

Combating ARGV Through The Use of Safeguard Ryegrass - PIRD

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.

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Company: Department of Agriculture, WA



Farmers: Don Sadler and Peter Whitfield

Location: Wongan Hills and Konnongorring

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 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 two locations. These sites were established to:

1. Compare the dry matter production of native ryegrass with that of Safeguard ryegrass.
2. Compare the prevalences 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.

Trial Details: Don Sadler's site

Plot size and replication	1 ha, 2 replications of each grass
Soil type	Sandy loam
Sowing date	19 th May 2003
Conditions at sowing	Moist soil
Machinery	DBS
Seeding rate	Native ryegrass – 3 kg/ha Safeguard ryegrass – 8 kg/ha
Fertiliser	Nil
Herbicides and Insecticides	Wild oats-Puma Progress 350 mL; Capeweed, Radish MCPA 1500 mL
Twist fungus application date	26 th June 2003
Twist fungus application rates	0, 200 g/ha and 200 kg/ha
Paddock History	2002 = Wheat, 2001 = Canola, 2000 = Wheat

Peter Whitfield's site

Plot size and replication	1 ha, 2 replications of each grass
Soil type	Medium loam
Sowing date	27 th May 2003
Conditions at sowing	Dry top soil
Machinery	Flexicoil 5000 direct drill
Seeding rate	Native ryegrass - 2 kg/ha Safeguard ryegrass – 8 kg/ha
Fertiliser	60 kg/ha Agflow extra

Herbicides and Insecticides	1L/ha Roundup; 10 g/ha Eclipse
Twist fungus history	Twist fungus applied to this paddock in 1999 in a concentrated mid strip at a rate of 600 g equating to 200 g/ha
Paddock History	2002 = Lucerne, 2000 = Lucerne, 2000 = Wheat

NB: The lucerne was poorly established.

NB: The native ryegrass accessed is believed to be Italian however we are unable to confirm this.

Results: During assessments of the plots after seeding, it was realised that the seed provided as native ryegrass seed was in fact not Wimmera ryegrass. It appeared to be a variety of Italian ryegrass. There was a low prevalence of native ryegrass within all sown plots.

1. Dry matter production

Site	Ryegrass	Dry matter (kg/ha DM) in:			
		July	August	September	October
Sadler	Italian	330*	983	4867	4917
	Safeguard	260	1434	7142	9642
Whitfield	Italian	90	567	2117	2384
	Safeguard	60	517	2434	3950

* The seeder ran out during seeding of the second plot. This plot was oversown 4 weeks later at 3 kg/ha. Safeguard was a little slower in getting established, but considerably outperformed the Italian ryegrass during spring, providing 66-96% more dry matter in October.

2. Ryegrass densities

These were visually assessed on 11th November 2003. Randomly chosen locations within the plot were assessed by placing a 1 m² quadrat on the ground and judging whether ≤ 5 , 6-10, 11-15, 16-20 or ≥ 20 ryegrass plants were within the quadrat. At Sadler's there were 30 assessments per plot, while at Whitfield's there were 15.

Site	Ryegrass	Ryegrass density assessment	
		% of plot with > 20 plants/m ²	Average density for remainder of plot (plants/m ²)
Sadler	Italian	22*	11.5
	Safeguard	56.5	13.5
Whitfield	Italian	20	13
	Safeguard	30	13

* The seed ran out during seeding of the second plot. This plot was oversown 4 weeks later at 3 kg/ha. The impression was that there were more ryegrass plants on the Safeguard plots.

3. Twist fungus assessments

Each of the quadrats evaluated for ryegrass density were also examined for the presence of twist fungus. The number of heads in each m² with twist fungus infection were counted, and this figure converted to infected heads /m² over the whole plot. No twist fungus was found at the Sadler site. This is not uncommon in the first year of application, particularly at the commercial application rate of 200 g/ha.

Twist fungus was found at the Whitfield site, coming into the experimental area from the previous inoculation of the paddock. The amounts found were:

Safeguard West –	0 infected heads/m ²
Safeguard East –	0.8 infected heads/m ²
Italian West –	0.6 infected heads/m ²
Italian East –	0.9 infected heads/m ²

The prevalence levels were too low to determine if there was a difference between the two grasses. In any case, in the first year of sowing Safeguard the nematode population would not have been reduced. There

would still be sufficient nematodes to carry the twist fungus up onto the heads. Differences should not appear until the second year if they are going to occur.

4. Laboratory tests

Samples have been collected from both sites for testing for the prevalences of the causative organisms of ARG; the nematode and the toxic bacterium. This information is obtained from laboratory tests that will be conducted in the first three months of 2004.

5. Additional observation

Sheep gained access to Sadler's experimental site for a short period in early November. It was observed that the sheep grazed the Italian ryegrass in preference to the Safeguard ryegrass.

Summary:

- An intended comparison between native ryegrass and Safeguard ryegrass became a comparison between what is probably Italian ryegrass and Safeguard ryegrass.
- Safeguard ryegrass produced 66-96% more dry matter than the Italian ryegrass by October. The yield for Safeguard averaged 6.8 t/ha DM.
- Laboratory tests to evaluate the affect of Safeguard ryegrass on the causative organisms of ARG are to be done in the first quarter of 2004.
- Meaningful evaluations of the establishment of twist fungus, its affect on the causative organisms of ARG and its interaction with the Safeguard ryegrass will not be possible until the second year of the project.
- It was observed that in early November sheep grazed the Italian ryegrass in preference to the Safeguard ryegrass.