

# Combating ARGV Through The Use of Safeguard Ryegrass

**Aim:** To determine if the livestock carrying capacity of pastures in the Eastern Wheatbelt of Western Australia, including those on mildly saline soil, can be increased by replacing native ryegrass with the Safeguard variety of ryegrass.

**Research Officers:** Jeremy Allen, Janette Drew, Greg Shea in collaboration with the Ballidu Woolpro Group (MLA funded PIRD project)

**Company:** Department of Agriculture WA



**Farmers:** Don Sadler, Peter Whitfield and Bernie Driscoll

**Location:** Konnongorring and Wongan Hills.

**Background:** This project was initiated by the Ballidu Woolpro Group, which is a satellite group of the Liebe Group. It was decided that ryegrass is a valuable pasture in the sheep system, however the threat of annual ryegrass toxicity (ARGV) limits the value of this plant.

The South Australian Research and Development Institute and Valley Seeds have bred an annual ryegrass that is resistant to the nematode involved in the pathogenesis of ARGV. This new ryegrass, called Safeguard, is herbicide susceptible, classed as early maturing and reportedly produces about 50% more herbage than native ryegrass. This new grass has not been evaluated in Western Australia. It has the potential to dramatically increase livestock production through the provision of extra dry matter and the reduced risk of ARGV.

Currently, apart from ryegrass and livestock management, the only other ARGV control option is the application of the twist fungus (*Dilophospora alopecuri*), a biological control agent of the organisms that cause this disease. No successful field studies have been conducted with this fungus in the Wongan Hills area. The twist fungus requires the nematode involved in the pathogenesis of ARGV to carry it onto the ryegrass seed head. Safeguard is resistant to the nematode and so may reduce the effectiveness of the twist fungus. This has never been investigated. The proposed work will investigate whether Safeguard is a suitable replacement for native ryegrass, what level of control of the ARGV organisms can be obtained by using the twist fungus, and how Safeguard and the twist fungus interact.

The project is being conducted at three locations. Two of these sites (Sadler's and Whitfield's) were established to:

1. Compare the dry matter production of native ryegrass with that of Safeguard ryegrass.
2. Compare the prevalence of the causative organisms of ARGV in the two grasses.
3. Measure the establishment of twist fungus and its effect on the causative organisms of ARGV in both ryegrasses.
4. In 2004 the Sadler site had an assessment for sheep grazing capacity.
5. One site (Driscoll's) only has had assessments for ARGV causal organisms

## Trial Details: Don Sadler's site

Plot size and replication	1 ha, 2 replications of each grass
Soil type	Sandy loam
Sowing date	19 <sup>th</sup> May 2003
Seeding rate	Italian ryegrass 3 kg/ha sown in 2003. Safeguard 8kg/ha sown in 2003. The Italian ryegrass plots were oversown with Wimmera ryegrass (sourced from the Moora district) in 2004.
Fertiliser	Nil
Twist Fungus	Applications of Nil, 0.2 kg/ha or 200 kg/ha rates
Paddock History	Regenerating site. 2003 = trial sown, 2002 = wheat, 2001 = canola, 2001 = wheat
Livestock grazing	Some grazing in 2004 as per results

## Peter Whitfield's site

Plot size and replication	1 ha, 2 replications of each grass
Soil type	Medium loam
Sowing date	27 <sup>th</sup> May 2003
Seeding rate	Italian ryegrass - 2 kg/ha Safeguard ryegrass - 8 kg/ha

Twist fungus history	Twist fungus applied to this paddock in 1999 in a concentrated mid strip at a rate of 600 g /ha equating to 200 g/ha for the paddock
Paddock History	2003 trial sown, 2002 = lucerne, 2001 = lucerne, 2000 = lucerne, 2000 = wheat

#### Bernie Driscolls' site

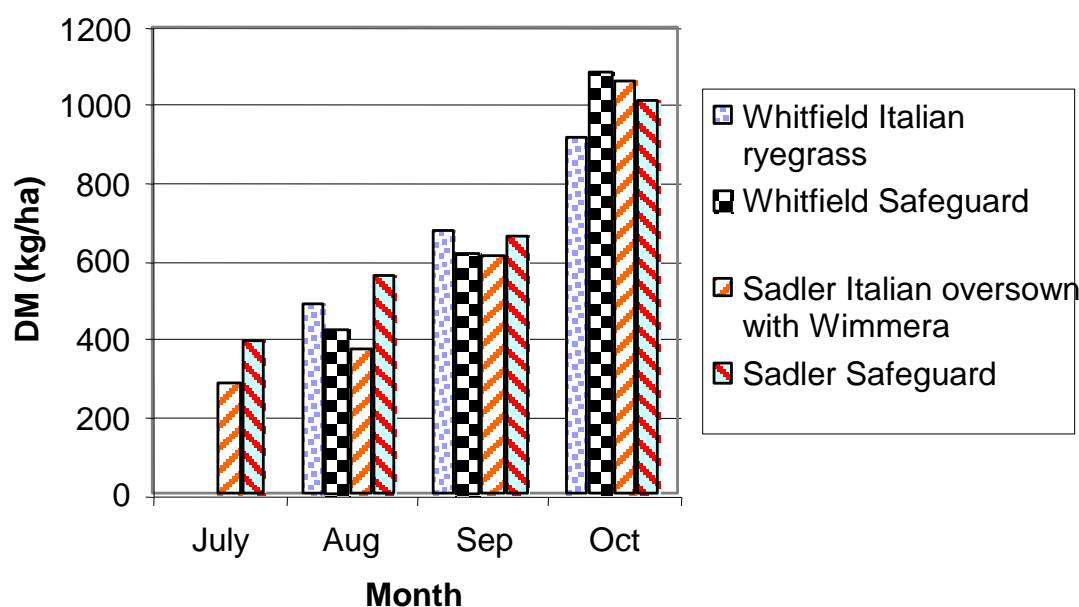
Plot size and replication	1 ha, 1 replication.
Soil type	Sand over clay
Sowing date	Sown May 2003, Combine with knife points
Seeding rate	Between 4-6 kg/ha

It is expected that all sites would have some level of background Wimmera ryegrass. This was not measured.

#### Results:

Dry matter production Sadler and Whitfield sites

### Changes in drymatter available at Wongan Hills and Konnongorring



#### Sheep grazing days – Sadler site

Sadler site	Sheep grazing days
Plot 1 (Safeguard)	430
Plot 2 (Italian ryegrass oversown with Wimmera Ryegrass)	161
Plot 3 (Safeguard)	441
Plot 4 (Italian ryegrass oversown with Wimmera ryegrass)	352

The dry matter production data showed that in 2004 there was no difference between the Safeguard and Italian ryegrass at both sites. The data for sheep grazing days suggests that Safeguard may have provided a greater grazing capacity than the Italian ryegrass, but the figures were not statistically different (only 2 replicates), and a difference in grazing capacity was not supported by the dry matter results.

#### Prevalence of nematode and bacterium- Sadler, Whitfield and Driscoll sites.

Samples were collected from all three sites for determination of the prevalence of the causative organisms of ARG1; the nematode and the toxic bacterium. Nematode assessments have been completed, and determination of the prevalence of bacterial gall will be done shortly.

Property	Plot number	Treatment	2003		2004
			Nematodes per kg seed heads*	Bacterial galls per kg pasture	Nematodes per kg seed heads*
Whitfield	1	Italian ryegrass	200	2312	0
Whitfield	2	Safeguard	700	1133	792
Whitfield	3	Italian ryegrass	300	1641	1196
Whitfield	4	Safeguard	400	>2667	2135
Sadler	1	Safeguard	0	24	95
Sadler	2	Safeguard + TF 200	0	22	45
Sadler	3	Italian Ryegrass (oversown Wimmera 2004) + TF 200	0	39	0
Sadler	4	Italian ryegrass (oversown Wimmera 2004)	100	35	0
Sadler	5	Safeguard	0	64	0
Sadler	6	Safeguard + TF 0.2	0	26	0
Sadler	7	Italian ryegrass (oversown Wimmera 2004) + TF 0.2	0	14	0
Sadler	8	Italian ryegrass (oversown Wimmera 2004)	0	2	414
Sadler	Outside plots	Italian ryegrass	300	348	0
Driscoll	East	Safeguard	0	24	0
Driscoll	West	Safeguard	0	10	0
Driscoll	Outside plots	Wimmera	0	398	9397

\* Heads not threshed until after weighed out. Cut from tillers, weighed, threshed then galls counted.

Safeguard contains genes that enable it to resist the nematodes inducing gall formation. Therefore, Safeguard should have significantly fewer nematode galls than native Wimmera ryegrass or Italian ryegrass, both of which are susceptible to nematode gall formation. However, at the Sadler and Whitfield sites there was no clear evidence that Safeguard had any effect on the number of nematode galls present. For some reason, genes for nematode resistance were not present in the Safeguard plots at a level sufficient to have any noticeable impact on nematode gall prevalence.

In stark contrast, at the Driscoll site the Safeguard has apparently completely inhibited nematode gall formation. It appears that the genes for nematode resistance must be present in almost 100% of the plants.

#### Herbicide resistance testing

It is expected that a herbicide resistance test will give an indication as to the presence of the Safeguard type in the ryegrass population. The lower the level of herbicide resistance, the higher the level of Safeguard present.

*Percentage survival of ryegrass following application of herbicide.*

	<b>Hoegrass 1 L/ha</b>	<b>Select 250 mL/ha</b>	<b>Glean 25 g/ha</b>
Safeguard West	23	27	60
Italian ryegrass West	67	47	81
Safeguard East	69	37	81
Italian ryegrass West	63	40	82

The results are inconclusive. There is an indication that Safeguard is present in one plot but not the other.

Bioassays will be carried out in 2005 on seed samples collected from all sites to determine the prevalence of the genes for nematode resistance in the various treatments. The information may help to explain the apparent failure of Safeguard at the Sadler and Whitfield sites.

Note: Although it is known that the Italian ryegrass is as susceptible to infection by nematodes as native Wimmera ryegrass, its late maturity is not conducive to survival of nematodes within the plant. Therefore, the potential for formation of bacterial galls is expected to be less for this ryegrass.

**Summary:**

- In 2004 there were no measurable differences in dry matter production between Safeguard ryegrass and Italian/Wimmera ryegrass.
- The sheep grazing assessment between Safeguard and Wimmera/Italian ryegrass was inconclusive.
- At two of the sites, Sadler and Whitfield, there was no clear trend in levels of casual organisms between treatments.
- The herbicide resistance testing carried out gave inconclusive results.
- The large difference in nematode galls between the Safeguard and the Wimmera areas at the Driscoll site indicates that Safeguard successfully inhibited nematode gall formation. This needs to be followed up with more measurements of nematode and bacterial galls in subsequent year.

**Technically reviewed by:** Gavin Bignell