments	Wheat yield (t/ha)	Screenings (%)
No irrigation + weeding	3.02 (↓0)	2.9 (0)
Irrigation + weeding	2.91 (↓4)	3.7 (↑28)
<b>Irrigation + no weeding</b>	<b>1.81 (↓40)</b>	<b>4.2 (↑45)</b>
LSD.05	0.202	1.1

Reasons?

- Reduced soil N by about 80%
- Reduced soil moisture by >95%

# Green bridge

- Summer weeds leads to a 'green bridge'
  - **Diseases:** cereal rust, root lesion nematodes, crown rot, viruses, take all
  - **Pests:** aphids, slugs, mites, web worms, cut worms, Lucerne fleas, beetle larvae

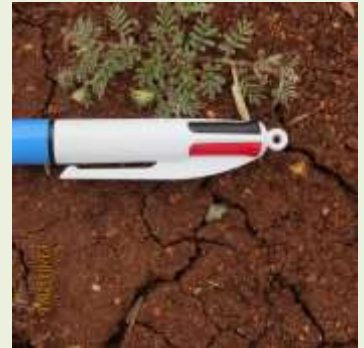
# **Some common summer weeds within WA Wheatbelt**

## Caltrop (*Tribulus terrestris*)

- Yellow flowers, vines
- Seed remains viable for up to 5 years
- Plant starts flowering within three weeks (even when 3-5 cm diameter)
- One cluster of burs has 4-5 seeds
- Good stock feed when young
- Burs are nuisance
- Native to Mediterranean/west Asia

### **Control:**

- 2,4-D amine, glyphosate, paraquat + diquat, glyphosate + compatible 2,4-D
- Use lower recommended rate for seedlings and upper recommended rate for mature plants



# Afghan melon (*Citrullus lanatus*)

- Other names: Afghan melon (WA), bastard melon, bitter melon, mickey melon, pie melon
- Germinate during spring and summer after descent rainfall.
- Deep tap root systems
- Ripe fruit may be occasionally eaten by sheep and cattle
- Native to tropical and southern Africa (Found in Tasmania before 1845)

## Control

- Very heavy grazing with wethers on young plants.
- Spray atrazine, triclopyr, 2,4-D and metsulfuron with spray oil



# Stinkgrass/ stinking lovegrass (*Eragrostis cilianensis*)

- Often confused with kerosene grass (*Aristida holathera*)
- Aromatic, palatable when young
- Inflorescence green or purple
- Germinate in late spring/summer
- Geraldton to Esperance
- Native to Mediterranean/North Africa

## Control

Heavy grazing when young, non-selective herbicides, double knockdowns (glyphosate/ paraquat)





# Button grass (*Dactyloctenium radulans*)

- Survey reveals moderate frequency (11%) within WA Wheatbelt
- Invading northern agriculture region and central agriculture region but slowly moving to south.
- Button grass can produce 8,000 - 32,000 seed/m<sup>2</sup>.
- Up to 45 primary tillers
- Each of the creeping primary tillers develops roots from nodes into the ground.
- Seed dormancy is high:
  - Hydration and Scarification increased germination



# Control of button grass

- **Very hot days (40 C):** Robust rate of glyphosate alone or as tank mix with 2,4-D Ester at seedling and rosette stage
- **Less hot days (<30 C):** a single application of glyphosate at moderate rate alone, tank mix of glyphosate and phenoxy herbicides, or Para-Trooper<sup>®</sup> alone can provide 100% control
- At seed set to seed shedding stage, glyphosate at moderate rate followed by Para-Trooper<sup>®</sup> controlled 100% button grass
- Grass herbicides or addition of adjuvant do not seem to improve control level
- Grazing and strategic cultivation

# Tar vine (*Boerhavia coccinea*) control

- Survey shows low frequency (<10%)
- Invading northern and central agriculture regions
- Can grow up to 1.5 m in diameter
- Seed has high level of dormancy



# Control of tar vine

- Individual herbicide products such as amitrole, glufosinate, saflufenacil, clopyralid, fluroxypyr, triclopyr or paraquat-based herbicides are not as effective
- Glyphosate alone at robust rate provide 82-98% control at seedling to early rosette stages
- Tank mix of glyphosate with saflufenacil, picloram, metsulfuron, glufosinate or double knockdowns provide good control
- Double knockdown of glyphosate mixed with compatible phenoxy followed by Alliance<sup>®</sup>, Spray.Seed<sup>®</sup> or Para-Trooper<sup>®</sup> provide up to 100% control

# Fleabane

- Germinate in spring and summer
- Seeds are blown away by wind
- Better germination from soil surface
- Produce up to 110,000 seed per plant
- Deep burial prolongs seed persistence
- Developed resistance to glyphosate in the eastern states.
- Native to South America and north America.



Flaxleaf fleabane (*Conyza bonariensis*),

# Fleabane control

- Application of a mixture of glyphosate and 2, 4-D followed by the application of Spray.Seed® was highly effective on fleabane
- Herbicides appears to be more effective on fleabane when applied at seedling or flowering stage than rosette stage



# Sowthistle

- Occurs both summer and winter
- Produce up to 25, 000 seed per plant.
- Germinate between 5 to 35 C
- More germination from soil surface
- Deep burial prolongs seed persistence
- Developed resistance to glyphosate in ES and WA
- Rather poorly competitive to cereal crops
- Native to North Africa and Eurasia



# Control of sowthistle

- **Single application of glyphosate as well as double knockdowns (glyphosate followed by Para-Trooper<sup>®</sup> or Spray.Seed<sup>®</sup>) provide up to 100% control of sowthistle**
- **However, double knocks is preferred to single knock to minimise risks of knockdown herbicide resistance development**



# Windmill grass (*Chloris* spp)

- *Chloris truncata* - C4 native species
- Summer but survive through winter
- Likes no disturbance, even knife point sowing hinders seedling emergence
- Seed production: up to 60,000 seeds/m<sup>2</sup>
- Spring cohorts produce more seeds than other seasons.
- Good feed of stocks during dry summer
- Developed resistance to glyphosate in ES and one population WA
- Native to tropical Africa



## Control options of windmill grass

- Continual grazing often provides reasonable control.
- In areas threatened by invasion, spraying the road shoulders with glyphosate and spot spraying satellite infestations will reduce the rate of spread.
- Apply glyphosate when the plants are actively growing (upper rate on larger plants)
- Residual herbicides (metolachlor)
- Grass herbicide followed by paraquat (if label permits)
- Narrow crop row spacing
- Strategic cultivation



Feathertop Rhodes grass  
(*Chloris virgata*)



Prickly lettuce (*Lactuca serriola*)



Wild lettuce / Willow-leaved lettuce  
(*Lactuca saligna*)



Wireweed (*Polygonum aviculare*),



Couch (*Cynodon dactylon*)



African lovegrass

# Key points to spray summer weeds

- Identify the weed species
- Analyse the risks – to control or no to control
- Know the right control options including herbicide options
  - Post emergence
  - Residual
- Timing of application
  - Weather conditions
  - Stress
  - Weed growth stages (never allow seed production)
- Read label, observe conditions
- Address the herbicide resistance issues
- Alternative IWM options
  - Strategic cultivation
  - Grazing
  - Agronomy



# Take home messages

- Summer weeds are good feed if livestock is present
- Uncontrolled weeds will remove soil moisture and nutrients, and facilitate green bridge and allelopathy but minimises the risks of soil erosion
- Button grass, fleabane, sowthistle, stinkgrass, and windmill grass are spreading within WA wheatbelt
- Some summer weed species have developed resistance to glyphosate
- IWM is necessary to manage summer weed
  - Identify the species (<https://www.agric.wa.gov.au/apps/myweedwatcher>)
  - Decide wisely to spray – what, when, and how, bearing in mind management of resistance
  - Double knock is preferred to single knock as part of IWM

# Thank you

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