Lower EP Spring Crop Walk

8 September 2020

Brought to you by the Medium Rainfall RD&E Committee

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Program

Meet at Cummins Oval from 8am, departing by 8.15am.

1. 8.30am
   Kenton Porker and Andrew Ware
   Resetting phenology
   Slater's Lane, Yeelanna (Mark Modra)

2. 9.30am
   Jake Giles
   Resilient EP soil moisture probe site
   Glover Road, Yeelanna (Jordan Wilksch)

3. 10am
   Dave Davenport and Brett Masters
   Deep ripping
   3919 Brooker Road, Brooker (Jason Challinger)

4. 11.15am
   Peter Boutsalis
   Weed survey results, new chemicals
   Chinmina Hill Road, Cockaleechie (Josh Telfer)

5. 12pm
   Bruce Morgan, Naomi Scholz
   AIR EP update, thanks and close
   Chinmina Hill Road, Cockaleechie

Speaker contact list

Kenton Porker	SARDI	0403 617 501
Andrew Ware	EPAG Research	0427 884 272
Jacob Giles	EPAG Research	0431 326 717
David Davenport	Davenport Soil Consulting	0477 270 106
Brett Masters	PIRSA Rural Solutions SA	0428 105 184
Peter Boutsalis	Plant Science Consulting P/L	0400 66 44 60
Bruce Morgan	Medium Rainfall RD&E Committee	0427 872 038
Naomi Scholz	AIR EP	0428 540 670

What is AIR EP?

AIR EP is a dynamic farmer driven group that drives locally relevant, independent research and extension for farming systems on the Eyre Peninsula (EP). AIR EP has a membership of 350+ local farmers and agribusiness representatives and plays a key role in influencing the adoption of new and innovative farm practices in the region.

AIR EP brings together and builds on the strengths of EPARF and LEADA. This move has been made to ensure the region is well placed to respond the changing scene of funding and requirements for accountability, providing even more value for farmers as they respond to the challenges of farming in an ever-changing environment.

AIR EP holds a range of events throughout the year to inform and discuss latest trends in research and development in farming systems, including the annual Expo held in March, a technical Member Day and the Spring Field Walk in August/September.

2020/2021 Focus

AIR EP is leading the new 'Resilient EP' project, where new and emerging technologies will be used to assist farmers make efficient use of soil moisture. The Eyre Peninsula has an extensive soil moisture probe network which is underutilised. A Regional Innovators group of farmers and advisers will engage researchers and link with the region's farmers to develop techniques to integrate information generated from the probe network, satellite imagery, climate and yield models. Farmers will be able to make more informed, timely decisions underpinned by innovations in agronomy and livestock management in order to optimise the region's productive potential whilst protecting soil and water resources in a changing climate. This project is funded by the Australian Government's National Landcare Program 2, Smart Farming Partnerships Program, and we are partnering with CSIRO, Regional Connections, SARDI, Square V and EPAG Research to deliver this exciting and ambitious project.

AIR EP is also excited to be partnering with SAGIT and EPAG Research to improve the capacity of grains research, development and extension in the Eyre Peninsula region by annually engaging a recent graduate to work as an intern – this program will expose a new graduate to a wide range of opportunities and experiences across EP and beyond.

AIR EP has a range of other projects that will be continuing in 2020/21 including:

- Pulse check groups to increase the knowledge of growers and advisers on sustainable pulse production
- Developing knowledge and tools to better manage herbicide residues in soil
- Increasing production on sandy soils
- Demonstrating and validating the implementation of integrated weed management strategies to control barley grass
- Using soil and plant testing data to better inform nutrient management and optimise fertiliser investments
- Taking South Australian Canola profitability to the next level

AIR EP Board Members:

The seven skills-based Board members are Bryan Smith (Chair, Coorabie), Greg Arthur (Adelaide), Andrew Polkinghorne (Lock), Ken Webber (Port Lincoln), Bill Long (Tooligie Hill), John Richardson (Tumby Hills) and Greg Scholz (Wudinna).

There are two sub-committees of the AIR EP Board to provide local input into project planning and develop priorities for RD&E, keep track of local projects and provide feedback on progress; organising local field days and forums and communicating with local members.

The **Medium Rainfall RD&E Committee** covers lower and parts of Eastern Eyre Peninsula and comprises Bruce Morgan (Chair), Ex-LEADA Committee members, researchers and advisors.

For more information, please contact Executive Officer Naomi Scholz, eo@airep.com.au or 0428 540 670.

AIR EP | Ag Innovation & Research Eyre Peninsula

Jacob Giles: Resilient EP project

ResilientEP
For a profitable farming future

Aim: The existing Eyre Peninsula soil moisture probe network and other technologies will be used to assist farmers make efficient use of limited soil water. A Regional Innovators group of farmers and advisers will engage researchers and link with the region's farmers to develop techniques to integrate information generated from the probe network as well as satellite imagery, climate and yield models, in a user friendly format to help make more profitable decisions.

Regional Innovators Group
Bill Long, farm consultant, farmer
George Pedler, farm consultant
Josh Hollitt, farm consultant
Ed Hunt, farm consultant, farmer
Michael Hind, farm consultant
Andy Bates, farm consultant
Jake Hull, farm manager
James Cant, farmer
Matt Cook, farmer
Dan Adams, farmer
Jordy Wilksch, farmer
Pat Head, industry researcher

Project Contacts
Andrew Ware, EPAG Research
Therese McBeath, CSIRO
Mark Stanley, Regional Connections
Amanda Cook, SARDI, Minnipa Agricultural Centre
Peter Hayman, SARDI Climate Applications
Naomi Scholz, Executive Officer, AIR EP
Susan Stovell, Landscapes EP Board

THIS IS AN AIR EP PROJECT

AIR EP
Ag Innovation & Research
Eyre Peninsula

Follow the project progress
and get involved at www.airep.com.au

@ag_eyre, #Resilient_EP

This project is funded by the National Landcare Program 2,
Smart Farming Partnerships Program

FUNDED BY

Australian Government
National Landcare Programme

PARTNERS

Government of South Australia
Primary Industries and Regions SA
SARDI
South Australian Research and Development Institute
CSIRO
Regional Connections
SquareV
EPAG Research

David Davenport: Increasing adoption of new techniques combining physical, chemical and plant based interventions to improve soil function on Eyre Peninsula

Site: J. Challinger

Location: Brooker. 34.06’14S 135.54’17E.

Soil Type: Sand over clay

Treatments applied: All treatments except the nil were ripped with “deep” inclusion plates

No. T	Treatment	Detail	Comment
1	Nil	Control	
2	Rip only	Rip with inclusion plates to 40 cm	4 tynes @ 60 cm centres.
3	Nutrients*	UAN (N 42 kg/ha), Phosacid (P 26.9 kg/ha), Cu (2 kg/ha), Zn (5 kg/ha), Mn (7 kg/ha)	Macro-nutrients matching Neutrog, Traces applied as sulphates
4	Biochar HR + Nutrients**	Biochar @ 680 kg/ha	Nutrients applied as T3
5	Biochar LR + Nutrients**	Biochar @ 200 kg/ha	Nutrients applied as T3
6	Biochar	Biochar @ 680 kg/ha	
7	Cereal straw + Nutrients**	Cereal straw pellets @ 1000 kg/ha	Nutrients applied to match T3
8	Manure	Neutrog manure @ 1000 kg/ha	Traces applied to match T3

*Nutrients applied as liquids in furrow and then ripped

**Nutrients sorbed to product prior to placement in furrow and then ripped

Product specifications

Product	N (g/100g)	P (g/100g)	C (g/100g)
Phosphoric Acid 85% FCC		26.9	
UAN	42	N/A	
Cereal straw pellets	6	0.05	43
Biochar	N/A	N/A	
Manure	4	1.4	63

The trial comprises 8 treatments replicated three times (Figure 1.) Plots are 2 m x 30 m with the ripping conducted @ 2.3 m centres. Some damage was caused by wind erosion reducing plant numbers in the south-eastern corner of the trial.

South
Cnr peg

Plot no	Treatment 2/4/20	Detail
1	Nil	Pegs placed at start and end of ripping
2	Nutrients + Rip	39 m to LRT
3	Rip	Plots @ 2.3 m centres
4	Neutrog + Rip	
5	Cereal straw + nut + Rip	
6	Biochar + Rip	

	7	Biochar HR + Nut + Rip	
	8	Biochar LR + Nut + Rip	
	9	Biochar HR + Nut + Rip	
	10	Nutrients + Rip	
	11	Biochar LR + Nut + Rip	
	12	Cereal straw + nut + Rip	
	13	Rip	
	14	Biochar + Rip	
	15	Neutrog + Rip	
	16	Nil	spray track 3 m
	17	Biochar HR + Nut + Rip	
	18	Neutrog + Rip	
	19	Cereal straw + nut + Rip	
	20	Biochar LR + Nut + Rip	
	21	Nutrients + Rip	
	22	Rip	
Peg	23	Biochar + Rip	
	24	Nil	

Figure 1. Site Plan (plot 1 on the southern side)

Plant counts and soil water and mineral N levels were collected at the 2-3 leaf stage. Plant numbers were generally lower on ripped treatments (Table 1.)

Table 1. Plant numbers 2-3 leaf stage

Treatment	Average plant numbers/m row
Nil	29
Rip	28
Nutrients + Rip	25
Cereal straw + nut + Rip	22
Neutrog + Rip	28
Biochar + Rip	23
Biochar LR + Nut + Rip	24
Biochar HR + Nut + Rip	24

There was very little difference in soil water between treatments with levels in the 0-10 cm all being 5-6% and in the 10-40 cm ranging from 9-13 % by weight.

Mineral N levels were highly variable with the control recording higher levels of ammonium even when compared to other treatments that had additional N applied (Figure 2). The reasons for this are not clear.

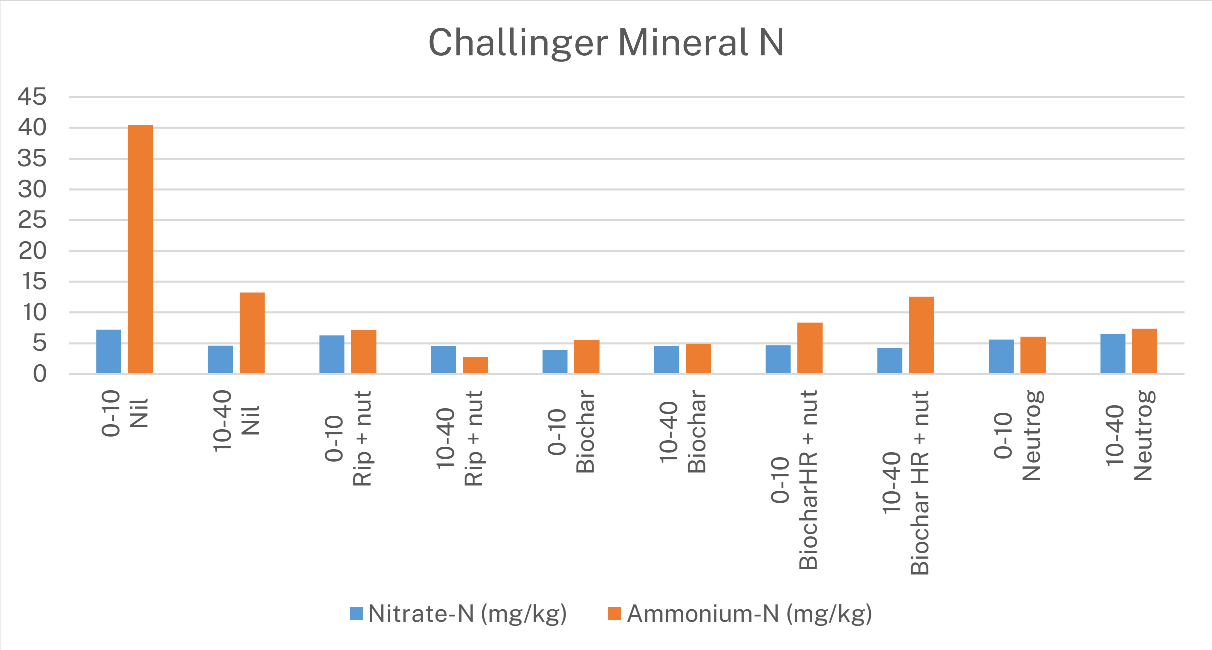


Figure 2. Mineral N at germination

Enzyme Assay

Measurement of enzymes was conducted at NSW DPI on the nil and Neutrog treatments. Enzymes analysed were those involved in P, N, S and carbon cycling (Table 2.)

Table 2. Enzyme Description

Enzyme Codes	**Enzyme substrate**	**Representative Enzyme**	**Representative nutrients cycled**	Comment
NAG	4-Methylumbelliferyl N-acetyl-β-D-glucosaminide	Chitinase	C, N	Chiton in fungal cell and insects
P	4-Methylumbelliferyl phosphate	Phosphatase	P	General indication of cycling ATP and is an indicator of general microbial activity
S	4-Methylumbelliferyl sulfate	Arylsulfatase	S	Sulphur mineralisation
GLC	4-Methylumbelliferyl β-D-glucopyranoside	Glucosidase	C	Similar to Phosphatase
LEU	L-Leucine 7-amido-4-methylcoumarin	Aminopeptidase	N	Similar to Phosphatase but may be a better indicator of N mineralisation
ACE	4-Methylumbelliferyl acetate	Esterase (non-specific)	C (microbial activity)	General measure of microbial activity

Results showed clear depth stratification with much lower levels of all enzymes in the A2 horizon (10-40 cm) on the nil treatment compared to the 0-10 cm layer. However, ripping with the addition of Neutrog pellets dramatically increased all enzymes in the 10-40 cm layer (Table 3). This is consistent with other similar sites in this project.

Table 3. Enzyme assay (mmol/g/h)

Treatment	**Depth**	**NAG**	**P**	**S**	**GLC**	**LEU**	**ACE**
Nil	0-10	0.74	2.35	0.03	1.22	0.22	7.53
Nil	10-40	0.07	0.56	0.01	0.11	0.07	0.49
Neutrog	0-10	0.75	1.83	0.02	0.71	0.17	4.87
Neutrog	10-40	0.62	1.42	0.02	0.57	0.15	2.21

Biomass

Dry matter cuts were taken on 1/9/20. Due to the impact of erosion on the southern replicates cuts were only taken on Rep 3. Ripping alone delivered a major increase in biomass with mixed results from the other treatments (Figure 3).

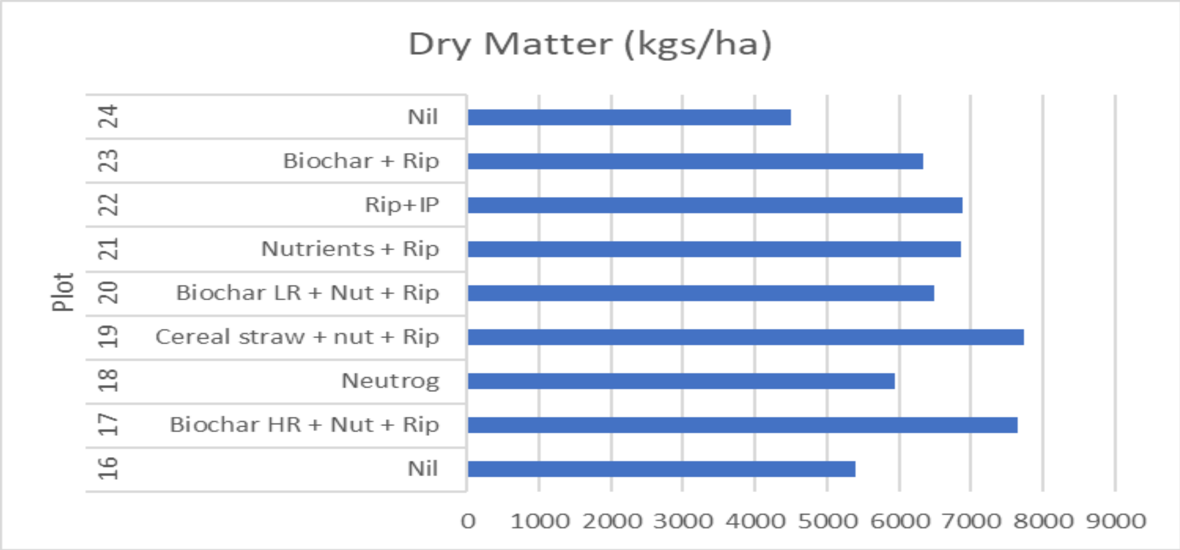


Figure 3. Biomass replicate 3.

Future analyses

- Soil organic carbon (Walkley Black)
- Yield
- Bulk density and soil chemistry post-harvest

Acknowledgements

The project would like to thank Jason Challinger for his involvement on the site, NSW DPI for analyses and the project Steering Committee; George Pedler, John Richardson, Bruce Morgan and Brett Masters.

Funded by:

Australian Government | National Landcare Programme

Brett Masters: Lucerne Rate Response Trial Site, Brooker

Host Farmer: Jason Challinger, Brooker SA

Funded By: GRDC Sandy Soil *CSP00203*

Project Title: Increasing production on Sandy Soils in low and medium rainfall areas of the Southern region

BACKGROUND & OBJECTIVES

Trials in South Australia have shown that incorporating high rates (10 to 20 t/ha) of organic amendments (OA) into underperforming sands can improve crop growth and increase grain yields but in many cases treatment costs have not been recovered. This trial aims to define the shape of the response curve to increasing rates of incorporated lucerne pellets on crop performance, and measure the residual value of the applied OA on crop growth and grain yield so that the cost benefits of such options can be more accurately estimated.

SITE CHARACTERISTICS

- Target soil was a siliceous sand in the medium rainfall zone of at least 50 cm deep (to avoid complications from B horizon material confounding the amelioration results).
- The Brooker site has very low OC, is moderately acidic in the A1 (5.1 $CaCl_2$ in 0-10 cm and 5.0 in 10-20 cm) and has low fertility for many nutrients.
- The site has an estimated water limited yield potential of 5.1 t/ha, but rarely achieves 2 t/ha.
- Although the site exhibits surface water repellence all except the untreated control were spaded which was expected to reduce repellency for at least the first year.

TRIAL DESIGN AND METHODOLOGY

Lucerne pellets (at rates of 1 to 20 t/ha) were incorporated to 30 cm using a rotary spader prior to seeding in 2019. Four OA treatments (0, 4, 8 and 15 t/ha) were replicated to compare OA rates and also against a spaded nutrient fertiliser treatment, formulated to match the essential nutrients in the 4 t/ha OA treatment. Five rates of OA (1, 2, 6, 10 and 20 t/ha) were not replicated but provide extra data points to map the response curve.

Treatments	**2 t/ha OA**	**10 t/ha OA**
Unspaded control (0 t/ha OA)	4 t/ha OA	15 t/ha OA
Spaded control (0 t/ha OA)	6 t/ha OA	20 t/ha OA
1 t/ha OA	8 t/ha OA	Sp + NuPak (0 t/ha OA)

2019 RESULTS AND OBSERVATIONS

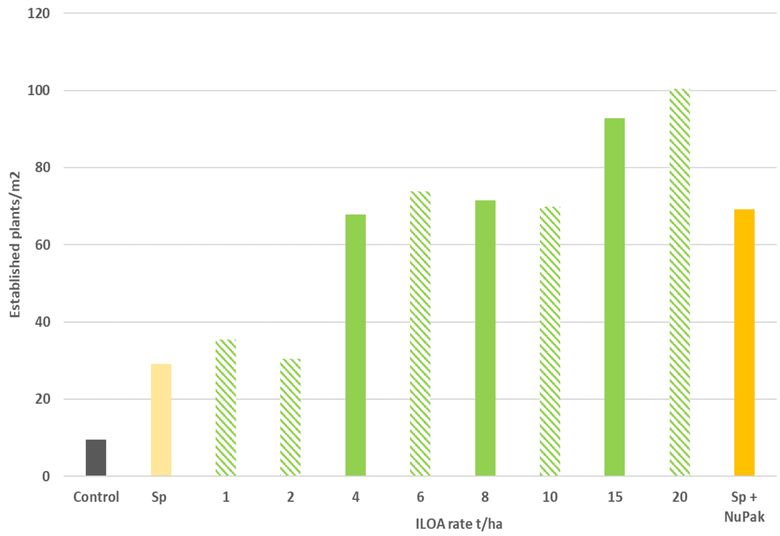


Figure 1. Wheat establishment (plants per sq m); control was not spaded, Sp was spaded but had no OA. Sp + NuPak is a fertiliser treatment estimated to supply similar nutrients to 4 t/ha of OA in the first year.

The trial was sown to wheat (Razor CL) in May 2019. Very severe water repellence reduced **crop establishment** drastically (Fig 1) except where higher rates of OA (above 2 t/ha) or fertiliser had been used. All treatments received starter N and P fertiliser. Fertilisers applied at sowing and in-crop were adjusted for each treatment to match likely crop demands during the season and also allowing for the available nutrients present

Early Season Crop Performance

- Heavy annual ryegrass populations were not controlled by a range of herbicides, including Intervix, and only the highest rate of OA provided sufficient crop competition to supress the ryegrass.
- Soil tests suggested that K deficiency should have been severe but an early season application of K to split plots had no consistent effect on crop performance. Cu, Zn and Mn were applied to the whole trial as a foliar spray mid-season

Crop vigour throughout the season was improved with increasing rates of OA, following the same pattern as at crop establishment (Figure 2).

Control 15 t/ha of OA **Sp + NuPak 20 t/ha of OA**

Figure 2. Growth differences between control and high OA rates, Spring 2019.

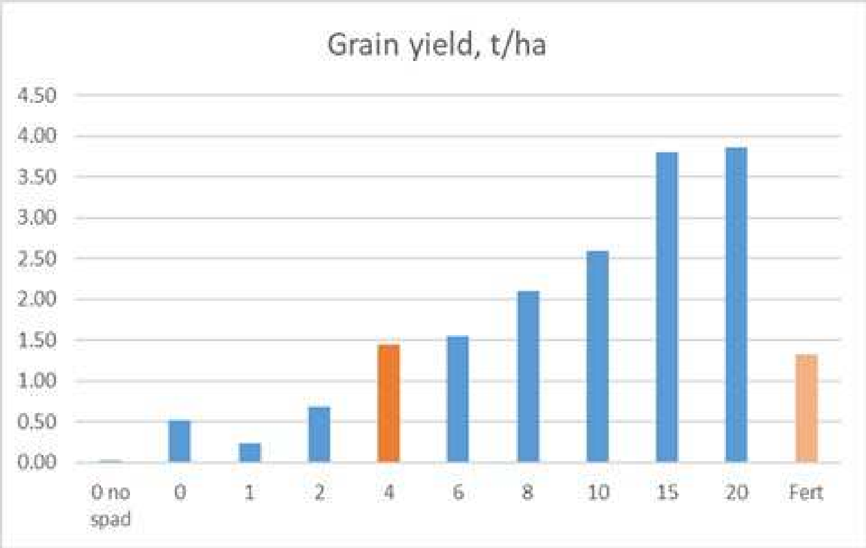


Figure 3. Wheat grain yield (t/ha) response to increasing rates of OA (Brooker, 2019).

Plots were machine harvested on 21 November 2019 (Figure 3). Crop production without amendments completely failed (grain yields less than 0.1 t/ha). Spading increased yields to 0.5 t/ha, whilst once OA rates exceeded 2 t/ha yields increased almost linearly (with yield gains of 1 t/ha achieved for every 5 t/ha of added OA), until a yield plateau appeared beyond 15 t/ha (Figure 4). Mineral fertiliser (Sp+NuPak) produced a similar yield to 4 t/ha of OA, adding nearly 1 t/ha to spading only.

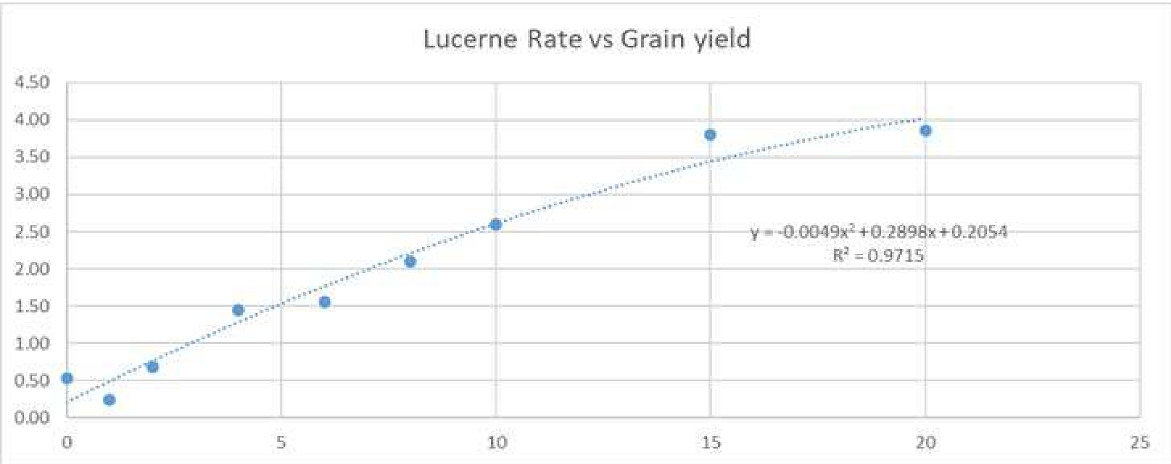


Figure 4. Relationship between wheat grain yield (t/ha) at Brooker in 2019 in repsonse to increasing rates of OA (t/ha).

None of the OA rates used were profitable based on first year results (Extra fertiliser was more profitable than its equivalent rate of OA in this first year and similar large responses will be required in subsequent years to recover costs) but some early observations from one year of grain yield data suggest;

- Using less than 4 to 5 t/ha of N-rich OA may not provide an economic benefit in a high production environment but that;
- An almost linear increase in grain yield was achieved with increasing rates of lucerne pellets between 4 t/ha and 15 t/ha, however;
- Using more than 15 t/ha may not provide additional benefit over 4 to 10 t/ha rates in high production environments.

NORTH

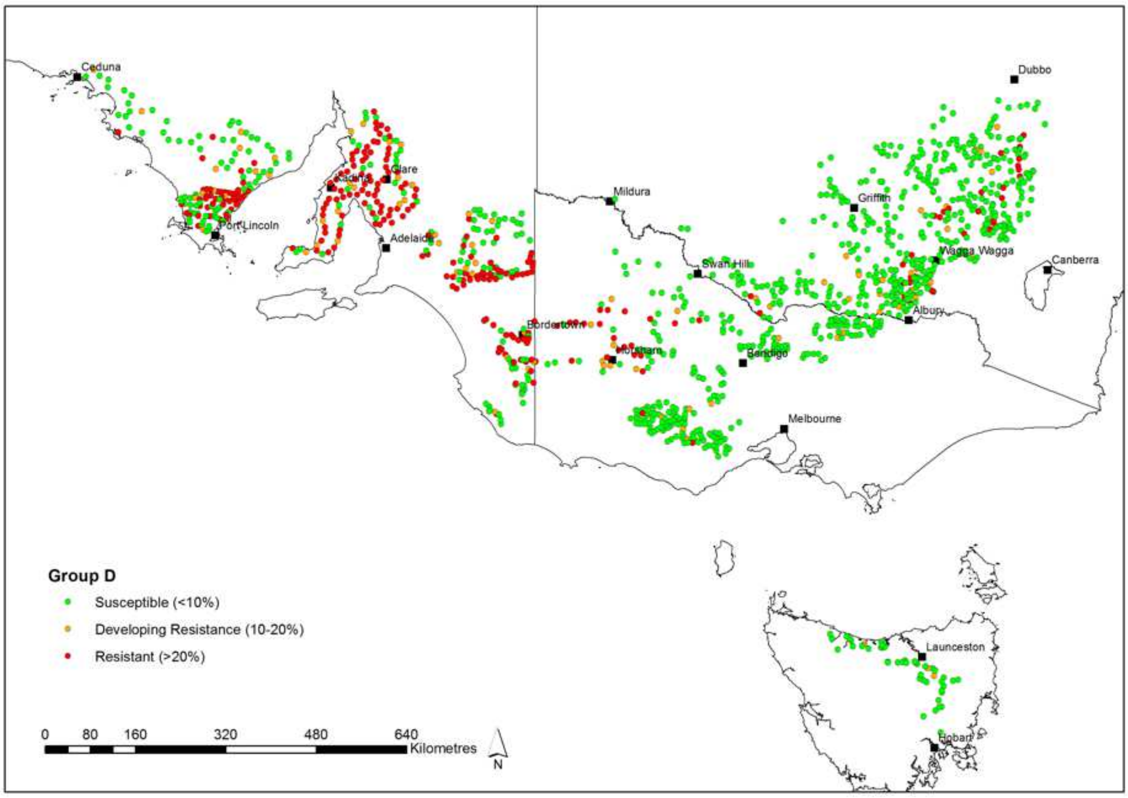
PLOT #	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
TREATMENT	**Buffer**	**7**	**2**	**1**	**11**	**9**	**5**	**3**	**8**	**6**	**9**	**1**	**5**	**11**	**7**	**2**	**4**	**10**	**11**	**5**	**2**	**7**	**1**	**9**	**Buffer**
Lucerne Pellets (OA) (t/ha)		8	0	0	0	15	4	1	10	6	15	0	4	0	8	0	2	20	0	***4***	***0***	***8***	***0***	15	

NB. Yellow shading denotes end of plot which had extra K applied mid-season 2019 and 2020.

CSP00203 Sandy Soils is funded by the GRDC and is a collaboration between the CSIRO, University of South Australia, South Australian Department of Primary Industries and Regions, Mallee Sustainable Farming Inc., Trengove Consulting and AgGrow Agronomy (NSW). We acknowledge the strong support and collaboration of Jason Challinger, farmer co-operator at the site as well as Agricultural Innovation and Research Eyre Peninsula, MacKillop Farm Management Group and Frontier Farming Systems (Vic). With thanks to project team; Nigel Wilhelm and Ian Richter (SARDI), Lynne MacDonald and Therese McBeath (CSIRO), Mel Fraser, Brett Masters, David Davenport, Bart Dessart (PIRSA) for collection and collation of data.

Peter Boutsalis: Efficacious use of pre-emergence herbicides

Trifluralin



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Diversify and Disrupt – Conquer weeds with the Big 6

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% of paddocks with resistant ryegrass

Table 1. Extent of resistance in annual ryegrass collected in random surveys across the Lower Eyre Peninsula in 2009, 2014 & 2019 and treated with recommended field rates. Populations were considered resistant if survival was ≥ 20% in outdoor pot trials conducted the following autumn-winter of each survey.

Lower Eyre Peninsula	2009	2014	2019
Trifluralin	10	51	66
Kerb	-	0	0
Avadex	-	3	33
Boxer Gold	-	0	4
Sakura	-	0	1
Hoegrass	66	73	84
Sulfonylurea	87	85	97
Intervix	70	53	97
Axial	64	32	71
Select 500ml/ha	-	7	14
Glyphosate	-	1	1 (23%)
Paraquat	-	-	0

ryegrass infestation (% of paddocks)

Region	High	Medium	Low
SW Vic	34	21	45
Lower Eyre Pen	22	24	54
Upper Eyre Pen	16	27	56

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#WeedSmartWeek

% of paddocks with resistant ryegrass

Table 1. Extent of resistance in annual ryegrass collected in random surveys across the Lower Eyre Peninsula in 2009, 2014 & 2019 and treated with recommended field rates. Populations were considered resistant if survival was ≥ 20% in outdoor pot trials conducted the following autumn-winter of each survey.

Upper Eyre Peninsula	2009	2014	2019
Trifluralin	1	10	17
Kerb	-	0	0
Avadex	-	0	3
Boxer Gold	-	0	0
Sakura	-	0	0
Hoegrass	2	10	19
Sulfonylurea	71	75	79
Intervix	30	39	88
Axial	3	0	8
Select 500ml/ha	-	0	0
Glyphosate	-	0	8 (28%)
Paraquat	-	-	0

ryegrass infestation (% of paddocks)

Region	High	Medium	Low
SW Vic	34	21	45
Lower Eyre Pen	22	24	54
Upper Eyre Pen	16	27	56

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New ryegrass pre-em herbicides- offer new MoA

Code/Product name	Chemical Name	Mode of Action	Registration	Selectivity	Weed control
BASF: Luximax®	Cinmethylin	T	2020	Wheat	Grasses
ADAMA: Ultro®	Carbetamide	E	2021	Pulses	Ryegrass, brome, barley grass
Devrinol-C®	Napropamide	K	2020	Canola	Ryegrass
Overwatch®	Bixlozone	Q	2021	Wheat, barley, canola	Grasses & broadleaf weeds
Mateno Complete	Aclonifen*	?	2023	Cereals	Grasses & broadleaf weeds

* Aclonifen is a key component of Mateno Complete, a new herbicide co-formulation under development by Bayer

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Diversify and Disrupt – Conquer weeds with the Big 6

Pre-em herbicides are 1 tool in the toolbox

- Expose as few individuals as possible to pre-emergence herbicides
    - Proactive → include tactics- knockdowns, seed capture, hay, resistance testing

- Herbicide rotation:

  Because ryegrass has a 2 year life, a 2 year herbicide rotation using the same MoA herbicide
  → can result in exposure of same cohort to the same MoA herbicide
  → greater chance to select for resistance

- Herbicide mixtures
    - Full label rates of different MoA herbicides
    - Greater chance to control metabolic resistance

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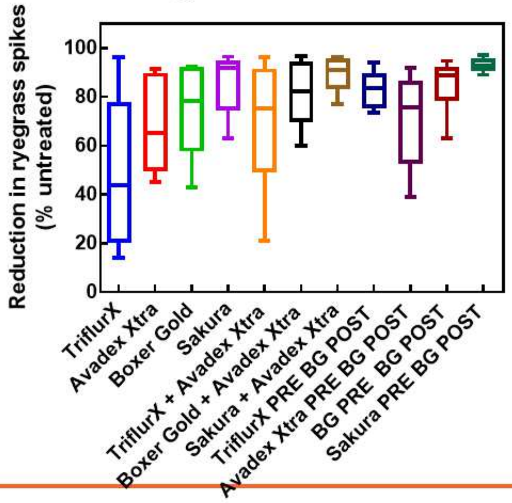
Diversify and Disrupt – Conquer weeds with the Big 6

Herbicide combinations with pre-em's for ryegrass control in high rainfall zone



- Sakura- more consistent
- Mixtures or sequences better
- Best = Avadex + Sakura
- Best = Triflur or Sakura followed by Boxer Gold early post.

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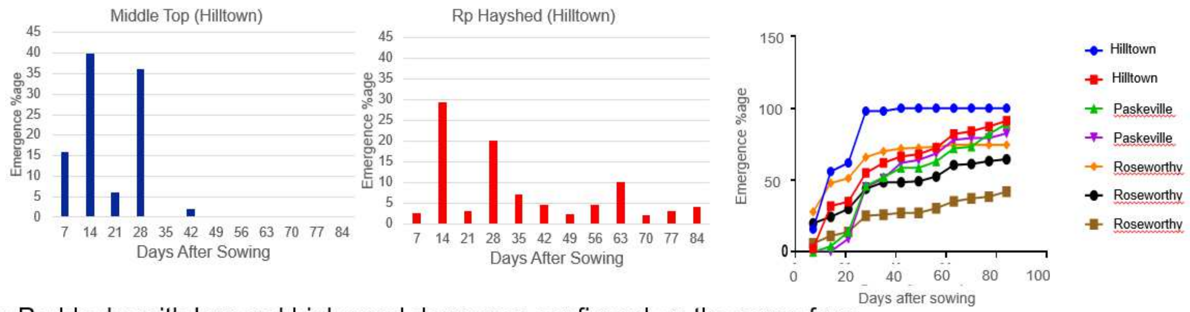
Variation in emergence pattern of ryegrass



- Paddocks with low and high seed dormancy confirmed on the same farm
- Dormancy does not seem to be related to regions
- Suspect its driven by management practices

Data courtesy of Zarka Ramiz & Gurjeet Gill

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Diversify and Disrupt – Conquer weeds with the Big 6

Summary

Ryegrass is challenging due to complex herbicide resistance

Enhanced metabolic resistance is complex

Quantification of the magnitude of resistance has resulted into R & D of new mode of action herbicides

Use them effectively in conjunction with 'The big 6'

Peters Recommendation → Big '7' → Test- know your resistance levels

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