Department of
Primary Industries and
Regional Development
GOVERNMENT OF WESTERN AUSTRALIA

Protect
Grow
Innovate

Darren Cail (Jibberding) showing the trial on brome grass management run by the Liebe Group.

# Protecting WA crops

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## Contents



## Local integrated weed management strategies for brome grass

### At a glance:

- In Highbury, Western Australia (WA), both barley cultivars, Titan AX (CoAXium®) and Maximus CL (Clearfield®), reduced the density of brome grass more than conventional weed management in a wheat crop. The CoAXium® barley system (using quizalofop-p-ethyl herbicide) reduced brome grass panicles by 90–98%.

- In Jibberding (WA), the best initial suppression of brome grass was achieved in a lupin crop (using propyzamide and clethodim herbicides) compared to other herbicides applied in cereals. However, the barley crop had 79% lower seed production than the lupin at harvest, likely due to its competitiveness.

- In Cape Burney (WA), the weed management systems (using a range of herbicides) in the wheat struggled against high-density brome grass, and by the end of the year had 3,347–12,039 brome grass seeds/m2. Sowing vetch as a break crop plus applying propyzamide, followed by quizalofop-p-ethyl, provided excellent control, as did applying chemical fallow (using glyphosate) which resulted in 0–2 brome grass seeds/m$^2$ at the end of the year.

- It was observed that brome grass seeds remained on the panicles at crop harvest at all sites. This suggests that implementing harvest weed seed control could further reduce brome grass seed return to the soil.

Brome grass is one of the most competitive grass weeds in wheat, estimated to cause a loss of $22.5 million annually across Australia. Two common species of brome grass are great brome (*Bromus diandrus*) and rigid brome (*B. rigidus*). It is a prolific seed producer, capable of generating 60 to 3,000 seeds per plant. Initially dormant, brome grass seeds require cold and dark conditions (such as seed burial) to stimulate germination. However, in reduced tillage systems, a large proportion of seeds remain on the soil surface, leading to delayed and staggered emergence, which makes control more challenging. With a seed bank for brome grass lasting 3-4 years, options for preventing seed set over consecutive years are needed.

The Department of Primary Industries and Regional Development (DPIRD) is partnering with the Grains Research and Development Corporation (GRDC), The University of Adelaide (UA), and grower groups including Facey Group, Liebe Group, and the WA No-Tillage Farmers Association (WANTFA) to trial both low- and high-input herbicide strategies aimed at reducing brome grass seed set over multiple years.

Demonstration sites with severe brome grass infestations have been set up on commercial farms with growers in the Liebe, Facey, and WANTFA Grower Group. These sites are used to evaluate the effects of various crop rotation strategies combined with different herbicide programs on the brome grass seed bank, compared to a conventional weed management in wheat. All sites will run for multiple years. This article outlines the results of treatments from the first year of trials – 2024 (Table 1).

Table 1. Crop varieties and herbicide programs for brome grass management used in 2024 with the Facey, Liebe and WANTFA Groups.

| **Facey Group** | **Liebe Group** | **WANTFA Group** |
|---|---|---|
| Wheat cv Scepter<br>Trifluralin *fb* pyroxsulam | Wheat cv Calibre<br>Trifluralin + sulfosulforon | Wheat cv. Tomahawk CL<br>Trifluralin *fb* imazamox + imazapyr |
| Barley cv. Titan AX<br>Trifluralin | Lupins (PBA Jurien)<br>Propyzamide + simazine *fb* | Wheat cv. Tomahawk CL<br>Cinmethylin, triallate, sulfosulfuron *fb* |

Table 1. Crop varieties and herbicide programs for brome grass management used in 2024 with the Facey, Liebe and WANTFA Groups.

| Facey Group | Liebe Group | WANTFA Group |
| --- | --- | --- |
| | quizalofop-p-ethyl [+ clethodim] | aclonifen + diflufenican + pyroxasulfone |
| Barley cv. Maximus CL<br>Quizalofop-p-ethyl | Barley cv. Maximus CL<br>Propyzamide + simazine *fb*<br>imazamox + imazapyr | Wheat cv. Tomahawk CL<br>Trifluralin, pyroxasulfone, triallate with high seeding rate |
| Barley cv. Maximus CL<br>Imazamox + imazapyr | Barley cv. Maximus CL<br>Trifluralin *fb*<br>imazamox + imazapyr | Vetch<br>Propyzamide *fb*<br>Quizalofop-p-ethyl + [fomesafen + clethodim] |
| Barley cv. Titan AX<br>Trifluralin + metribuzin quizalofop-p-ethyl<br>glyphosate | Lupins (PBA Jurien)<br>Propyzamide + simazine *fb*<br>quizalofop-p-ethyl + [clethodim + butroxydim] | Fallow<br>Glyphosate |
| Barley cv. Maximus CL<br>Trifluralin + metribuzin<br>quizalofop-p-ethyl<br>glyphosate | Barley cv. Maximus CL<br>Trifluralin + metribuzin *fb* | |

Table 1. Crop varieties and herbicide programs for brome grass management used in 2024 with the Facey, Liebe and WANTFA Groups.

| Facey Group | Liebe Group | WANTFA Group |
|---|---|---|
| | imazamox + imazapyr | |
| Barley cv. Maximus CL<br>Trifluralin + metribuzinimazamox + imazapyr | Barley cv. Maximus CL<br>Trifluralin + metribuzin *fb*<br>imazamox + imazapyr imazamox + imazapyr | |

*CL = Clearfield®, Titan AX = Titan AX (CoAXium®), fb= followed by*

## Facey Group site at Highbury, WA

The first year of results at the Facey Group demonstration site show that 4 weeks after seeding the pre-emergent application of trifluralin did not significantly reduce brome grass density compared to plots using no pre-emergent herbicides. However, it did provide good control of ryegrass. Brome grass levels were significantly reduced by post-emergent herbicides. Quizalofop reduced brome grass panicle numbers by 90–98% in Titan barley. Similarly, imazamox + imazapyr application to 3-leaf brome grass in Maximum CL barley reduced panicle numbers by 55–74%, compared to the management approach in a wheat crop.

Weed management in the barley systems outperformed the conventional approach in wheat, with lower brome grass panicles and resulting in 76–90% higher yields. Compared to the crops with post-emergent herbicides only, the addition of pre-emergent herbicides doubled barley yield, likely due to reduced brome and ryegrass competition, allowing the barley to produce more tillers.

## Liebe Group site at Jibberding, WA

In the Liebe Group trial, brome grass density was initially similar in lupins and barley as compared to the conventional weed management in wheat. However, by the time the crop reached maturity, there was a significant reduction in brome grass density in both the barley and lupin treatments.  Brome grass density was 25-31% lower in the lupin crop treatment compared to the cereal treatments due to greater efficiency of propyzamide and simazine (pre-emergent) followed by quizalofop-p-ethyl (post-emergent). Regardless of a higher initial brome grass density than lupins, barley reduced brome grass seed set by 79–82% compared to wheat and lupins. This indicated greater competitiveness of barley against brome grass in minimising the return of weed seeds to the seedbank.

## WANTFA Group site at Cape Burney, WA

The brome grass at the WANTFA Group site is resistant to both sulfonylureas and imidazolinone (IMI) herbicides (Group 2) but remains susceptible to Group 1 herbicides. The trial at this site is investigating different pre- and post-emergent herbicide combinations, high seeding rates, and fallow periods over a three-year period to determine the most effective approach for sustainable management of herbicide-resistant brome grass.

Results in the first year show that all wheat-based plots had very high brome grass density. Seed production of brome grass was highest in the conventional treatment with imazamox + imazapyr in wheat (12,039 seeds/$m^2$), followed by wheat receiving diverse herbicides (7,833 seeds/$m^2$). The wheat crop with high seeding rates and diverse herbicides was the best performing out of the wheat systems at reducing brome grass seed production (3,347 seeds/$m^2$), although brome grass seed production was still high. In contrast, brome grass seed production was drastically reduced in both the vetch (2 seeds/$m^2$) and chemical fallow systems (0 seeds/$m^2$).

## Other findings

It was observed that brome grass seeds remained on the panicles at crop harvest at all sites. This suggests that implementing weed seed control at harvest could further reduce brome grass seed return to the soil.

## Further information

This research will continue for another 2 seasons, so watch this space.

For more information on brome grass, refer to DPIRD’s Brome grass webpage and GRDC’s Brome grass factsheet.

## Meet Crop protection team member- Sneha Sharma


Sneha joined DPIRD in October 2024, working on the crop disease modelling project that focuses on disease predictive modelling, validation, and forecasting. The project aims to maintain and further develop existing management decision tools and products for major crop diseases.

Originally from Nepal, a country of beautiful mountains and amazing terrains, Sneha completed a PhD in 2022 in Agricultural Engineering at a university in Thailand. Her PhD focussed on horticultural product quality assessment using advanced spectroscopy and hyperspectral imaging sensors. Sneha also has experience and a keen interest in precision agriculture and the application of remote sensing for crop health and yield estimation.

After completing her PhD, Sneha moved to Melbourne where she worked at the University of Melbourne, contributing to multiple projects that enhanced crop yield sustainability and optimising irrigation practices.

In her spare time, Sneha likes to travel, enjoy different culinary experiences and go for runs or short hikes.