GRDC
GRAINS RESEARCH & DEVELOPMENT CORPORATION

2019 GRAINS RESEARCH UPDATE, Perth

25th and 26th February, 2019

Crown Perth, Burswood

grdc.com.au

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Welcome – GRDC Western Panel Chair

GRDC Western Region Panel Chair, Darrin Lee

Welcome to the 2019 Grains Research and Development Corporation (GRDC) Grains Research Update, Perth – Western Australia's premier annual grains research forum.

Attended by hundreds of growers, agronomists, advisers, researchers and other industry personnel, this event showcases the latest research and development results that are relevant to the State's almost $7 billion export-focused grain industry.

Strategies to manage production constraints and improve profitability are constantly evolving and to ensure they remain profitable, the advice and recommendations made to growers must be constantly reassessed and updated.

The 2019 Grains Research Update program is carefully refined each year to ensure the subjects addressed are those that are front and centre for local growers, to help them navigate the coming growing season and beyond.

We are pleased to be able to present a line-up of respected speakers who will address a wide range of topics that impact on the bottom line of farm businesses.

'Innovation – applying grains R&D on farm' is one of the themes of the event and leading a discussion of precision post-emergence control of target weeds in green crops will be Guillaume Jourdain, the co-founder and chief executive officer of French technology startup company, Bilberry.

Other keynote speakers on the theme of innovation will be Canadian grain and oilseed producers Jordan and Jennifer Lindgren, Saskatchewan's Young Farmer of the Year Award winners for 2018. The Lindgrens aim to maximise crop production, while minimising costs, by using field scale trials to determine which products, genetics and practices work on their farm.

Speaking about on-farm grain storage will be grower and Nuffield scholar Andrew Freeth, of Gilgandra, New South Wales, and agricultural engineer Ben White, who is the Kondinin Group's research manager, editor of *Farming Ahead* magazine and a member of the GRDC's Grain Storage Extension team.

Sarah Nolet, of AgThentic, and Natasha Ayers, of AgriStart, will continue the innovation theme on day two when they address the topic 'Creating the conditions for innovation to thrive: How we bring the right people together to get great ideas to market'.

On the second theme of 'The big picture – what our export customers want', Bunge Asia distribution director William Syers will talk about the future demand for Australian grains in North East and South East Asia.

Australian Export Grains Innovation Centre (AEGIC) chief executive officer Richard Simonaitis will address the topic of 'Technical support for the Indonesian wheat industry – our single biggest wheat customer'.

In addition to keynote presentations, concurrent sessions will be held over the two days of the GRDC Grains Research Update, Perth, addressing several issues with practical, on-farm application. Extended focus sessions will address a number of topics, including in the area of innovation.

The ability to network with many industry people is an important feature of the event, and I encourage you to take advantage of the opportunity to speak with the broad range of industry people who will be here.

Please also take the chance to chat to GRDC staff and Western Region Panel members while you are here. The GRDC values your feedback and input on any issues impacting on grower profitability.

This event would not be the success it is without the support of its many sponsors including Premium Sponsors AEGIC; CBH Group; the Department of Primary Industries and Regional Development (DPIRD); TruFlex™ Canola; and Rocks Gone.

I would also like to thank the excellent work of GRDC western region staff and the Grain Industry Association of WA in coordinating and delivering this flagship event on behalf of the GRDC.

I trust you find the 2019 GRDC Grains Research Update, Perth, engaging, informative and inspiring.

Darrin Lee

GRDC WESTERN REGION PANEL CHAIR

2019 Grains Research Update, Perth

Hosted by:

GRDC
GRAINS RESEARCH & DEVELOPMENT CORPORATION

GRDC would like to acknowledge all 2019 Grains Research Update, Perth Sponsors

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Need Information?

Registration Desk

The Registration Desk will be manned during the entire two day program. Please feel free to approach members of the GIWA team with any questions or assistance you may require.

Presentations and papers

This Program Book contains abstracts of presentations at the 2019 Grains Research Update, Perth to enable you to select which presentations you wish to attend and provide key messages for each presentation.

Papers in support of presentations, as and when available, can be accessed via the GRDC website (**grdc.com.au/resources-and-publications/grdc-update-papers**) and GIWA website (**www.giwa.org.au/2019researchupdates**).

PowerPoint presentations will be made available on the GIWA website, as and when available by presenters following the event, unless not approved.

Speakers Corner

Speakers Corner, proudly sponsored by AEGIC, is a feature at the Grains Research Update, Perth and is located in the catering and Exhibition Hall (Grand Ballroom 2). During the catering breaks, you can catch up with speakers who presented during the immediate previous sessions. Come along to ask the questions you did not get time to ask in the session.

Focus Sessions

A feature of Tuesday's program is the opportunity to attend one of five Focus Sessions. These sessions are designed to enable a more in-depth discussion with experts in these fields than is possible during the concurrent sessions. Further details can be found in this Program Book.

List of Attendees

Included in your satchel bag is a list of attendees and sponsors supporting the 2019 Grains Research Update, Perth. This list will assist with networking and making contacts with industry colleagues.

Wifi

Complimentary WiFi is available for all attendees.
WiFi connection details will be provided during the Plenary sessions.

Join the conversation:

@GRDCWest @theGRDC

#GRDCUpdates

Charging Station

A mobile device Charging Station will be available in the foyer near the main Plenary Room (Crown Ballroom 1), this is kindly sponsored by TruFlex™ Canola.

Fuel for the body and mind — Catering breaks

The Exhibition Hall and catering stations are located in Grand Ballroom 2 and is your home away from home during the two days. This is where catering for morning tea, lunch and afternoon tea will be served.

Catering breaks will feature a unique Western Australian flavor for morning tea and lunch.

Please note, if you have any dietary requirements you have already made us aware of, there will be a special dietary catering station at the very back of the Exhibition Hall.

Coffee Carts

Nothing beats a caffeine boost. Coffee Carts, proudly sponsored by Rocks Gone, are located at the front and back of the Exhibition Hall in Grand Ballroom 2.

Networking Event – Day 1

The Networking Event on Monday evening is kindly sponsored by the CBH Group and will be held in the Exhibition Hall (Grand Ballroom 2). Take the time to chat with the exhibitors, old friends and make some new ones.

GIWA Breakfast – Day 2

The GIWA breakfast on the morning of Tuesday 26th is sponsored by the Department of Primary Industries and Regional Development.

Tickets are included in Full Package Registrations. Additional tickets can be purchased from the Registration Desk for $70.00.

Details:

7.15am start — Crown Ballroom 1 (Plenary Room)

Speakers and Sponsors Thank You Refreshments – Day 2

Following the Focus Sessions on Tuesday, join us for refreshments from 4.30pm to 5.30pm to thank all the Research Updates speakers and sponsors in the foyer outside the three concurrent rooms, Ballroom 3A, 3B and 3C. This final networking opportunity will feature craft beer tasting.

We value your Feedback

We aim to continually improve each Research Update event and welcome your thoughts to help us improve. Please complete the Report Card located in your satchel bag from the first presentation you attend. If you prefer you can access the Report Card on Survey Monkey during or post the event, details to be provided by email and during sessions.

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Program DAY 1 — Monday 25th February 2019

8.00 am	**Registration & Coffee**	
9.00 am	**PLENARY 1 — Crown Ballroom 1**	
	9.00 am	**Welcome and opening of Updates** — John Woods, Chairman GRDC
	9.10 am	**GRDC investments in R D&E benefiting WA growers** — Steve Jefferies, Managing Director GRDC
	9.25 am	**'Seed of Light' presentation** — John Woods, Steve Jefferies and Darrin Lee, Chairman, GRDC Western Panel
		THE BIG PICTURE — what our export customers want
	9.35 am	**The future demand for Australian grains in North East and South East Asia** William Syers, Bunge Asia
	10.05 am	**Technical support for the Indonesian Wheat Industry — our single biggest wheat customer** Richard Simonaitis, AEGIC
10.40 am	**Morning Tea**	
11.10 am	**PLENARY 2 — Crown Ballroom 1**	
		INNOVATION — applying grains R&D on farm
	11.10 am	**On-farm storage and the grain supply chain** Andrew Freeth, Gilgandra NSW and Ben White, Kondinin Group
	11.40 am	**Precision post emergence control of target weeds in green crops** Guillaume Jourdain, Bilberry, France
	12.10 pm	**Observations from the 2018 Saskatchewan Young Farmer of the Year Award winners** Jordan and Jennifer Lindgren, Saskatchewan, Canada
12.40 pm	**Lunch**	

This program may be subject to change.

(Program for Day 1 continued following page...)

www.giwa.org.au/2019researchupdates **grdc.com.au**

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Program DAY 1 — Monday 25th February 2019 *(continued)*

1.40 pm	SESSION 1 — Wheat	SESSION 2 — Grain quality – lessons from our markets	SESSION 3 — Nutrition management	SESSION 4 — Weeds
	Wheat variety update — 2018 season and NVT results Dion Nicol, DPIRD	**Why do one percenters matter so much; even for grain quality?** Ross Kingwell, AEGIC	**iLime – farming for the long term** James Fisher, Désirée Futures	**A 'focus farms' survey in the Kwinana West reveals herbicide resistance levels in champion farmers' paddocks: what's next?** Roberto Busi, AHRI; and **Harvest weed seed destruction – does it work for great brome grass and barley grass?** Catherine Borger, DPIRD
2.20 pm	**5 Min Moving**			
2.25 pm	**Which wheats for when and agronomy in early April?** Brenda Shackley, DPIRD	**Quality assessment of Australian oat varieties and their performance in processing Asian oat products** Sabori Mitra, AEGIC	**How digital technologies will assist with nitrogen management** Roger Lawes, CSIRO	**A response tyne for site-specific fallow weed control** Andrew Guzzomi, UWA
2.55 pm	**5 Min Moving**			
3.00 pm	**Understanding the pre-harvest sprouting susceptibility of new wheat varieties** Jeremy Curry, DPIRD; and **Sprouting warning system for WA wheat farmers** Richard Williams, grolQ	**Opportunity for Australia to supply soft wheat for cake and biscuit applications in Asia** Siem Siah, AEGIC	**Tactical nitrogen agronomy for wheat** Dion Nicol, DPIRD	**Biology and management of matricaria** Alex Douglas, DPIRD
3.30 pm	**Afternoon Tea**			
4.00 pm	**SESSION 5 — Frost**	**SESSION 6 — Pulses**	**SESSION 7 — Management of soil constraints**	**SESSION 8 — Disease management**
	Beer is better than porridge and bread in frost-prone landscapes! How early is too early to sow? Ben Biddulph, DPIRD	**Potential for pulses in WA** Jason Brand, Agriculture Victoria and Mark Seymour, DPIRD	**Ten years of managing water repellent soils research in WA – current progress and future opportunities** Stephen Davies, DPIRD	**The incidence of fungicide resistance in spot form net blotch (SFNB) and its implications** Fran Lopez-Ruiz, CCDM; and **New options for managing spot form net blotch (SFNB) in barley** Matt Sherriff, SACOA
4.30 pm	**5 Min Moving**			
4.35 pm	**Mounting evidence that soil amelioration can reduce frost damage on water repellent soils** Tom Edwards and Giacomo Betti, DPIRD	**Experiences in growing pulses in Western Australia** Panel: Two WA growers — Jason Brand, Agriculture Victoria, Mark Seymour and Greg Shea, DPIRD	**How do we define gypsum responsive soils?** David Hall, DPIRD	**Scope for improved profitability of wheat through tactical use of fungicides** Amir Abadi, CCDM
5.05 pm	**5 Min Moving**			
5.10 pm	**We'll all be rooned: rapid provision of weather maps** Anna Hepworth and Meredith Guthrie, DPIRD	**Lupin agronomy for seed production** Martin Harries, DPIRD	**Inversion tillage had a greater long-term effect on grain yield than phosphorus and potassium management on a water-repellent sand** Craig Scanlan, DPIRD	**Barley loose smut – control variety susceptibility and effects on grain yield** Andrea Hills, DPIRD
5.45 to 7.15 pm	**Networking Event**			

This program may be subject to change.

Crown Ballroom 1 | Crown Ballroom 3A | Crown Ballroom 3B | Crown Ballroom 3C | Meeting Room 2

THE 2017-2019 GRDC WESTERN REGIONAL PANEL

JANUARY 2019

GRDC
GRAINS RESEARCH & DEVELOPMENT CORPORATION

CHAIR - DARRIN LEE

Darrin Lee is Managing Director and partner in Bligh Lee Farms, a mixed cropping and livestock farming operation, north-east of Mingenew. He has a keen interest in digital agriculture, implementing a wifi network across the farm, adopting moisture probes, weather stations, remote sensing devices and digital analytics. Darrin has a value-adding project with Albus lupins through a 'paddock to plate' joint venture initiative. He has a background in banking and finance, and is a past member of the CBH Group Growers Advisory Council and previous Board member of Mingenew Irwin Group.

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DEPUTY CHAIR - CHRIS WILKINS

Chris Wilkins is an agronomic and agribusiness adviser based in Badgingarra. He has 28 years' experience in WA agriculture, including 20 years offering farm business, agronomy, farming systems and crop protection advice through his Vision Agribusiness Services company. Chris is also a director of agricultural consultancy business Synergy Consulting WA, and chairs the Council of Grain Grower Organisations Ltd.

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GEMMA WALKER

Gemma Walker and her husband run a 4000 hectare mixed cropping and sheep property near Munglinup, in the state's south-east. In addition, she has worked for many years managing farming systems groups to deliver development and extension activities. These included Mallee Sustainable Farming and the South East Premium Wheat Growers Association. Gemma is on the Board of Partners in Grain, and on the Southern Biosecurity Group, and on the Esperance Organised Purchasing Power Board, and has a Bachelor of Agribusiness (Hons) from Curtin University.

M 0428 751 095 **E** hamiltondowns@hotmail.com

DR GREG REBETZKE

Greg Rebetzke is a wheat geneticist with CSIRO, and is committed to delivering traits and germplasm for improving crop variety water productivity. He works closely with commercial breeders to understand the relative benefits of one trait over another, and how to integrate new genetics more efficiently in the development of higher-yielding, more robust cereals.

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JULES ALVARO

Jules Alvaro is involved in all aspects of the family's 6000-hectare which is predominately a cropping and livestock business which she operates with her husband Pep at Nokanning, Merredin, in WA's Eastern Wheatbelt. Jules is also involved in off-farm roles, including a member of the GRDC Western Panel, Partners in Grain Treasurer and a new member of Western Australia's Muresk Advisory Committee. Jules was awarded a 2019 Growing Leaders Scholarship sponsored by the CBH Group in partnership with the Grower Group Alliance (GGA) and Leadership WA. Jules is a firm believer in farm businesses minimizing their losses in the dry years, maximizing profit in the good years and believes this is imperative in keeping our rural communities strong and viable.

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ANDY DUNCAN

Andy Duncan is business partner in a mixed broadacre family farming business in the West River area on the south coast of WA, producing wheat, malt and feed barley, canola, lupins and field peas. He has been involved with several organisations including the Grains Industry Association of WA (GIWA) Barley Council, the South East Premium Wheat Growers Association, the GRDC Esperance Regional Cropping Solutions Network, and the Ravensthorpe Agricultural Initiative Network.

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MICHAEL LAMOND

Michael Lamond is an experienced hands-on agronomist who started his career in discovery and innovation related to agricultural systems, including herbicide resistance, herbicide systems with minimum tillage, legume rotations, pasture systems, soil acidity and crop variety evaluation. He has run or been a partner in contract research organisations conducting or managing projects for many of the companies that operate in Australia. Michael has worked with many talented agricultural graduates from universities around Australia and has a passion for capacity building for the future in agriculture.

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ROHAN FORD

Rohan Ford farms east of Binnu with his wife Carol, growing wheat, lupins and canola in a low rainfall zone with highly variable precipitation. They have been control traffic farming for more than 15 years, and involved over many years in trial work and projects related to a variety of areas that help improve farming outcomes and increase knowledge in what is an ever-evolving industry. Rohan is also involved closely with the local grower group.

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DR FIONA DEMPSTER

Dr Fiona Dempster is an applied economist with The University of Western Australia, School of Agriculture and Environment, and a farmer at her family's crop and livestock operation in Mingenew. Her expertise is in designing decision tools for environment and agricultural management and identifying the adoption drivers of management practices in agricultural landscapes. Fiona is an active member of Mingenew Irwin Group and the Australasian Agricultural and Resource Economics Society, and sits on the Board of Management for the Mingenew Midwest Expo. Fiona has a Doctorate and Bachelor of Science.

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JULIET MCDONALD

Juliet currently works as an Area Manager for Summit Fertilizers in the North Midlands and provides agronomy based support for nutrient recommendations and conducts R&D to integrate nutrition applications with current farming systems. Juliet lives on a family farming enterprise west of Marchagee and produces grains, meat, wool and PD stud rams. Juliet was previously an Elders Sales Agronomist for Elders, a Grain Pool Area Manager, and started as an Extension Officer with DPIRD. She holds a Bachelor of Science in Agriculture and is qualified as a Fertcare Accredited Adviser. Juliet is passionate about sustainably profitable agriculture and is committed to improving the understanding of agriculture in the wider community.

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BRONDWEN MACLEAN

Brondwen MacLean has spent the past 20 years working with the GRDC across a variety of roles and is currently serving as General Manager for the Applied R&D business group. She has primary accountability for managing all aspects of the GRDC's applied RD&E investments and aims to ensure that these investments generate the best possible return for Australian grain growers. Ms MacLean appreciates the issues growers face in their paddocks and businesses. She is committed to finding effective and practical solutions `from the ground-up'.

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2019 GRAINS RESEARCH UPDATE, Perth

CROWN PERTH, BURSWOOD

GRDC GRAINS RESEARCH & DEVELOPMENT CORPORATION

Program DAY 2 — Tuesday 26th February 2019

7.00 am	**Breakfast Registration**			
7.15 am	**Corporate GIWA Breakfast sponsored by the Department of Primary Industries and Regional Development** **Creating Social Licence in Agriculture in the 21st Century** Linda Eatherton, Director Global Food & Beverage, Ketchum, Chicago			
9.00 am	**SESSION 9 — Farming systems**	**SESSION 10 — Oats and canola**	**SESSION 11 — Management of soil constraints**	**SESSION 12 — Disease management**
	Long-term rotation diversity, but not residue handling, affects wheat yield and protein content Phil Ward, CSIRO	**Oats: grain and hay research** Georgie Troup, DPIRD	**A stocktake of knowledge on soil amelioration tools** David Pannell, UWA	**Tackling Sclerotinia – an insight into the factors influencing disease development** Sarita Bennett and Mark Derbyshire, CCDM
9.30 am	**5 Min Moving**			
9.35 am	**Vetches and their potential in the WA farming systems** Stuart Nagel, SARDI	**Review of 2019 canola yields and phenology** Jackie Bucat, DPIRD	**Lime and gypsum application strategies for increased grain yield** Gaus Azam, DPIRD	**Sclerotinia research update and approaches to in-season management** Ciara Beard and Ravjit Khangura, DPIRD
10.05 am	**5 Min Moving**			
10.10 am	**Strengthen your cropping and mixed farming systems with pastures** Adriano Rossi, DPIRD	**Early sowing of canola – field trials and crop simulation** Imma Farre, DPIRD; and **Can we extend the sowing window of canola in WA?** Martin Harries, DPIRD	**Using EM and gamma to simply map soil types for subsoil constraint management** Yvette Oliver, CSIRO	**Tailored management of Sclerotinia in canola with the SclerotiniaCM app** Art Diggle, DPIRD
10.40 am	**Morning Tea**			
11.10 am	**SESSION 13 — Crop quality topics**	**SESSION 14 — Pest management**	**SESSION 15 — Management of soil constraints**	**SESSION 16 — Disease management**
	Tweaking the management of malt barley for enhanced productivity Blakely Paynter, DPIRD	**Profitable break crops for management of root lesion nematodes (RLN) and *Rhizoctonia solani* AG8** Bec Swift, DPIRD	**Improving the effectiveness of soil amelioration by optimising soil machine interaction** Mustafa Ucgul, University of South Australia	***Turnip yellows virus* epidemic in 2018 – it's time to get one step ahead of the green peach aphid** Ben Congdon, DPIRD
11.40 am	**5 Min Moving**			
11.45 am	**Looking inside grain bags** Aidan Sinnott, SEPWA	**GrainCam – a device for detecting contaminants in grain as it is being harvested** and **Using image analysis to map snails** Svetlana Micic and John Moore, DPIRD	**Getting the edge on improving crop productivity on sandy soils** Therese McBeath, CSIRO	**Ten years of different crop rotations in a no-tillage system – what happened to plant diseases and nematode pests?** Ken Flower, UWA
12.15 pm	**Lunch**			
1.15 pm	**PLENARY 3 — Crown Ballroom 1**			
1.15 pm	**ACCELERATING COMMERCIAL INNOVATION IN THE AG SECTOR** Sarah Nolet, AgThentic and Natasha Ayers, AgriStart			
2.30 pm	**FOCUS SESSIONS**			
	Focus Session 1	**Focus Session 2**	**Focus Session 3**	**Focus Session 4**	**Focus Session 5**
	New research in the understanding and management of fungal diseases Convenor: Mark Gibberd	**Best management and control of weeds** Convenor: David Bowran	**Regional Cropping Systems Network Open Forum** Convenor: Julianne Hill	**New pathways for commercialising Agtech in Australia** Convenor: Steve Thomas and Manjusha Thorpe	**Snail management strategies** Convenor: Ken Young and Georgia Megirian
4.30 pm	**Close**			
4.30 – 5.30pm	**Speakers and sponsors thank you refreshments – Craft beer tasting**			

This program may be subject to change.

Crown Ballroom 1 | Crown Ballroom 3A | Crown Ballroom 3B | Crown Ballroom 3C | Meeting Room 2

2019 GRAINS RESEARCH UPDATE, Perth

Day 1 – Contents

Note: Presenters are listed. Where there are multiple authors of papers full authorship should be taken from the final papers, located on the GIWA website at **www.giwa.org.au/2019researchupdates**, as and when they become available.

Day 2 – Contents

Note: Presenters are listed. Where there are multiple authors of papers full authorship should be taken from the final papers, located on the GIWA website at **www.giwa.org.au/2019researchupdates**, as and when they become available.

2017-2019 WESTERN REGIONAL CROPPING SOLUTIONS NETWORK (RCSN)

JANUARY 2019

In October 2011, the GRDC introduced the five Western Regional Cropping Solutions Networks (RCSN's), based on the WA Port Zones. They meet formally twice a year, tasked by the GRDC to "identify the critical needs to ensure profitability of the grains industry in your Zone".

Each Network comprises of 12 members representing farming, agronomy, agribusiness and research sectors, facilitated by Julianne Hill, and includes a local GRDC panellist to assist in maintaining a two-way communication between the GRDC and the RCSN members.

RCSN members work together to identify and further develop local activities addressing key regional issues. Through the Western Regional Panel and Regional Cropping Solutions Network (RCSN) groups, the GRDC maintains an extensive RD&E ideas-capturing network in WA. This is increasing local engagement, improving the ability to act on grower feedback and enabling better coordination and delivery of RD&E outcomes, products and services.

The GRDC are interested in hearing from all levy payers and others with an interest in the activities and research that will make a difference to the profitability of growers in your local area. So, if you'd like to get some of your ideas across to the GRDC, or would like to highlight an issue for your port zone, then we'd like to see you at one of our upcoming Open Forums which are being held in July at 10 different locations throughout WA. Keep your eye open for upcoming dates and locations.

You also have the chance to represent your area and zone on one of the RCSN groups. There is a two year rolling term for each member (who can re-apply to sit on their port zone RCSN). In March, we will be advertising to fill skills and geographical gaps for some members who will be stepping off their RCSN.

WESTERN REGION RCSN COORDINATOR

JULIANNE HILL

Julianne went on to complete a Bachelor of Business in Farm Management from the University of Sydney. When Julianne and her husband bought their first farm in WA's southern coastal region near Ravensthorpe, Julianne started working for the then Department of Agriculture in the Esperance Zone as a Biosecurity Officer responsible for managing the southern section of the State Barrier Fence and declared pest and weed outbreaks. Moving positions, she became a Farming Systems Development Officer where she was responsible for starting the Jerdacuttup TopCrop Group, and worked closely with the local grower groups, especially RAIN, to develop trials and establish key research sites in the region. After moving to the Bunbury Department of Agriculture office, Julianne established grower groups to look at the cost of production and benchmarking on beef and sheep farms in the high rainfall zone.

Working with DPIRD for 19 years has given Julianne the ability to create links between growers and researchers and create a strong network linked to the GRDC. Julianne has been coordinating the Western Region RCSNs since inception; with Cameron Weeks running the Geraldton port zone from 2011-2014.

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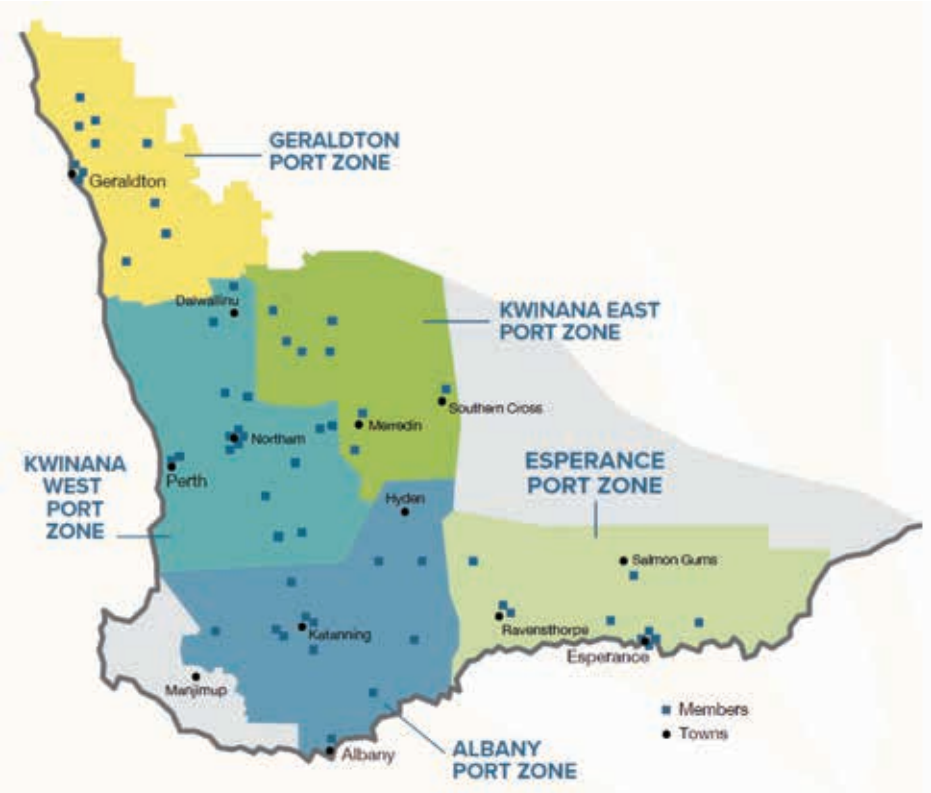

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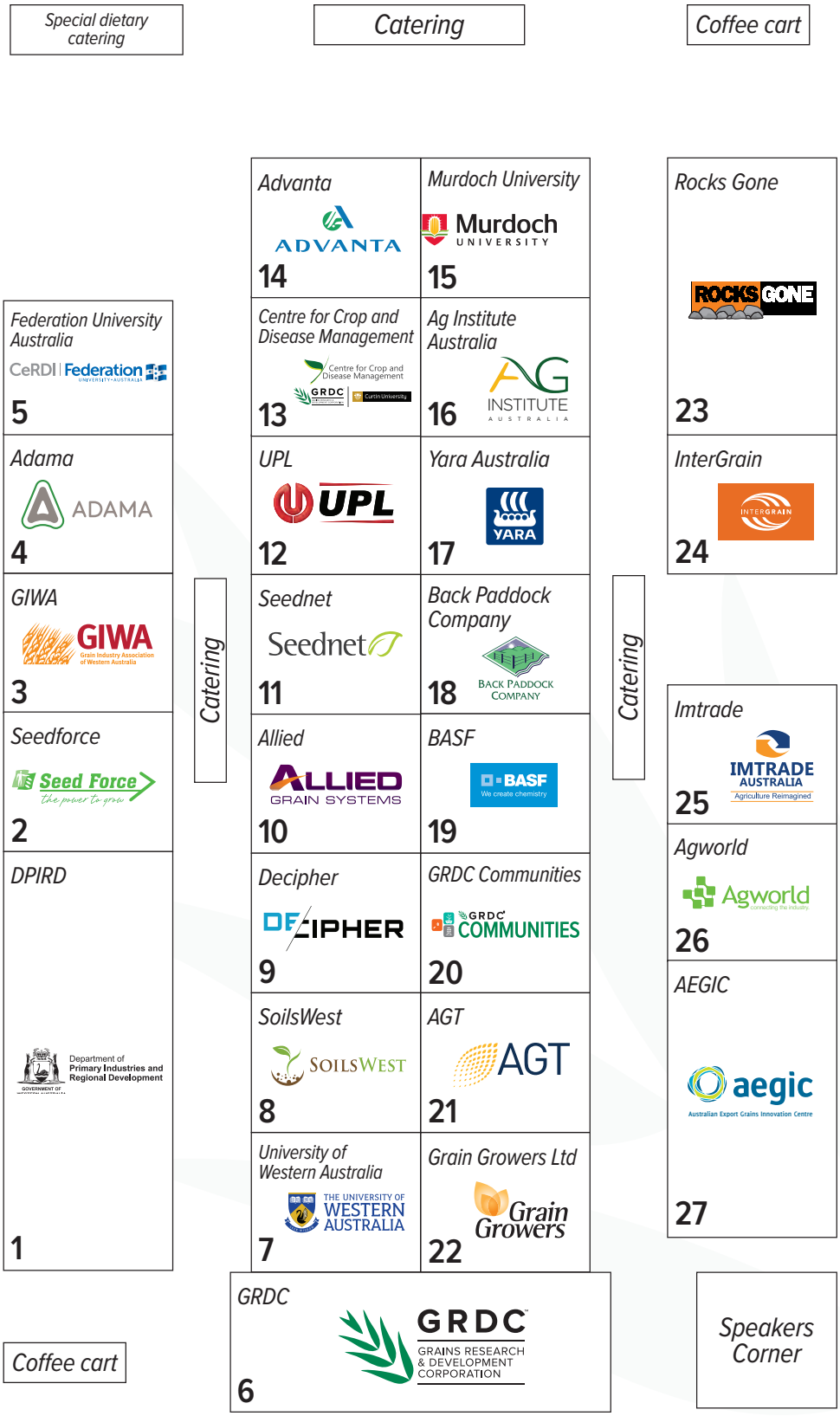

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The future demand for Australian grains in North East and South East Asia

William Syers, Bunge Asia

William is Distribution Director for Grains into Asia for Bunge.

William has a technical flour milling background with more than 30 years experience in the Industry and is part of the sixth generation in his family to be involved in flour milling. He worked as a Technical Miller for 11 years involved in Mill Commissioning and Mill design throughout the world but particularly in Asia. He was AWB's Asian Technical advisor from 1996 where he was one of the key team members which opened the Taiwan and Philippine markets. William then went to Singapore with the Prima Milling Group as their Group Technical head before joining Bunge in 2007. While at Bunge, aside from marketing Australian and other origin wheat into Asia, he leads the design team for the terminal Bunge built in Bunbury and is a member of Bunge's global milling and bulk handling expert groups.

Notes:

Technical support for the Indonesian Wheat Industry – our single biggest wheat customer

Richard Simonaitis, AEGIC

Richard has broad experience in export-focused commodities industries, having worked in logistics and product quality roles in the iron ore industry and in senior management roles in the grain industry across logistics, operations and marketing and trading.

Richard has a track record of leading teams and effecting change by fostering an effective and high performing culture. With the CBH Group, Richard led the national Accumulations Team for five years.

He has a strong understanding of grain growers, the grains industry across Australia and of the markets Australian grain is sold into. Richard also has international experience developing a number of grain infrastructure projects in Indonesia.

Notes:

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AEGIC engages with international customers of Australian grain to understand more about the specific quality attributes they need to make the best possible products for their consumers. We combine this with analysis of long-term economic and demand trends to identify new markets and opportunities for Australian grain.

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- **EMPOWERING** the Australian grains industry with intelligence to help breed, grow, classify and supply grain that meets market requirements.
- **INNOVATING** to develop new products and opportunities for Australian grain.
- **EDUCATING** international users with technical information and in-market support so they can optimise the value of Australian grain.

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AEGIC is an initiative of the Western Australian State Government and Australia's Grains Research & Development Corporation

aegic.org.au

On farm storage and the grain supply chain

Andrew Freeth, Gilgandra NSW and **Ben White,** Kondinin Group

Andrew will share his knowledge of international grain supply chains including key trends and discuss implications for grower investment in on-farm storage. Strategies to effectively manage grain in storage will also be discussed including hygiene, aeration and requirements for gas tight storage that meets Australian industry standards for fumigation with phosphine. Andrew also has a background in grain marketing and will touch on the importance of managing price risk for stored grain.

Key messages

- Growers considering an investment in grain On Farm Storage (OFS) should do their homework and thorough planning to maximise value.
- Given grain storage assets can have working lives of 30 years, growers must consider future changes to their needs and those of the supply chain market.
- Good hygiene and aeration are important when storing grain in unsealed environments. Gas tight storage that meets AS2628 is vital to fumigate grain storage pests.
- Clear objectives, a marketing plan and knowledge of managing grain in storage are critical for investment in OFS. Simply building OFS and filling it with grain does not guarantee success.
- The share of the Australian grain crop stored on-farm is likely to continue to grow in the near term.
- Mainline rail efficiency is key to reducing supply chain costs for growers and to improve productivity and profitability for supply chain operators.

Ben is an agricultural engineer, Kondinin Group's Research Manager and editor of *Farming Ahead* magazine.

Coming from a farming background and having worked for the group for 16-years, Ben has extensive experience in delivery of research and has expertise in the areas of farming technology, grain storage, precision farming, engine technology, harvesting, seeding and spraying equipment.

Ben also undertakes grain storage extension work for the GRDC, delivering extension information to farmers and the grains industry on retaining grain quality in storage.

Notes:

GIWA
Grain Industry Association of Western Australia

2019 Events

GIWA

The Grain Industry Association of Western Australia (GIWA) Inc is a not-for-profit, member based association, representing the interests of the entire Western Australian grain value chain.

GIWA holds public meetings each year to discuss market and seasonal developments, variety rationalisation and value chain issues for wheat, barley, oilseeds, oats and pulses, connecting the market with growers, and highlighting topical issues for discussion.

Upcoming GIWA Events - 2019

Tues, 26th February	GIWA Corporate Breakfast
Wed, 27th February	AOF and GIWA Oilseeds Council Meeting
Wed, 27th February	GIWA Pulse Council Meeting
Thurs, 14th March	GIWA Oat Council Meeting
Fri, 22nd March	GIWA Barley Autumn Forum
Wed, 17th July	GIWA Barley Rationalisation Meeting
Sun, 8th to Mon, 9th Sept	GIWA Barley Spring Forum
Fri, 20th September	GIWA Oat Spring Forum
Wed, 2nd October	GIWA AGM and GIWA Forum
Thurs, 21st November	GIWA Seeding Success

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Visit www.giwa.org.au/events for further details or call Rachel Nash on 08 6262 2128.

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Precision post emergence control of target weeds in green crops

Guillaume Jourdain, Bilberry, France

Guillaume is the co-founder and CEO of Bilberry, a French startup that aims to reduce the use of herbicides by 80%. Trained as an engineer, he was eager to create his company, to bring artificial intelligence and agriculture together, to open up new perspectives.

Bilberry was created in 2016 and develops embedded systems that recognise weeds, both on rails or on sprayers, to spray only where it is needed. It is now a fast-growing company, with several patent-protected products, sold and used both in Europe and in Australia.

Thanks to specifically developed artificial intelligence algorithms, Bilberry is able to recognise weeds on rails at 60km/h, day and night, or to detect weeds within crops in agriculture. Being able to do 'green on green' weed detection is a game changer for growers, thus Guillaume will focus for a large part on the green on green perspectives in his talk and will also review the results Bilberry got with the first users during the 2018/19 summer spraying season.

Notes:

GRDC

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Observations from the 2018 Saskatchewan Young Farmer of the Year Award Winners

Jordan and Jennifer Lindgren, Saskatchewan, Canada

Jordan and Jennifer, along with their four children, own and operate Lindgren Farms at Norquay, Saskatchewan, Canada. Lindgren Farms is a grain and oilseed farm that works diligently at maximising production for these crops, while minimising cost of production. They do this by using field scale trials to determine what products, genetics and practices work on their farm. By combining these methods, with the latest advancements in technology, they continue to meet and exceed their production goals.

They not only place importance on educating themselves, but also sharing this information with fellow farmers.

Jordan and Jennifer partner with local agriculture distributors to host the 'Field of Dreams' tour that is held annually on their farm. It is an opportunity to share trial results from previous years and showcase the current trials that are focussed on new genetics, applications and variable fertiliser rates. They also educate the next generation on the importance of farming and teaching them where their food comes from.

Notes:

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Wheat variety update – 2018 season and NVT results

Dion Nicol, Department of Primary Industries and Regional Development

ABSTRACT:

Wheat Variety Update for Western Australia

Dion Nicol, Jeremy Curry, Brenda Shackley and Christine Zaicou-Kunesch, DPIRD

Scepter (AH) has shown the ability to consistently yield very highly over the past four years of NVT in WA, but now has a rival for yield in Devil (AH/APWN) in 2017 and 2018 results.

Vixen (AH) performed very well in 2018 NVT but is a shorter maturity and has shown less yield overall-stability in WA than Devil and Scepter, but is a superior yielding short-season variety to other current options.

The new release, Razor CL Plus (ASW), does not adequately out-yield Chief CL Plus (APWN), which is likely to remain the strongest contender for Imi-tolerant wheats.

Ninja is remaining the highest yielding ANW but is closely followed the much longer maturity, new release Kinsei. Kinsei, a mid-long maturity, has performed better than its equivalent maturity in other grades (e.g. Calingiri, Cutlass and Magenta) and looks very promising as an earlier sowing option.

In 2018, only one site in WA germinated before the 25th May and this needs to be considered when comparing relative variety/maturity performance with contrasting results to previous seasons.

Notes:

Which wheats for when and agronomy in early April?

Brenda Shackley, Department of Primary Industries and Regional Development

ABSTRACT:

Which wheat and when?

Brenda Shackley[1], Christine Zaicou-Kunesch[2], Jeremy Curry[3] and Dion Nicol[4], DPIRD [1]Katanning, [2]Geraldton, [3]Esperance and [4]Merredin

Key messages

- There is an opportunity cost and yield penalty of sowing short-mid season varieties too early (early to late April) in the central and southern production zones, similar to sowing mid-long season varieties too late.
- If sowing mid-April in the northern, eastern and southern wheatbelt without frost risk sow mid-long season varieties. If sowing in late May sow short-mid season wheats.
- If sowing in areas of frost risk in the northern, eastern and southern wheatbelt, don't sow wheat in April, in early May sow mid-long season varieties in areas of low to moderate frost risk and sow areas of severe frost risk in late May to mid-long varieties.
- Highest yields at all sites have typically been achieved by mid-long maturing varieties sown from late April onwards, and short-mid maturing varieties sown in mid-May. At moderate to severe frost prone sites and with disease pressure, however, delaying sowing of mid-long maturities into mid-May, and the use of winter/long wheats when sowing in early to late April, is essential to minimise frost and disease risk.

Aims

To determine the appropriate sowing time by variety combination to maximise the grain yield and quality of wheat in the WA.

Results

Switching from mid-long variety sown in April to a short-mid in May at Mullewa in 2018 led to similar yields achieved even as sowing was delayed.

Short-mid season varieties were the highest yielding at Merredin, provided they were not sown early April. However, the mid-long season varieties do have a greater flexibility for early planting opportunities compared to mid-short season varieties which have a high frost/disease risk if you sow them early.

At Katanning, frost limited the yield of all varieties sown in early April, with mid-long varieties sown early May and short-mid varieties sown in late May providing the highest yields.

The performance of the mid-long varieties has been the consistent across seasons at EDRS giving growers a greater flexibility in early sowing opportunities and an option to diversify their wheat program that typically consists of >80% short-mid varieties and is geared towards May sowings.

Conclusion

Sowing wheat at the right time is one of the most important means of maximising grain yield and it should be noted that the highest grain yields were not associated with the earliest sowing date at all sites. Although variation occurs across environments and seasons, maturity effect on yield performance was evident and the results highlight that just as long maturing varieties should not be sown in late May, short-mid maturing through to short maturing varieties are typically not suited to be sown in April or early May (except northern environments). Mid-long maturing varieties sown from late April onwards, and short-mid maturing varieties sown in May typically result in the highest yields at most sites. In frost prone sites, however, delaying sowing of even mid-long maturing types into May results in increased yields.

ABSTRACT:

Agronomy of early sown wheat in Western Australia

Christine Zaicou-Kunesch[1], Jeremy Curry[1], Brenda Shackley[1] and Georgia Trainor[2],
[1]DPIRD, [2]former DPIRD and current InterGrain

Key messages

Four field trials in 2018 assessed the influence of plant density, nitrogen timing and grazing on yield and quality of three long maturing wheat varieties sown early April in Western Australia.

- Based on yield, Forrest and Longsword wheat varieties are more suitable for the early sowing opportunities in April than EGA Wedgetail at all locations (except Katanning where frost with early sowing is a risk to production).
- Seeding at low density (50 plants/m^2) in early April did not generally reduce yields. Some varietal specific responses were observed at Yuna, with EGA Wedgetail more suited to reduced plant density than Forrest or Longsword, although these responses were also driven by nitrogen timing.
- For early April sown crops, delaying nitrogen application until stem elongation improved yields at Esperance, Katanning and Yuna (except the frosted Longsword at Katanning or EGA Wedgetail at Yuna).
- Grazing at stem elongation did reduce yields by up to 0.9t/ha depending on environment and variety choice, but could be achieved with minimal yield loss for some varieties and environments.

Aims

To test the following hypotheses:

- Low plant density will not reduce yield of early April sown wheat
- Delayed nitrogen application will not affect grain yield
- Agronomy can offset yield reductions from grazing wheat sown in early April

Results

Variety and grazing influenced wheat grain yield at each of the four locations in Western Australia. Grazing was undertaken once after the variety had reached stem elongation. There was a variety by nitrogen interactions at three of the four locations. The nitrogen was applied as urea (200kg/ha) at either seeding or at stem elongation.

Conclusion

Growers can establish low input systems for crops sown in early April without affecting yield however some varieties are better suited to grazing systems. Seeding at low density (50 plants/m^2) in early April and a delay in nitrogen application did not led to reduced yields for the crops sown in early April in 2018. Appropriate variety choice for the environment is more important than the plant density or nitrogen timing strategies tested. Grazing at the beginning of stem elongation (Z30) did reduce yields by up to 0.9t/ha depending on environment and variety choice, and so appropriate management (such as earlier grazing) may be required to reduce this impact for some varieties.

Notes:

Understanding the pre-harvest sprouting susceptibility of new wheat varieties

Jeremy Curry, Department of Primary Industries and Regional Development

ABSTRACT:

Jeremy Curry[1] and Dion Nicol[2], DPIRD [1]Esperance and [4]Merredin

Key messages

- Wheat varieties differ in their susceptibility to low falling number, both at maturity, and after pre-harvest rainfall.
- Varietal grain dormancy and physical characteristics influence susceptibility, but are complexly influenced by environment and stage of maturity.
- DS Pascal has leading PHS tolerance as a result of its grain dormancy, while Scepter and Mace have a low risk of PHS compared to many other main season varieties.
- Falling number at maturity (prior to any rainfall exposure post-maturity) is influenced by variety, environment and time of sowing.

Aims

To determine the relative susceptibility of wheat varieties to low falling number due to pre-harvest sprouting.

This trial series uses a combination of artificial rainfall treatments, germination index testing and field weathering trials to compare new wheat cultivars to industry standards to understand their risk of low falling number. Field trials involve several times of sowing to line-up important growth and maturation stages of varieties of different maturity length, and reduce the impact of maturity length, while artificial rainfall treatments allow consistent discrimination between varieties even in seasons of minor harvest rainfall.

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Sprouting warning system for WA wheat farmers

Richard Williams, grolQ

ABSTRACT:

Richard Williams[1,3], Dean Diepeveen[2,3] and Fiona Evans[3,4], [1]grolQ, [2]DPIRD, [3]Murdoch University, [4]Centre for Digital Agriculture at Curtin University

Key messages

- Desk-top research, that recycled and combined different sets of data, identified two climate profile with meaningful correlations to low falling number levels in wheat. That research was supported by a Grower Group Grant to WA Farmers from the state government Agricultural Sciences Research and Development Fund.
- To test the application of the research findings to forecast, before harvest, the likelihood of low falling numbers a practical comparison was made across several WA farms for the 2018/19 harvest. Site falling number levels from the CBH Group were also analysed for correlations with the identified climate profiles.

Aims

To assess the usefulness of the desk-top research findings during the 2018/19 harvest period with grower and CBH Group information.

Results

Comparison of real time climate measurements will be discussed in relationship to the frequency of low falling numbers at a farm and CBH site level.

Conclusion

During the course of an annual harvest period in WA the CBH Group can collect over 150,000 wheat quality profiles from individual truck loads. Such data provided the platform to retrospectively analysis whether relationships could be identified between low falling number levels in wheat and climate conditions. Research identified correlations between falling number and climate measurements for the period from flowering to harvest. This was an efficient research approach in trying to understand, and importantly anticipate, low falling numbers in wheat.

Applying the research findings to individual farm situations in real time allowed the veracity of those findings to be tested. That showed potential in helping to manage the risk of low falling number levels.

Notes:

GRDC

ONLINE FARM TRIALS

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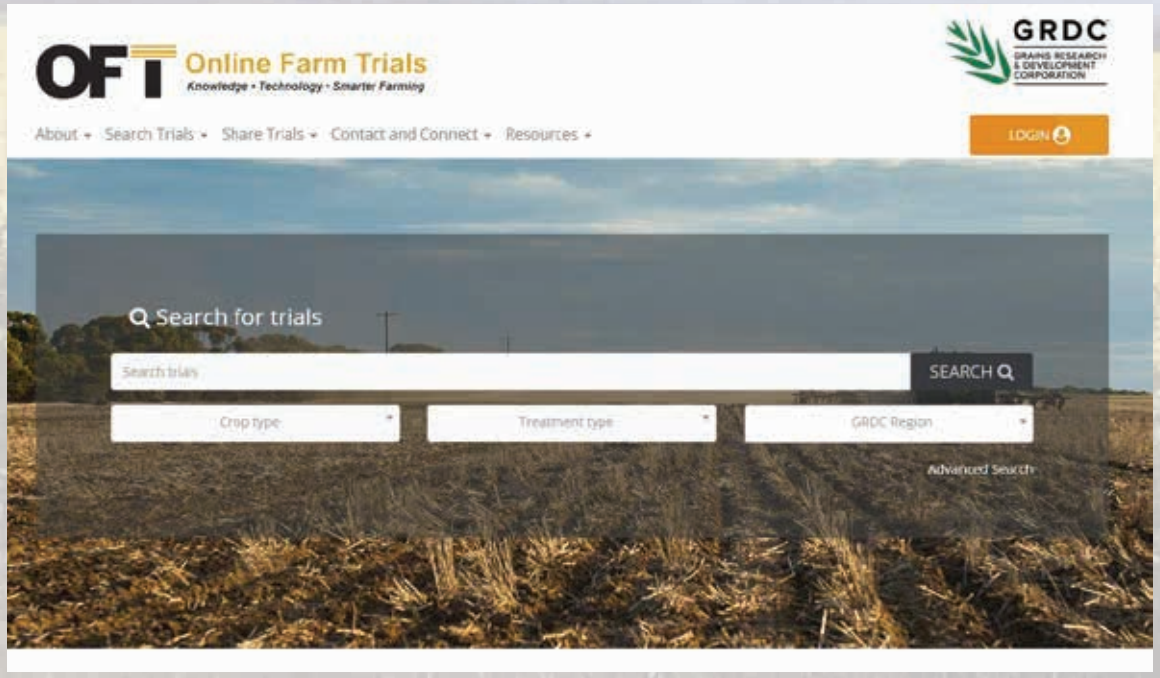

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Why do one percenters matter so much; even for grain quality?

Ross Kingwell, Australian Export Grains Innovation Centre

ABSTRACT:

Sporting coaches command their players: "Do the one percenters!" These are the little acts, on and off the field, that in aggregate are sometimes the difference between losing and winning. But does that coaching slogan apply to farming? As this paper shows, Yes is the answer. Success in farming is not only about getting the big decisions right. It's also often about getting the detail right as well. Farming's one percenters do matter. Using some examples, this paper shows that enterprise profit jumps more than many might think. Plus, these one percenters are cumulative, so over several years profits can be greatly boosted, just by being assiduous.

Notes:

Quality assessment of Australian oat varieties and their performance in processing Asian oat products

Sabori Mitra, Australian Export Grains Innovation Centre

ABSTRACT:

Quality assessment of Australian oat varieties and their performance in processing Asian oat products

Sabori Mitra, Mr Nabeen Dulal and Mr Mark Tucek, AEGIC, South Perth, WA

Key messages

- There is the potential to increase the demand for Australian oats as a high value crop domestically and in the export market, especially in Asia through new oat-based foods.
- The quality of Australian oat varieties can be affected by genotype and growing season.
- Varietal variation of oats in their composition and physical properties making them particularly suitable for different oat-based food products according to different or specific end-user requirements.
- Australian oat varieties are suitable to produce traditional oat flakes and several innovative oat-based Asian style food products such as oat noodle and oat rice.

Aims

To increase the value and consumption of Australian export oats by:

- better understanding the variation in quality characteristics between Australian oat varieties; and
- investigating the functionality of Australian oat varieties and their suitability for various oat-based Asian food products.

Results

Significant variation was observed amongst the Australian oat varieties for β-glucan, total dietary fibre, insoluble dietary fibre, amylose, protein, lipid, total starch, ash and all minerals except selenium. β-glucan and amylose content were significantly higher while soluble and total dietary fibre content were significantly lower in the warmer and dryer year of 2015 compared to 2016. Yallara$^{\Phi}$, which had the highest starch content, was observed to have the lowest combined content of protein and β-glucan. Oat flour pasting peak viscosity and final viscosity were positively correlated to firmness and resilience of oat-wheat noodles. Oat-wheat noodle made with Mitika$^{\Phi}$, Yallara$^{\Phi}$ and Wombat$^{\Phi}$ had the significantly highest resilience and recovery to compression (chewing characteristic). Durack$^{\Phi}$ and Mitika$^{\Phi}$ produced the brightest oat-wheat noodles which is preferred by Chinese consumers. During oat rice processing the pearling time was found to be influenced by the physical properties of groats (hardness index, roundness) with Dunnart$^{\Phi}$, Bannister$^{\Phi}$ and Yallara$^{\Phi}$ having the shortest pearling time to achieve the standardised bran loss. Pearling increased the brightness and reduced the cooking time of oat groats without significantly reducing the β-glucan content. Analyses of the textural properties of oat rice instrumentally showed that all the textural parameters were significantly affected by variety. For instance, Kowari$^{\Phi}$ oat rice had the highest hardness followed by Yallara$^{\Phi}$, Dunnart$^{\Phi}$, Durack$^{\Phi}$ and Mitika$^{\Phi}$.

Conclusion

Varietal variation was observed to be significant for most of the oat quality parameters and seasonal variation was also noted for few of the oat quality parameters. The oat flour composition was successfully increased to more than 50% of the oat wheat blend in the development of good quality, dried oat-wheat noodles. Pearling to produce oat rice improved its colour and textural properties and reduced the cooking time of groats without affecting its β-glucan content.

Notes:

Opportunity for Australia to supply soft wheat for cake and biscuit applications in Asia

Siem Siah, Australian Export Grains Innovation Centre

ABSTRACT:

Opportunities for Australia to supply wheat for cake and biscuit applications in Asia

Siem Siah[1], Ken Quail[1], Daniel Li[1], Sabrina Lim[1], Matt Yamamoto[2], Sean Cowman[2], Chris Carter[2] and Barry Cox[2],
[1]AEGIC, North Ryde, NSW, [2]AEGIC, South Perth, WA

Key messages

- At similar protein levels, soft-grained off-grade ANW (ANW2) and ASFT make better quality Japanese cakes and Indonesian biscuits than hard-grained ASW.
- The cake volume and biscuit spread ratio of ANW2 and ASFT are comparable to that of North American SWW.
- There are export market potentials for Australian soft-grained wheat to Asia.

Aims

- Evaluate performance of soft-grained ANW2, ASFT and hard-grained ASW against that of North American soft white wheat in Asian cake and biscuit products.
- Investigate how Asian mills prioritise choices when purchasing soft-grained wheat.

Results

Solvent retention solubility (SRC) and cookie spread ratio (diameter) are the two most important quality parameters for Indonesia when purchasing low-gluten wheat for production of flour for cakes and biscuits. Collaboration with two Indonesian mills showed that generally ANW2 and ASFT make cookies with higher spread ratio than that of ASW and they were comparable to that of SWW. However, the SRC values of Australian soft-grained wheat do not always meet their quality specification.

Cake textural property i.e. 'melting-in-mouth' and softness, and cake volume are the most important quality attributes for Japanese mills when purchasing soft-grained wheat for production of flour for cakes and biscuits. Technical collaboration with two Japanese mills revealed that ANW2 and ASFT produce cakes with bigger volume than those of ASW and they were comparable to those of SWW. The cake textural property was acceptable for one of the mills but slightly unacceptable for the other mill.

Conclusion

The ANW2 and ASFT could be blended partially with SWW to produce cakes and biscuits with acceptable qualities for Asian markets. There is potential in developing dual-purpose ANW for noodle and cake and biscuit applications at different protein levels, this can help to reduce risks for growers to grow ANW. The ANW2 and ASFT provide opportunities for Australian growers to realise increased values by becoming an alternative supplier of soft-grained wheat to Asian countries.

Notes:

iLime – farming for the long-term

James Fisher, Désirée Futures

ABSTRACT:

James Fisher[1], Fiona Evans[2], Chris Gazey[3], [1]Désirée Futures, [2]Murdoch University, [3]DPIRD

Key messages

- iLime is an app for planning of lime application that was developed with feedback from growers and consultants.
- iLime makes it easy to compare liming scenarios and provides estimates of the economic and biological impact of various liming options. To this end, iLime includes estimated rates of acidification, assessment of lime application for remediation and/or maintenance, along with estimated net present value and return on investment.
- The app produces results with selection of only a few inputs, from sensible pre-set values, but is also able to be tailored (and saved) for more specific analyses.

Aims

Feedback from farmers and consultants pointed to the need for a mobile app to aid planning of lime application. Such an app needed to estimate biological and economic responses to managing soil acidity with lime, in an easy-to-use interface.

Results

iLime implements the Optlime spreadsheet model that was developed and tested in WA as part of the 'Time to Lime' research program. The app was developed using cycles of drafting–feedback–redrafting to ensure that what has been produced will be of use and valued by the target audience of farmers and consultants (as well as researchers and students). It estimates rates of acidification, assesses lime application for remediation and/or maintenance, and also provides estimated net present value and return on investment.

iLime produces results with selection of only a few inputs, from sensible pre-set values, but is also able to be tailored (and saved) for more specific analyses. Importantly, once downloaded, the app will work entirely off-line.

Conclusion

Assessing options to manage soil acidity is not easily done. iLime calculates estimated rates of acidification and changes with liming, along with net present value and return on investment.

The iLime app is in the final stages of production. In this presentation we will introduce the functionality of the app, working through some examples. Workshops around managing soil acidity and the role of iLime will be conducted this coming winter and spring.

Notes:

How digital technologies will assist with nitrogen management

Roger Lawes, CSIRO

ABSTRACT:

Roger Lawes, Yvette Oliver and Neil Huth, CSIRO

Crop nitrogen (N) fertiliser decision aids traditionally provide a nitrogen fertiliser recommendation that requires information about the supply of N from the soil and the likely demand of N by the crop. It has often been a challenge to identify whether the crop will respond to an N application for a particular season or soil type. To address this, we combined on farm experimentation, crop simulation modelling and machine learning to develop a framework to better predict the optimal amount of N required. The experiment used an N-minus and N-rich strip. From these analysis, the ability to predict the amount of N required by the crop improved by 30 kg/ha. That is, the likelihood that the N strategy was correct increased on average by 30 kg/ha/N when on farm experimentation, historical yields, soil moisture and leaf N were assessed. In future, these systems will be developed to provide farmers with an N management system that allows them to more precisely tailor their fertiliser needs to the crop and season in question.

Notes:

Tactical nitrogen agronomy for wheat

Dion Nicol, Department of Primary Industries and Regional Development

ABSTRACT:

Tactical Nitrogen management in wheat

Dion Nicol, Jeremy Curry, Brenda Shackley and Christine Zaicou-Kunesch, DPIRD

A field program consisting of:

- nine varieties of wheat by different timing and rates of nitrogen application; and
- two time of sowing by variety by timing of nitrogen application.

Experiments from 2016-2018 have generally found little evidence to support variety specific nitrogen management, except where yield potential is notably different between varieties.

Nitrogen rate was generally more important than timing, however, applying a greater proportion of nitrogen in season (i.e. later than 6 weeks after sowing) was more efficient in increasing grain yield and protein in the majority of sites than increasing the proportion applied upfront.

Tailoring applications to development stage of the specific wheat crop (influenced by variety and time of sowing) or to manipulate yield components (such as tiller density) were not as important as the environmental conditions allowing uptake and conversion of nitrogen to grain yield and protein. Generally, the better the conditions, the wider the application timing window, which can vary by season and location.

Notes:

A 'focus farms' survey in the Kwinana West reveals herbicide resistance levels in champion farmers' paddocks: what's next?

Roberto Busi, Australian Herbicide Resistance Initiative

ABSTRACT:

Herbicide resistance in focus paddocks of WA champion farmers

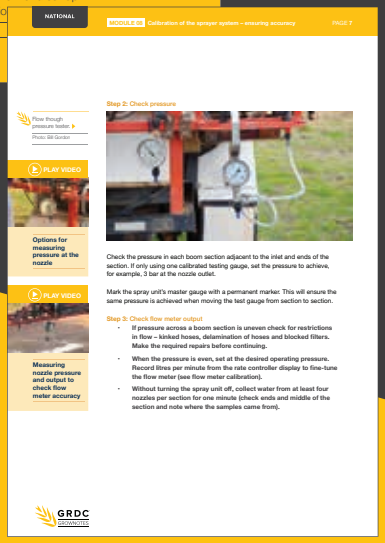
Roberto Busi[1] and Hugh Beckie[2], [1]AHRI, School of Agriculture and Environment, [2]University of Western Australia

A study was conducted to assess herbicide resistance in annual ryegrass seed samples collected from "focus farms" in Western Australia practicing harvest weed seed control. Farmers' perceptions of herbicide resistance were collected before herbicide testing. Herbicide resistance was determined by treating germinating seeds or seedlings with 19 treatments including different dosages of pre-emergent ('pre') and post-emergent ('post') herbicides, binary mixtures and sequences. Plant survival > 6% indicated a developing level of herbicide resistance. Plant survival to post herbicides was > 25% denoting substantial herbicide resistance, whereas 1% survival to tested pre-herbicides reflects effective control of ryegrass field populations. High level resistance to post herbicides corresponds to farmers' perceptions of resistance and it has been the driving force for widespread adoption of harvest weed seed control techniques. Herbicide mixtures of pre-herbicides are effective to control resistant ryegrass. Adoption of harvest weed seed control in combination with mixtures of pre-herbicides should be adopted to reduce population size and lower the risk of herbicide resistance by increasing the heterogeneity of selection pressures on weeds. A centre for herbicide resistance testing in Western Australia will support growers' decisions/investments on weed control, encourage herbicide stewardship and help develop new solutions to control herbicide-resistance prone weeds.

Notes:

GRDC
GROWNOTES

SPRAY APPLICATION GROWNOTES™ MANUAL



SPRAY APPLICATION MANUAL FOR GRAIN GROWERS

The Spray Application GrowNotes™ Manual is a comprehensive digital publication containing all the information a spray operator needs to know when it comes to using spray application technology.

It explains how various spraying systems and components work, along with those factors that the operator should consider to ensure the sprayer is operating to its full potential.

This new manual focuses on issues that will assist in maintaining the accuracy of the sprayer output while improving the efficiency and safety of spraying operations. It contains many useful tips for growers and spray operators and includes practical information – backed by science – on sprayer set-up, including self-propelled sprayers, new tools for determining sprayer outputs, advice for assessing spray coverage in the field, improving droplet capture by the target, drift-reducing equipment and techniques, the effects of adjuvant and nozzle type on drift potential, and surface temperature inversion research.

It comprises 23 modules accompanied by a series of videos which deliver 'how-to' advice to growers and spray operators in a visual easy-to-digest manner. Lead author and editor is Bill Gordon and other contributors include key industry players from Australia and overseas.

Spray Application GrowNotes™ Manual – go to: https://grdc.com.au/Resources/GrowNotes-technical
Also go to https://grdc.com.au/Resources/GrowNotes and check out the latest versions of the Regional Agronomy Crop GrowNotes™ titles.

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GRAINS RESEARCH & DEVELOPMENT CORPORATION

Harvest weed seed destruction – does it work for great brome grass and barley grass?

Catherine Borger, Department of Primary Industries and Regional Development

ABSTRACT:

Catherine Borger and Abul Hashem, DPIRD

Key messages

- Harvest weed seed destruction will be effective for some great brome and barley grass populations, in some years, but plant height, shedding and lodging are variable between populations.
- Growers need to be familiar with the ecological characteristics of their own populations to plan effective weed management strategies at harvest.

Aims

A potential control technique for great brome and barley grass is harvest weed seed destruction (HWSD). However, both of these species shed seed at maturity, and HWSD is most effective for those species that retain the majority of their seed, like annual ryegrass. This research investigated seasonal and genetic variation in seed shedding times for great brome and barley grass.

Results

At the earliest possible harvest date at Wongan Hills (14 November 2016, 9 November 2017 and 12 November 2018), annual ryegrass had shed 9%, 3% and 5% of seed in 2016, 2017 and 2018. Great brome had shed 64%, 28% and 46% of seed and barley grass shed 38%, 4% and 1% of seed in each year. However, while annual ryegrass and great brome heads were above harvest height, barley grass heads were below the harvest height of 15cm.

In controlled conditions, ten populations of great brome and barley grass commenced shedding between 8 October 2018 and 22 November 2018, and finished shedding between 22 November 2018 and 6 December 2018. Some barley grass populations were again below harvest height, and some great brome populations were subject to lodging.

Conclusion

Great brome populations retained most seed until November, but seed shed rapidly at maturity, and it is clear that a crop should be harvested as early as possible if great brome seed destruction is the goal. Great brome heads may lodge, but this can be reduced with a competitive crop (high density, narrow row spacing) to support the seed heads.

There was wide variation in the timing of barley grass shedding. Growers will need to be familiar with their own populations to determine if HWSD will be appropriate. Further, some populations were too short to catch at harvest. Growing in a competitive crop may increase weed height (to avoid shading by the crop canopy), or lower harvest height (possibly using a flex front) may be suitable for some areas.

Notes:

A response tyne for site-specific fallow weed control

Andrew Guzzomi, University of Western Australia

ABSTRACT:

Site-specific targeted tillage for fallow weed control

Andrew Guzzomi[1], Carlo Peressini[1], Michael Widderick[2], Adam McKiernan[2] and Michael Walsh[3], [1]UWA, [2]Queensland Department of Agriculture and Fisheries and [3]University of Sydney

Key messages

- A targeted tillage system has been developed for site-specific fallow weed control based on a rapid response tyne.
- Pre-commercial testing of the targeted tillage system is now underway.

Aims

- To develop a rapid response tyne based on a hydraulic breakout tyne.
- To establish the weed control efficacy of the developed response tyne for site-specific tillage weed control.

Results

Detailed explanation of the engineering process and results will be presented in forthcoming publications. Weed kill field testing demonstrated very high efficacy on all targeted summer and winter annual weeds regardless of growth stage. The survival of any weeds during testing was due to the design of the current cultivator sweeps not being suitable for the targeted tillage. Weed control was 100% effective when the weed was targeted by the point of the sweep, however there was high weed survival when the weed was hit by the side of the sweep. There was also reduced efficacy when weeds were excessively large. When Feathertop Rhodes grass was >70cm diameter there was only poor control. The system is highly effective on both broadleaf and grass weeds with the resultant soil disturbance potentially being low (Figure 1).

Figure 1. Wild oats pre- targeted tillage (A), post-targeted tillage (B) and the resulting 'divot'(C)

Figure 2. Proof-of-concept rig used in the testing and validation of targeted tillage fallow weed control

Conclusion

The response tyne's mechanical nature enables it to control weeds with greater flexibility around environmental conditions such as surface temperature inversions, wind, humidity and heat. Its ability to handle a vast range of weeds at varying growth stages will likely reduce the number of passes required to manage fallow weeds compared to current herbicide practice and help mitigate the current slower travel speed and narrower coverage. The periodic tilling action required for low-density weed populations will also permit the targeted tillage to be coupled to low horsepower tractors. With no direct need for chemical use the site specific targeted tillage system is an efficient tactic suitable for integration in an Integrated Weed Management system.

Notes:

Biology and management of matricaria

Alex Douglas, Department of Primary Industries and Regional Development

ABSTRACT:

Biology and management of matricaria (*Oncosiphon piluliferum*)

Alexandra Douglas[1] and David Nicholson[2], DPIRD, [1]Katanning and [2]Northam

Key messages

- Matricaria seed survives well when buried at 2–10cm, and darkness inhibits germination under laboratory conditions.
- Cost-effective herbicide options are available for control of matricaria in both sub-clover and medic pastures, with glyphosate, paraquat + atrazine, Jaguar® and bromoxynil providing good control.
- Time of herbicide application is critical; apply treatments either to small plants (six to eight leaves, 8cm rosette) or during the early flowering stages (bud formation with few yellow buttons) for seed set control. Both glyphosate and paraquat can be used for seed set control.

Aims

This project is investigating the biology of matricaria, triggers for germination, etc. and management options with a focus on the pasture phase.

Results

The effect of depth of seed burial on the persistence of matricaria was studied. Seed samples were buried at three depths (0, 2, and 10cm) and collected at three, six and 12 months after burial. A greater number of matricaria seeds persisted (remained viable) when buried at 2cm and 10cm than those on the soil surface. This result was consistent in the three collection times and for each of the three populations assessed.

In medic pasture in Beacon, 2018, the outstanding treatments were paraquat, paraquat plus atrazine and glyphosate. These treatments are exceptionally cost effective and despite reducing medic density and growth for a short period post treatment application, the pasture was able to recover and set seed prior to the end of the growing season. Jaguar® and Raptor® + paraquat also provided acceptable control of matricaria with significantly less effect on medic growth.

A seed set control experiment was conducted near Merredin, 2017, to test time of application of a range of herbicides on flowering matricaria. The three times of application spanned early bud formation to full flowering (with no seed formed). The glyphosate treatments applied in time one and two were very effective at reducing seed set as they killed the plants outright. Herbicide applications in time three dramatically reduced the number of seed set per plant compared to the untreated control. Treatments applied at times two and three did impact on the viability of the seed produced.

Conclusion

Matricaria seed can remain viable in the soil seed bank for up to five years when buried.

Results from field trials are showing that time of herbicide application is critical. Selective herbicides need to be applied to small plants to be most effective and knockdown applications may work best when mixed with other herbicides, to act as a 'spike'. The best time for applications targeting seed set are before plants are fully flowering, seed viability can be reduced when nonselective herbicides are applied during the flowering stage.

Notes:

Beer is better than porridge and bread in frost-prone landscapes! How early is too early to sow?

Ben Biddulph, Department of Primary Industries and Regional Development

ABSTRACT:

Beer is better than porridge and bread: Evaluating barley, oats and wheat for early sowing in frost prone landscapes in Western Australia in the medium (Kulin-Lake Grace, Quairading, Wickepin 2017-2018) and high production zones (Dale 2016-2018)

Ben Biddulph[1], Rebecca Smith[2], Chloe Turner[3], Andrew Smith[4], Karyn Reeves[5], Sarah Jackson[1] and Dean Diepeveen[1],
[1]DPIRD South Perth, [2]Living Farm, [3]Facey Group, [5]ConsultAg / Farmanco and Curtin University / SAGIWEST

Key messages

- Barley is better able to maintain grain yield and gross income than wheat in all sowing windows from mid-April to mid-May under moderate and severe frost.
- Under severe frost, long season oats was able to maintain higher grain yield and gross income than barley under severe frost. The lower price of oats relative to barley and the lower grain yield potential in medium to low rainfall environments reduces the usefulness of oats as a frost management tool.
- In the higher production environments at Wickepin and Dale longer season strong and mild PPD responsive wheats such as Forrest sown in mid-April and then Cutlass in late April to early May were able to maintain grain yield, quality and gross income competitive with barley in mild frost environments.
- With low frost in late May mid-long wheat varieties such as Sceptre had the highest gross margin of the cereals available.
- Maintaining grain quality is as important as grain yield and shorter season varieties of all crops often failed to achieve premium delivery standards with mid-April and early May sowing.
- There is currently a yield penalty and opportunity cost associated with mid-April and early May sowing compare to late May in both medium and high production environments for all crop types.
- In high and medium production environments sowing barley or longer season wheats in late April to mid-May and then mid-long wheats in late May is still the management practice which achieves the highest gross income in frost prone environments.

Aims

The aim of this study was to compare the relative suitability of barley oats and wheat when sown in early, mid and late sowing windows in frost prone landscapes.

Results

Phenology, grain Yield and gross income analysis will be presented for the 4 sites by 2 years for the 3 to 4 sowing windows used.

Conclusion

Optimising crop and variety choice at sowing time to minimise frost exposure is still the most important way farmers can minimise frost damage while also managing terminal stress.

Growers should be planting oats, barley and then longer maturity wheat varieties when early opportunity arises, rather than the currently used mid-season varieties. This will ensure adequate biomass is accumulated both above and below ground so that this can be converted into grain yield, while managing frost risk and can reduce the potential opportunity cost associated with lower yield and greater frost damage in seasons when it does occur with associated effects on yield and quality. Growers need to be mindful of the opportunity cost of sowing mid-season varieties in late April and early May they do not optimise grain yield and quality compared to mid and late May sowing crops.

ABSTRACT:

Sow early, sow long or don't sow wheat at all

Ben Biddulph[1], Dion Nicol[2], Dean Diepeveen[1] and Brenton Leske[3],
DPIRD [1]South Perth and [2]Merredin, and [3]University of Western Australia

Key messages

- Matching wheat variety with sowing time is critical to ensure optimal flowering and biomass production occurs in order to maximise grain yield.
- Growers should be planting longer maturity wheat varieties when early opportunities arise, rather than currently used mid-season wheat varieties. This will ensure adequate biomass accumulation both above and below ground that can be converted into grain yield, while managing frost risk.

Aims

The aim of this study was to explore the relationships between frost, sowing time, spike fertility and maturity types on yield formation and grain yield of wheat in a severely frost prone landscape. To achieve this 75 wheat varieties were established from 8 sowing dates from mid-April to late June, at Brookton WA, 2015 and then Dale 2016-18.

Results

In all seasons, grain yields were greatest when flowering occurred during or just after the most frequent frost period in early spring in all seasons. Despite very different growing conditions in terms of in season rainfall, thermal time accumulation and frost severity and duration the optimum sowing windows for each maturity type were consistent across all years. Currently grower should be sowing mid-long season Yipti types in early May, mid-season Mace types in mid- to late May. Mid-season wheats are not suited to early May and long season wheats are not suited to mid-April and there is a large opportunity cost associated with sowing these types too early. Longer season strong PPD types such as Forrest are suited to mid-April sowing, but generally there are few choices of wheat varieties to sow in that window and there are more productive other crop types to sow including barley and oats.

Conclusion

Optimising crop and variety choice at sowing time to minimise frost exposure is still the most important way farmers can minimise frost damage while also managing terminal stress to maximise production, quality and financial returns.

Notes:

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Mounting evidence that soil amelioration can reduce frost damage on water repellent soils

Tom Edwards and Giacomo Betti, Department of Primary Industries and Regional Development

ABSTRACT:

Mounting evidence that soil amelioration can contribute to reduced frost severity on water repellent soils

Giacomo Betti[1], Tom Edwards[1], Ben Biddulph[1], Stephen Davies[1], Andrew Van Burgel[1], David Hall[1] and Chloe Turner[2], [1]DPIRD, [2]Facey Group

In recent years, several anecdotal reports (Fulwood 2013; Williams 2016) and field assessments (Butcher et al. 2017) have suggested that soil amelioration for the management of water repellent soils can potentially reduce crop damage in frost prone areas. This is not a new hypothesis and evidence from previous research in South Australia (Rebbeck et al. 2007) have shown the positive effects of claying (by clay delving) in reducing frost damage in wheat. In more recent work by Butcher et al. (2017) the evidence gathered were insufficient to prove a direct connection between amelioration of water repellent soils and the reduction in frost severity and duration. This research aimed to collate and assess field research data collected from multiple sites and seasons, in support of the hypothesis that amelioration of water repellent soils may decrease the severity of frost events and reduce crop damage. Based on the results, we found strong evidence of the effect of the soil ameliorations on frost severity and indications that this reduced crop damage. However, this was seen only when seasonal conditions produced severe, discriminating frost events.

Notes:

We'll all be rooned: rapid provision of weather maps

Andrew Guzzomi, University of Western Australia

ABSTRACT:

Anna Hepworth[1], Meredith Guthrie[1], and Fiona Evans[2], [1]DPIRD, [2]Murdoch University

Key messages

- In 2018, the Department of Primary Industries and Regional Development (DPIRD) produced a wide range of climate and weather maps.
- New rainfall decile maps use Bureau of Meteorology (BoM) weather data for the South West Land Division (SWLD) and relate current conditions to post-1975 climate norms.
- Flexible selection of date range, reference years, and dataset(s) (BoM and/or DPIRD weather stations) has improved our ability to rapidly map weather. For example:
  - frost occurrence and severity maps for individual frost events,
  - plant available soil water maps now include ten soil type specific options; and
  - potential yield maps now include multiple evaporation, water use efficiency, and seasonal finish options.

Aims

Frost, heat stress, and dry seasons all negatively impact grain production in SWLD, which includes the grainbelt. Managing weather related risks and optimising inputs in relation to expected conditions is a primary concern of all grain growers. DPIRD produce several tools to make weather dependent management decisions easier. In this paper we discuss the increased range of mapping capability in relation to climate impacts. This includes, but is not limited to, frost severity and occurrence, heat stress, decile rainfall, potential yield and soil water.

Results

Rainfall maps provide the agriculture industry with a snap shot of the current season. As well as knowing absolute rainfall amounts, anomalies provide information on how the season is tracking with respect to the historical record. This can help in making decisions about the farming business.

Frost occurrence and severity maps are now produced each time a frost event occurred. These included daily maps where an event lasted more than one calendar day, and summary maps for the whole event. Inclusion of the DPIRD stations in these maps improved understanding of how widespread each frost event was.

The increased range of potential yield maps will allow users to more accurately match the French & Schulz equation to their farm. This is the first step in expanding this product to represent yields in crops other than wheat.

Conclusion

Improved access, by weather API, to up-to-date weather data and flexible data summaries has enabled a wider range of map tools to be generated. Spatial accuracy is improved with the addition of 175 stations, improving understanding of current climate conditions, and their potential impact on the agriculture industry.

Notes:

Potential for pulses in WA

Jason Brand, Agriculture Victoria, and **Mark Seymour,** Department of Primary Industries and Regional Development

ABSTRACT:

Understanding the implications of new traits on adaptation, crop physiology and management of pulses –and how they fit in Western Australia

Jason Brand[1], Mark Seymour[2], [1]Agriculture Victoria, Department of Jobs, Precincts & Regions and [2]DPIRD

Pulse crops have been widely adopted in Eastern Australia. Recent innovations in agronomy and breeding may lead to further expansion onto non-traditional soil types – such as sandy textured soils and soils with lower pH. These innovations include soil amelioration to alter soil conditions, plant breeding for tolerance to lower pH and tolerance to a wider range of herbicides, and selection of rhizobia with greater tolerance to lower pH.

In our presentation, we will provide examples of improvements in pulse adaptation and management from both an Eastern and Western Australian perspective.

Notes:

Experiences in growing pulses in Western Australia

Panel: Two Western Australian growers — **Jason Brand,** Agriculture Victoria, and **Mark Seymour,** Department of Primary Industries and Regional Development

ABSTRACT:

Mark Seymour[1], Greg Shea[1], Jason Brand[2], Ron Longbottom[3] and Ben Webb[4], [1]DPIRD, [2]Agriculture Victoria, Department of Jobs, Precincts & Regions, [3]Cape Lagoon Farms, Grass Patch and [4]Kojonup

Why do farmers choose to grow pulses in Western Australia? What pulses have they tried and what are their experiences? We will hear from two WA growers about their farms and their experience with pulses.

Ron Longbottom farms at Grass Patch near Esperance and has a long history of growing field peas on his farm. In recent years, Ron has moved into growing substantial areas of lentils.

Ben Webb farms with his family at Kojonup and for a number of years has included faba beans in his rotation.

Greg Shea is an experienced Development Officer who has helped many pulse growers over the last 30 years. Greg will cover off on where Western Australia's chickpea industry is at – recent experiences and potential. Following brief presentations from each of our guests, we will have a Q+A session to allow lots of questions from the floor.

Notes:

Lupin agronomy for seed production

Martin Harries, Department of Primary Industries and Regional Development

ABSTRACT:

Over the past few seasons there have been several instances of poor lupin establishment in trials, bulk-ups and commercial crops. There are several well-known principles that can be implemented to ensure grain produced is of sufficient quality to be used as next years' seed. This review discusses these principles and identifies research gaps.

The main topics include manganese nutrition, pre-harvest factors, harvest timing, physical damage and storage conditions.

Adequate manganese nutrition is critical to ensure germination of lupins (Longnecker 1996) and farmers and agronomists continue to report issues with manganese deficiency, observed as split seed. This was first reported in the early 1970's; "between 1971 and 1974, manganese deficiency nearly crippled the infant sweet lupin industry in W.A.", (Gartrell and Walton 1989). Mn deficiency is most prevalent in low rainfall areas and on sandy soils where it becomes poorly available to the plant in drying soil (Perry and Gartrell 1976). A comprehensive management strategy was developed which minimised the problem. Agronomic strategies to facilitate early plant maturity before soils dried, such as earlier flowering, earlier sowing and increased plant density were promoted (Perry and Gartrell 1976) and soil and foliar fertiliser recommendations were developed (Brennan 2001a, 2001b, 1996, White 2008). In recent years there has been a spike in Mn deficiency (split seed) and it is not clear if this is due to seasonal conditions (late starts and dry springs), changed farming practices, varietal differences or a combination of these factors.

It is likely that both sides of the supply demand equation for Mn have changed in response to altered farming practices;

Supply may be reduced due to increased application of lime, use of higher P:Mn ratio fertilisers such as MAP (20 P:4 Mn), reduced frequency of lupin production and corresponding reduction in application of compound Mn over the rotation. The trend of reduced deep banding and effects of soil inversion on Mn are also likely to be changing distribution, and plant availability, within the soil profile.

Demand has increased substantially due to improved lupin yields compared to 1970s and 80s. Additionally in recent years the rapid adoption of soil amelioration practices to address chemical and physical barriers to root growth have improved soil water usage and altered the yield architecture, which may impact the best timing for foliar Mn application (Hannam et al 1984).

Pre-harvest deterioration can occur if crop-topping occurs too early or with glyphosate and if grain is exposed to rain while mature and still in the pod (Harries et al 2018). Mechanical damage at harvest, during handling and through air seeders was studied by with several recommendations including to harvest above 12% moisture (Blanchard 1994, Blanchard 1990). Handling and storage conditions can also have a large effect.

Notes:

Ten years of managing water repellent soils research in WA – current progress and future opportunities

Stephen Davies, Department of Primary Industries and Regional Development

ABSTRACT:

Ten years of managing water repellent soils research in Western Australia – a review of current progress and future opportunities

Stephen Davies[1], Giacomo Betti[1], Tom Edwards[1], Glenn McDonald[1], David Hall[1], Geoff Anderson[1], Craig Scanlan[1], Chad Reynolds[1], Jo Walker[1], Grey Poulish[1], Phil Ward[2], Priya Krishnamurthy[2], Shayne Micin[2], Ramona Kerr[2], Margaret Roper[2] and Tim Boyes[3], [1]DPIRD, [2]CSIRO and [3]agVivo

Key messages

- Choice of method for managing soil water repellence is influenced by soil type, climate and associated agronomic considerations.
- Mitigation strategies (paired-row sowing, near-row sowing, and wetting agents) provide cheap management options, but must be implemented every year and need to be targeted at responsive soils and situations. Paired and near-row sowing typically increased early emergence by 50%, but had smaller and more variable effects on grain yield. Banded soil wetters are most beneficial for dry sown cereals on repellent forest gravels of the south-west with less reliable benefits for break-crops. Benefits of banded wetters are minimal or at best sporadic for dry sown crops on deep sands and there is no benefit with wet sowing for any crop or soil type. Benefits are larger in seasons with low and sporadic germinating rains in autumn.
- Amelioration of repellent soils with strategic deep tillage (e.g. spading or inversion ploughing) provides long-term and reliable benefits across most repellent soils and locations. For pale deep sands the benefits are present for two-years before declining significantly at many sites. Clay spreading may help sustain benefits for longer on these less fertile soils, but the cost is high and yield potential of these soils is still limited.
- Repellent soils are often prone to compaction and subsoil acidification and ameliorating these constraints is important for increasing and sustaining yield benefits. For example, deeper ripping following soil inversion can increase average grain yields by a further 10% (340 kg/ha), over inversion on its own.

Aims

- Collate and present data from the past ten-years of field research into managing water repellent cropping soils.
- Discuss findings in the context of management method, soil type, seasonal conditions and risk and identify ongoing gaps in knowledge and barriers to adoption..

Results

Improved seeding strategies such as paired-row and near-row seeding can benefit establishment on repellent soils but this does not always translate to yield increases. Banded wetters are currently best suited to dry seeding of cereals on repellent forest gravels of the south-west. Amelioration approaches using strategic deep tillage can result in large yield benefits partly because they address multiple soil and agronomic constraints. Average cereal yield increases across a range of strategic deep tillage implements and soil types were 460–880 kg/ha for the first two seasons after amelioration and 220–680 kg/ha in subsequent seasons. Most sandplain soils are responsive to strategic deep tillage though benefits can decline after 2–3 years on the pale deep sands, which have low fertility, clay content and soil water storage.

Notes:

How do we define gypsum responsive soils?

David Hall, Department of Primary Industries and Regional Development

ABSTRACT:

How do we define gypsum responsive soils?

David Hall[1] and Jeremy Lemon[2], DPIRD, [1]Esperance and [2]Albany

Key messages

- Exchangeable sodium percentage (ESP) remains the most reliable measurement for predicting dispersion in loam and clay soils.
- Crop yield responses to gypsum were highly variable for current and historic trials. The optimum gypsum rate across all sites was between 2.5 and 5 t/ha
- The soil measurements with the best ability to differentiate between gypsum responsive and unresponsive soils were ESP and Stability Index. Overlap in the data ranges of the soil chemical and physical properties defining gypsum response were found. Gypsum strip trials remain valuable in defining gypsum response.

Aims

Determine which soil properties are important in causing clay dispersion and that can be used to identify gypsum responsive soils.

Results

Based on data from eight sites in southern WA, for every 10 % increase in ESP there was a 10–20% reduction in yield. The yield reductions resulting from sodicity in southern WA would appear to be larger than that previously published, most likely due to the presence of boron and transient salinity which further reduce plant available water. Soil indices that predict dispersion were ranked in the order ESP > EC/ESP = Stability Index. Crop responses to gypsum were found to be highly variable based on historic trials with the optimum gypsum rates being between 2.5 and 5 t/ha. ESP and Stability Index were best able to differentiate between gypsum responsive and unresponsive soils. There was considerable overlap in the data ranges defining gypsum response and unresponsive sites.

Conclusion

Sodicity is common in the wheatbelt soils of WA and has a major impact on reducing crop yields by restricting water entry, root growth and plant available water. Aggregate dispersion was found to be mainly correlated with ESP in the soils tested with Stability Index, EC/ESP, OC% and Ca:Mg ratio being significant factors but accounting for less variation in dispersion. Crop responses to gypsum from historic gypsum rate trials were found to be highly variable. The optimum gypsum rate from the sites presented here and those from historic trials was between 2.5 and 5 t/ha. ESP and Stability Index were most effective in discriminating between gypsum responsive and unresponsive soils in southern WA. Given the overlap in the ranges of the soil chemical and physical properties used to discriminate gypsum response, gypsum strip trials remain a useful tool in diagnosing soils that are likely to respond to gypsum.

Notes:

Inversion tillage had a greater long-term effect on grain yield than phosphorus and potassium management on a water-repellent sand

Craig Scanlan, Department of Primary Industries and Regional Development

ABSTRACT:

Craig Scanlan, Mario D'Antuono, Ross Brennan and Gavin Sarre, DPIRD

Key messages

- Rotary spading increased soil K availability.
- The influence of potassium availability on grain yield increased as the years progressed.
- Ameliorating soil water repellence did not change the residual effect of phosphorus and potassium fertiliser.

Aims

To examine how ameliorating a water-repellent soil affects the residual effect of phosphorus (P) and potassium (K) fertiliser on grain yield over a 5-year period.

Results

Tillage treatment had a greater influence on grain yield than nutrient treatment over 5 years. Tillage with a rotary spader increased grain yield in three years and nutrient treatment affected grain yield in two years; however, the magnitude of the effect was greatest for tillage treatments.

The differences between treatments increased as the years progressed. For example, the rotary spading treatments were not different to the untreated control in 2013 (year 1) but by 2017 were 60% higher than the untreated control. Potassium availability emerged as the main factor affecting grain yield as the years progressed. The yield increase from rotary spading was associated with an increase in shoot K concentration.

Conclusion

Ameliorating a water repellent soil with rotary spading did not change the residual benefit from P and K fertiliser. Grain yield and nutrient availability was less affected by nutrient treatment than tillage treatment, suggesting that addressing the soil constraint is of greater importance than changes to P and K fertiliser strategy.

Notes:

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The incidence of fungicide resistance in spot form net blotch (SFNB) and its implications

Fran Lopez-Ruiz, Centre for Crop and Disease Management, Curtin University

ABSTRACT:

Fran Lopez-Ruiz[1], Wesley Mair[1], Geoff Thomas[2], Kith Jayasena[2], Andrea Hills[2], [1]Centre for Crop and Disease Management, School of Molecular and Life Sciences, Curtin University, Perth, and [2]DPIRD

Key messages

- Fungicide resistance to Group 3 (DMI) fungicides in spot form of net blotch is spreading in the southern region of WA.
- Overuse of fungicides with the same mode of action will speed up fungicide resistance.
- We can limit the development of fungicide resistance by using the lowest effective dose, appropriate fungicide group rotations and employing IDM practices including crop rotation, stubble management and selection of more resistant cultivars (if available).
- Fast (and cheap) monitoring of pathogen populations for fungicide resistance is central for the sustainable chemical management of diseases.

Aims

The efficacy of some Group 3 fungicides has been impacted by the development of resistance in SFNB in WA populations. This paper provides an overview of the current knowledge on SFNB fungicide resistance and the spread of the resistant populations in WA.

Results

The analysis of four hundred and seventy samples of SFNB diseased barley between 2016-2018 has revealed the existence of different populations of the pathogen based on their resistance level to the Group 3 compounds propiconazole, prothioconazole and tebuconazole. The MR and HR groups showed a similar level of reduced sensitivity to epoxiconazole. While moderately resistant (MR) populations were found stretching from Perth to Esperance, the distribution of highly resistant (HR) populations seemed to be limited to the South Stirling and Esperance regions.

Conclusion

With the development of resistance to Group 3 fungicides in SFNB, growers need to be cautious about its control and implement adequate integrated disease management strategies to minimise the ongoing selection of SFNB resistant populations. Any spray program heavily dependent upon Group 3 fungicides will increase the selection of the resistant populations. The introduction of seed dressing, in-furrow and foliar products containing fungicide mixtures from different chemical groups (Groups 3, 7 and 11) in combination with the removal of tebuconazole, crop rotation, the use of resistant varieties and stubble management, will provide the best opportunity to limit the spread of SFNB resistance in other barley growing regions of Australia.

Notes:

New options for managing spot form net blotch (SFNB) in barley

Matt Sherriff, SACOA

ABSTRACT:

Matt Sherriff[1], Kithsiri Jayasena[2], Bevan Addison[3], [1]SACOA Perth, [2]DPIRD Albany, [3]ADAMA Perth

Key messages

- In medium to high rainfall areas – using a fungicide program to control SFNB increased yield by up to 0.41 t/ha
- A two application strategy – alternating modes of action, was found to be superior to a single early or late fungicide application
- Using a carrier such as BIOPEST™ in tank mix with fungicides was found to have a beneficial effect on disease control when using fungicides as part of a resistance management strategy.

Aims

- To evaluate the efficacy of various mode of action fungicides including the newly registered *propiconazole* + *azoxystrobin* (TOPNOTCH™) for controlling SFNB in barley.
- Determine the best application timing and application sequence of a range of fungicides.
- Validate the benefits of paraffinic oil (BIOPEST™) as a carrier for fungicides and alternative mode of action for *Pyrenophora* disease control.

Results

Analysis of disease incidence, yield and grain quality in barley canopies from two replicated sites; Frankland and South Kellerberrin, which included 13 different fungicide treatments indicates the following;

- At both sites disease incidence was most prevalent at the top 4 leaf of the canopy.
- Significant reductions in disease severity between the untreated control and all fungicides were observed at the Frankland site which resulted in a significant yield increase of +0.41 t/ha between the untreated and the average yield of the 13 fungicide treatments.
- An early (Z31) stem extension growth stage, application of *propiconazole* followed by a (Z39) flag leaf emergence application of *azoxystrobin* + *epoxiconazole* resulted in a significant reduction in canopy disease versus single early or late applications or other actives at the Frankland site.
- At the Frankland site the addition of BIOPEST™ to each of the fungicide treatments was found to have a positive effect on efficacy, particularly with *propiconazole*, *azoxystrobin* + *epoxiconazole* and *prothioconazole* + *tebuconazole* where are significant reduction in disease incidence was observed versus using the fungicides alone.

Conclusion

SFNB is an increasingly important barley disease which has the potential to cause significant yield loss, particularly in medium to high rainfall production areas of WA. Recent identification of SFNB with resistance to commonly used fungicide groups, particularly *triazoles*, has only increased the risk of economic loss to this disease and requires the development of alternative management options.

This work has identified the use of a two-application timing strategy – alternating between mode of action groups and using BIOPEST™ as a carrier as the most effective method of reducing disease incidence and increasing yield, particularly in medium to high rainfall areas.

In lower rainfall areas – the application of fungicides to manage SFNB was found to reduce disease incidence, however more work is required to determine conditions required for positive yield impacts.

Notes:

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Scope for improved profitability of wheat through tactical use of fungicides

Amir Abadi, Centre for Crop and Disease Management

ABSTRACT:

Amir Abadi[1], Ayalsew Zerihun[1], Fiona Evans[2], John Noonan[1], King Yin Lui[3], Mark Gibberd[1], [1]Centre for Crop and Disease Management, Curtin University, [2]Big Data in Agriculture, Curtin and Murdoch Universities, [3]Research Development and Innovation, Grains Industry and Economic Development at DPIRD

Key messages

The tactical adjustment to fungicide application in response to seasonal conditions improves long run profitability of the wheat production. A deliberate approach that allows flexible management of diseases permits alteration of the number and timing of fungicide treatments and improves return on investment to fungicides.

Aims

This paper describes a risk-adjusted analysis of the economics of disease management. It shows that using seasonal conditions to inform decisions on timing and number of applications of fungicides improves profitability when compared with a scheduled crop protection approach.

Economically significant infection levels occur in high rainfall seasons, particularly during late winter and spring when key crop growth stages coincide with weather conditions that extend leaf wetness duration on major yield contributing leaves including the flag leaf. Fungicides, when used preventatively, offer some protection against significant yield loss if severe infections occur. When below average seasons are expected, funds will receive higher returns in other uses or in future seasons.

Results

We show with a case study that in a medium rainfall farming system, when tactical decision making is a practical option, optimal treatment is a single application at flag leaf emergence (Z39) in average to above average seasons. That is when the grower expects decile 5 or higher rainfall conditions with long run average farm gate price for grain. However, if at Z25 to Z30 a below average crop is expected (decile 3 or lower), most fungicide treatments would have negative to very poor return on investment.

Conclusion

We conclude that, when logistics and management resources allow for some flexibility, making tactical adjustments to the fungicide program, in response to seasonal conditions, can save money in the long-run. However, it is worth bearing in mind that this type of tactical response does not come with a guarantee of success in every season. This technique improves the likelihood of success but it does not attempt the impossible task of avoiding the rare situations when a good decision may have undesirable consequences.

Notes:

Barley loose smut – control variety susceptibility and effects on grain yield

Andrea Hills, Department of Primary Industries and Regional Development

ABSTRACT:

Andrea Hills[1], Geoff Thomas[2] and Kith Jayasena[3], DPIRD, [1]Esperance, [2]South Perth, [3]Albany

Key messages

- All seed dressings reduced loose smut but the most effective were the SDHI fungicides EverGol® Energy, Systiva®, Vibrance® and Vitaflo® C. The Dash/Hindmarsh family of varieties are particularly susceptible to loose smut and will require a seed dressing every year to maintain control.
- Grain yield loss was in proportion to the percentage of infected plants present.
- Management strategies to reduce loose smut in crop were of no or limited value although grading seed hard to retain the >2.5mm portion could be useful.

Aims

Growers are still concerned at levels seen in popular varieties such as La Trobe(ϕ) and Spartacus CL(ϕ). Levels fluctuate across varieties and seasons and increase rapidly in susceptible varieties in years when spring is mild. Loose smut is carried inside the seed which is visually the same as healthy seed. Fungicidal seed dressings are used to prevent infected seed from expressing a smutted head but these vary in their effectiveness.

Results

The most susceptible varieties were Hindmarsh, La Trobe, and Spartacus CL while the least susceptible were Fathom, Planet and Flinders.

Delaying nitrogen application did not affect smut levels while one of two trials showed a reduced level of smut with high sowing rates. Smut levels tended to be higher in smaller seed so that grading over a 2.5mm screen could be useful. Grain yield penalty from loose smut was proportional to the percentage of infected plants present.

Conclusion

The varieties Hindmarsh, La Trobe, Spartacus CL and Rosalind should be treated with a seed dressing to prevent loose smut every year.

All seed dressings are registered for loose smut control, select one according to the susceptibility of your variety, environment (low rainfall = lower risk) and other diseases/insects that you may need to control.

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Corporate Breakfast

Tuesday, 26th February 2019
7.15 – 8.50am, Crown Ballroom 1

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(Full Package Registration for the Grains Research Update includes attendance at this GIWA breakfast event)

Keynote Speaker

Linda Eatherton, **Partner/Managing Director Global Practice Development and Director, Global Food & Beverage, Ketchum, Chicago**

One of the leading authorities on the global food and beverage sector, Linda has devoted her entire career to the food and agricultural industry and has served it from the inside out. She held leadership roles at Kraft Foods and Dairy Management Inc. before becoming director of Ketchum's Global Food & Beverage Practice in 2000. Linda has provided counsel to companies throughout the food supply and value chain on issues, marketing, reputational and social challenges. At Ketchum she has led award-winning work for top firms including Nestle USA, ConAgra Foods, General Mills, Wendy's, FritoLay, the Kellogg Company, US Farmers & Ranchers Alliance.

Eatherton is recognised for her cultivation and curation of global food insights from her research series "Food 2020: Consumer as CEO" and the breakthrough identification of the Food eVangelist, a powerful cohort that has reshaped consumer mindsets about food and agriculture worldwide.

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Notes:

Long-term rotation diversity, but not residue handling, affects wheat yield and protein content

Phil Ward, CSIRO

ABSTRACT:

Phil Ward[1], Ken Flower[2,3], David Minkey[3], Shayne Micin[1], Neil Cordingley[3], [1]CSIRO, [2]University of Western Australia, [3]WANTFA

Key messages

- Wheat in the most diverse rotation is now consistently producing more grain (by about 0.2t/ha), with consistently higher grain protein (by about 1.6%), compared with the continuous wheat treatment.
- Residue windrowing and burning has reduced residue levels by about 50%, which has had an inconsistent impact on crop yield and has increased wheat protein in the cereal rotation, but not in the diverse rotation.

Aims

The long-term rotation trial at Cunderdin was originally established in 2007 to develop and test enhanced conservation farming practices, built around minimum soil disturbance, maximum residue retention, and diverse rotations. In this report we show the impacts of rotation diversity and residue handling on wheat yield and protein content.

Results

A diverse crop rotation (wheat/legume/canola) has consistently produced more wheat (by about 0.2 t/ha) at a higher protein content (by 1.6%) than a continuous wheat or a continuous cereal rotation in a long-term (12-year) trial at Cunderdin. Differences between the rotations were small and non-significant for the first few years, but have become significant since 2012. Residue retention versus burning had no impact on yield or protein in the diverse rotation, but residue retention was associated with higher protein in the cereal rotation.

Conclusion

The inclusion of a legume, and possibly benefits from soil microbial activity as demonstrated by residue retention in the cereal rotation, have resulted in increased grain yield and increased grain protein in a diverse rotation. These may me sustainable and cost-effective strategies for increasing grain protein in WA cereal crops.

Notes:

Vetches and their potential in the WA farming systems

Stuart Nagel, South Australian Research and Development Institute

ABSTRACT:

Stuart Nagel, Gregg Kirby and Angus Kennedy, National Vetch Breeding Program, SARDI

Key messages

- Vetches can adapt to the lower pH soils in Western Australia.
- Inoculating with appropriate Rhizobium which is suited to acidic soils is strongly recommended.
- Choose the species of vetch and variety depending on your end goals.

Aims

To demonstrate the potential and opportunities for the use of vetches in Western Australian farming systems, particularly mixed farming enterprises looking for a short-term legume option that fits into their cropping rotation.

Results

Trials conducted in Western Australia at Cunderdin and Kojunup on lower pH soils have shown vetch can be grown successfully in these environments.

Farmers in Western Australia are using both common vetch and woolly pod vetch to fill different roles in their farming systems.

The key to a successful vetch crop and achieving the maximum benefits from vetch is to treat it as a crop, not as a set and forget break option. Inoculate with appropriate rhizobium, control weeds where possible and monitor for insects and disease.

Conclusion

Vetches have the ability and potential to fit into modern farming rotations in WA, particularly in mixed farming systems where farmers are looking for a versatile break option that stills allows for strategic action against specific cropping problems. Unlike pulses and other break crops, the focus is not solely on grain production. Vetch can be used as a tool against herbicide resistant grass weeds and still produce a return with hay, grazing or grain and have an impact on subsequent cereals with increased levels of soil nitrogen.

When successfully grown vetch can be an effective risk management tool on farm. Allowing for a reduction in fertiliser and chemical use in following crops, reducing costs and the risks involved with in crop nitrogen applications. This can have a significant impact on profitability and the stress levels associated with these decisions.

Notes:

Strengthen your cropping and mixed farming systems with pastures

Adriano Rossi, Department of Primary Industries and Regional Development

ABSTRACT:

Adriano Rossi, DPIRD

The benefits of pastures in mixed systems are fairly well known. In 100% cropping systems, we often think of pastures as 'getting free nitrogen (N) in the system' and 'improving organic matter'.

Unfortunately, we expect miracles from these Mediterranean born battlers, and unless our farm becomes completely free of N fertiliser, and our organic matter increases from 0.5% to 2% in the first year, we may lose faith in them.

Aside from free N, and organic matter, we will discuss how we can use pastures for a variety of situations to reduce costs and risk, mainly in 100% cropping situations, such as:

- How much N do I need to apply after a pasture - can I really cut out all N, even my starter N?
- My chemical bill is getting big, and herbicide resistance is scaring me, can I do something with pastures?
- Can we use a pasture instead of a chemical fallow?
- With almost one in every three years being a late break since 2000, can I use a pasture to reduce risk of the late break, and a drought?
- How do I correctly manage a pasture, especially the newer ones? Can I give them the fast food treatment, or do they need the fine dining experience?

You may also find yourself in this situation:

- Livestock and wool prices are interesting me, but I've pulled out all my fences, and necessary stock infrastructure. It just seems too hard to get back in to stock even though I want to.

Using pastures slowly, and learning how to tame them in some of the 100% cropping situations, can give you confidence before getting stock back in the system. Once your confidence is up, and they are growing well, it might make transition back to a mixed system a little easier.

Pastures discussed will be serradella, eastern star clover, biserulla, bladder clover, vetch, plus more.

Notes:

Oats — grain and hay research

Georgie Troup, Department of Primary Industries and Regional Development

ABSTRACT:

Oat agronomy and variety selection: how changes to receival specifications for 2019/20 will impact oat production on-farm.

Georgie Troup, DPIRD Northam

Key messages

- Changes to the Oat2 receival standards include; the introduction of a 15% screenings limit, and the reduction of groats from 144 to 72 per black plastic measure.
- Growers should review their ability to meet these tightened specifications with their current variety and agronomic practices at their location.
- Maintaining grain quality can be achieved by; a) selecting a variety with strong yield potential matched with good grain quality, and the ability of that variety to perform in the target environment in variable seasons. Sowing date, nutrition and plant density are agronomic factors that can be adjusted to suit the variety, growing environment and targeted end product.
- Agronomy, and the use of variety specific agronomy becomes more important in maintaining grain quality, and improving a grower's ability to meet receival specifications in shorter growing seasons, compared to seasons which have a mild or soft finish where agronomy has a reduced effect on grain quality.

Results

National Variety Trial (NVT), and Oat Agronomy research results for grain yield, hectolitre weight, and screenings percent will be presented for all oat growing Agzones. Including an economic analysis for each of the Agzones illustrating the ability of currently available milling oat varieties to meet the tightened oat receival standards. The performance of newly accredited Oat1 variety Bilby$^{\Phi}$ will also be discussed.

Conclusion

Growers need to be mindful of the changes to the oat receival standards, and how these changes are likely to impact their ability to meet Oat2 quality specifications for screenings percent and groat number.

Growers should be planting varieties which are most likely to produce plump grain if they intend to produce milling oats.

Notes:

Review of 2019 canola yields and phenology

Jackie Bucat, Department of Primary Industries and Regional Development

ABSTRACT:

Key messages

- The highest yielding canola varieties are identified from the 2018 NVT trials and NVT multi-year analysis.
- Data from DPIRD trials is presented to match the suitability of varieties with time of sowing and the relative profitability of open pollinated and hybrid TT varieties.

Aims

To review NVT and DPIRD trial data to assist making good decisions about canola varieties for different regions and times of sowing, within each herbicide group.

Results

This presentation highlights the seed yield data from 36 NVT trials conducted in 2018 and the multi-year analysis (MET) data provided by NVT.

We also model the relative profitability of hybrid and open pollinated TT canola varieties, using the long term MET data. This is compared with density treatments from DPIRD trials, where we have used the common farm practice of lower density for hybrid varieties, compared with open pollinated varieties.

We present the flowering phenology data from DPIRD and discuss the relative suitability of varieties for different sowing times.

The 2018 canola crop statistics will be included, showing the proportion of GM varieties grown in WA in 2018 and the most widely grown canola varieties, using CBH data.

Conclusion

NVT data is available at nvtonoline.com.au. Search tools on the site allow comparison of variety performance within and between regions, locally and nationally. Extension of the results at the Agribusiness and regional Research Updates is important to maximise the benefit of the program to the WA agricultural industry.

Notes:

Early sowing of canola — field trials and crop simulation

Imma Farre, Department of Primary Industries and Regional Development

ABSTRACT:

In the last decade there has been considerable interest in sowing canola early to maximise yield and minimise the risk of missing a sowing opportunity. Dry sowing canola in mid-April has become standard practice in the northern cropping regions. However, there is a lack of experimental data on very early sowings before mid-April.

In this project we aim to combine the use of field trials with crop simulation modelling to obtain phenology and canola yield for very early sowing and to provide better advice to agronomists and growers about safe sowing windows and best varieties for different locations.

Notes:

Can we extend the sowing window of canola in WA?

Martin Harries, Department of Primary Industries and Regional Development

ABSTRACT:

Phil Ward[1], Ken Flower[2,3], David Minkey[3], Shayne Micin[1], Neil Cordingley[3], [1]CSIRO, [2]University of Western Australia, [3]WANTFA

Key messages

- Canola varieties have substantial plasticity and growers may be able to use a few varieties across a wide range of emergence dates; this is important if pre-ordering hybrid seed and/or dry sowing.
- Mid-season maturity varieties showed the greatest plasticity in plant development across sowing dates and may be a good option over a wide sowing/establishment period.
- Short season hybrids may enable the sowing window to be extended later with reduced risk.
- Difficulty establishing canola in hot conditions could limit how far the sowing window can be brought forward in northern areas.
- To take advantage of early autumn rains larger seeded broadleaf species that can be sown deeper, into better soil conditions, should be tested.

Aims

To investigate yield and phenology of canola varieties when sown in March to provide better advice to agronomists and growers about the best varieties to use and safe sowing and flowering windows.

Results

Tenindewa

Overall yield from May 17 sowing was impressive for this AgZone, at 1.6 t/ha. Delayed sowing by 34 days, to June 20, led to 1042 kg/ha less yield – 30 kg/ha/day. APSIM flowering dates match observed dates well.

Wongan Hills

Yields were impressive and did not decline with a delay in sowing; 1.9t/ha from April 26 and 2.2t/ha from May 17. APSIM predictions of flowering date were reasonable, although the range of 50% flowering dates was greater at TOS1 from observations.

Beverley

Yields were relatively stable across sowing times ranging from 2.2 to 3.1 t/ha. APSIM modelling of flowering dates differed from observations. It was observed that delaying sowing caused flowering dates of the varieties to converge more than was predicted by APSIM. This may be an underestimation of the vernalisation effect at this site.

Conclusion

It should be possible to extend the sowing window of canola:

- For short season environments and late sowing an ideotype appears to be early flowering with plasticity in growth and flowering to continue to form yield while conditions are favourable.
- The newer short season hybrids fit this ideotype flowering early with high biomass, for example short season hybrids yielded up to 870 kg/ha when sown on June 20 at Tenindewa.
- For longer season and early planted areas we need further testing of long season types to gauge their responsiveness.
- To take advantage of early autumn rains we need to test other broadleaf species that can be sown deeper.

Notes:

A stocktake of knowledge on soil amelioration tools

David Pannell, University of Western Australia

ABSTRACT:

Fiona Dempster[1], David Pannell[1] and Stephen Davies[2], [1]UWA, [2]DPIRD

Key messages

- Yield improvement was the key benefit from soil amelioration reported in the research literature and farmer interviews.
- There was a divergence in the research findings and in-paddock experience of farmers for crop vigour, ability to increase season length and crop establishment.
- The key knowledge gaps identified were the effect of soil amelioration tools on crop diseases, in-paddock nutrition and herbicide application and variability in tool cost.
- The findings support grower understanding and adoption of soil amelioration tools, identify knowledge gaps and provide recommendations for future research.

Aims

The aim of this study was to review the current research literature and collect farmer's views on the benefits, costs and risks of different soil amelioration tools for Western Australian grain growers.

Results

Information on the adoption, benefits and risks of soil amelioration was collated from literature review and interviews with 10 growers. This information was collated according to the adoption framework that underpins the ADOPT decision support tool. Growers listed compaction, soil water repellence, soil acidity and sodicity as their main soils constraints. Growers had used multiple tools to address these constraints. Most had used deep ripping with a subset of these having also tried very deep ripping or ripping with topsoil inclusion. Nearly two-thirds had used some form of deep mixing, with soil inversion, clay spreading and clay delving each having been undertaken by several growers. Awareness of and ability to trial and evaluate the amelioration practice was rated highly by most growers but having advisory support was not seen as particularly important. Both the literature and growers listed numerous profit, environmental and risk reduction advantages arising from soil amelioration but also acknowledged many potential risks. Increased yields, overcoming soil constraints, incorporating soil amendments/inputs, improved weed control and nutrient availability were some of the main profit and environmental benefits listed by growers, with poor establishment, climate interactions and variable response across soil types some of the reasons why profit might be reduced. Both the literature and growers reported both positive and negative view on ease and convenience of using amelioration tools and acknowledged significant upfront costs, though the size of these costs, and growers perception of them, varied considerably.

Conclusion

The findings confirm that growers, researchers and industry are aware of the profit, environmental and risk reduction benefits of soil amelioration practices but also acknowledge the costs and potential risks of the practices. Despite the risks and complexity the growers interviewed and the literature found there was a positive return on the investment in soil amelioration. Most of the growers were using multiple soil amelioration practices and some were looking at how they might extend amelioration benefits onto other soil types.

Notes:

Lime and gypsum application strategies for increased grain yield

Gaus Azam, Department of Primary Industries and Regional Development

ABSTRACT:

Gaus Azam, Chris Gazey, Richard Bowles and Mario D'Antuono, DPIRD

Agricultural lime is applied to the soil surface to ameliorate acidic soil. Surface applied lime takes many years to increase subsurface soil pH and improve grain yield. Physical incorporation of lime to depth can rapidly increase subsurface soil pH, but this increases the cost of liming. Surface applied gypsum (which does not change soil pH), on the other hand, quickly moves into the subsoil. However, the role of gypsum in acidic soil, its interaction with lime and effect on grain yield remains unclear. Combined application of lime and gypsum has been shown to be more effective than the application of either ameliorant separately but the mechanism of interaction on grain yield is poorly understood.

This paper reports on the long-term (6-23 years) effect of recurring lime applications on the improvement of the movement of alkalinity to the acidic subsurface soil and grain yield; the fate and potential use of undissolved lime in the surface to rapidly improve subsurface soil pH through incorporation; and our current understanding of the synergistic role of lime and gypsum to reduce the effects of subsoil acidity. This work is invested by GRDC, and is also investigating the role of different factors such as soil type, lime rate and amount of rainfall in enhancing the deeper movement of alkalinity.

Notes:

Using EM and gamma to simply map soil types for subsoil constraint management

Yvette Oliver, CSIRO

ABSTRACT:

Using EM and gamma maps to map soil types and help locate subsoil constraints for management

Yvette Oliver[1] Mike FT Wong[2], Gonzlo Mata[1], Karen Holmes[3], [1]CSIRO, [2]Murdoch University, [3]DPIRD

Key messages

- Soil maps improve the targeting of sampling for constraint and nutrients management, as well as variable rate management.
- Using low, medium and high gamma K or TC counts classes and low and high EM classes 6 soil types can be mapped to define areas of sand, saline sand, gravels, duplex soils, gravelly duplex and clay soils.
- Point data, such as soil texturing and soil chemistry as well as farmer knowledge can be used to adjust and evaluate the gamma and EM classes.

Aims

The aim is to create simple paddock and farm scale soil maps, using ground-based geophysics measurement of EM and gamma, for variable rate management such as nutrient or soil constraints.

Results

The main soils mapped, were defined after discussions with advisors and farmers about which soils they manage differently. The EM values are related to water content, salts in the soil (EC) and clay content, while gamma (K counts or total counts) correlate to clay and gravel content. Therefore overlaying the gamma (low, medium and high classes) and EM (low and high classes) enabled up to six soil types to be differentiated within a paddock or farm and defining areas of sand, saline sand, gravels, duplex, gravelly duplex and clay soils. Point data, such as soil texturing, soil chemistry, were used to adjust the gamma and EM classes.

This approach was tested and refined using the EM, gamma and point data of soil descriptors (texture, soil chemistry and PAWC measurements) from GRDC funded Subsoil Constraint project (DAW00242) and from previous GRDC funded precision agriculture projects covering the full extent of the WA Agricultural region. This included 16 farms with 29 paddocks (2733ha) plus one whole farm (>20 paddocks, 2466 ha) and 355 soil sampling points. We found the cut-off value for the high gamma class was similar to the mean of the gamma for the paddock. The low cut-off value for gamma is similar (but not quite) to the mean subtracting 0.6 x Standard deviation. At some of the sites, the mean was also useful as a first estimate to separate the low and high EM classes.

Conclusion

Simple soils maps which can be used for management of nutrient and subsoil constraints can be created by overlaying farm scale EM and gamma spatial layers. Splitting the gamma into three classes and EM into two classes enabled differentiation of up to six soil types. Using the mean and standard deviation of gamma to estimate the class cut off values and the mean for EM is a good starting place for mapping different soils for practical management applications and can be refined with farmer knowledge and soil description sites. These soil maps will improve the targeting of dollars spent by farmer for management of soil constraints or nutrient inputs with direct benefits on Return on Investment.

Notes:

Tackling Sclerotinia – an insight into the factors influencing disease development

Sarita Bennett and Mark Derbyshire, Centre for Crop Disease and Management

ABSTRACT:

Tackling Sclerotinia – an insight into the factors influencing disease development, including hybrid v open pollinated infections, lesion development, management practices and environmental conditions

Sarita Jane Bennett and Mark Derbyshire, CCDM, School of Molecular and Life Sciences, Curtin

Key messages

- Preconditioning temperatures between 35 and 50°C for 30 to 60 days increases sclerotia germination to 80%, compared to with no preconditioning.
- Sclerotinia stem rot infections were low in field trials in 2018, with a maximum 15% recorded, despite spores being present on 75 to 100% of petals tested.
- Sclerotium development is primarily below the point of infection in canola stems, with more, larger and greater overall sclerotia weight recorded in the lower half of the lesion.

Aims

- To determine the preconditioning temperatures required over summer and the winter temperatures required to initiate germination of sclerotia once wet
- To record genotype by environment by management interactions that influence Sclerotinia infections in the field, including prior soil assessment, petal testing and final disease score
- To understand the relationship between stem lesion and sclerotia development in hybrid and open-pollinated canola varieties.

Results

Sclerotia preconditioning and germination temperatures

Sclerotia preconditioned at 35°C and 50°C for more than 60 days germinated 30 days after wetting, and total percentage germination increased to up to 80%, compared to with no preconditioning. Both required preconditioning and germination temperatures varied with sclerotia collection location.

2018 field trials

Field trials recorded a low incidence of Sclerotinia stem rot in 2018, with less than 15% infection at all sites. In contrast petal testing for Sclerotinia spores were positive in greater than 75% of collected petals at most sites. Soil testing prior to sowing was variable (0 to 66 sclerotium/ m^2).

Sclerotia development in canola stems

In Sclerotinia infected canola stems sclerotia primarily developed in the lower half of the lesion, with significantly greater numbers of sclerotia, larger sclerotia and total sclerotia weight recorded below the site of infection. A significantly greater number of sclerotia were recorded below the point of infection in hybrid varieties compared to open-pollinated varieties.

Conclusion

Temperature over summer and during winter are important in determining the percentage germination of sclerotia in a paddock, with the required temperatures depending on the location.

The number of sclerotia developing within infected canola stems was higher in hybrid canola varieties than open pollinated varieties. However, the susceptibility to Sclerotinia stem rot infection is variety, rather than pollination type dependent. Further research is required in this area.

Notes:

Sclerotinia research update and approaches to in-season management

Ciara Beard and Ravjit Khangura, Department of Primary Industries and Regional Development

ABSTRACT:

DPIRD Sclerotinia research update and approaches to in-season management

Bonnie Jupp[1], Alice Butler[2], Ciara Beard[1], Jean Galloway[3], Christiaan Valentine[3], Geoff Thomas[1], Bec Swift[3], Ravjit Khangura[1], Anne Smith[1] and Laurie Wahlsten[2], DPIRD, Geraldton[1], Albany[2], Northam[3] and Perth[1]

Key messages

- The Department of Primary Industries and Regional Development (DPIRD) with funding from GRDC is taking a multifaceted approach to enable the grains industry to make informed management decisions on in-season Sclerotinia management.
- Sclerote depots, including automated imaging systems are used to monitor the start of the disease cycle (apothecia germination) in multiple locations each season. These showed that sclerotes formed in the 2016 season contributed to the Sclerotinia infections observed in the 2018 season. Factors that affect sclerote germination such as temperature, moisture and seed destructor technology have also been investigated.
- Monitoring Sclerotinia distribution across the wheatbelt through the national canola pathology project including basal infection, understanding how and why it occurs, and petal testing, to determine presence of the first stage of disease.
- Conducting trials and large on-farm demos to investigate fungicide timing, row spacing, plant density and varietal differences to inform management options for growers.
- On-farm testing of the SclerotiniaCM app, a decision support tool that helps growers and consultants make economic decisions on the value of applying a fungicide spray in a specific canola paddock at a specific time in a given season.
- Sclerotinia also effects grain legumes. DPIRD are conducting research on understanding the disease epidemiology in lupin crops, fungicide efficacy and timing, working on fungicide permits and investigating sclerote burden after the lupin rotation.

Aim

To enable the grains industry to make informed decisions on in-season Sclerotinia management.

Results

The presentation will cover an overview of all the Sclerotinia work that DPIRD is currently conducting with particular reference to observations, trials, on-farm demonstrations, petal testing and SclerotiniaCM app testing in the 2018 season in WA. Apothecia and disease development observations from canola crops in the Geraldton, Kwinana West and Albany port zones will be shown along with results from testing the SclerotiniaCM app. Lupin Sclerotinia trial results will be presented.

Conclusion

Sclerotinia is affecting grain legume and canola crops in WA. Sclerotinia of lupin is a rapidly growing issue, preliminary experiments have shown that fungicides effective in canola can reduce infection in lupin, however further work is required to understand what seasonal conditions favour the disease, how the disease causes yield loss, how much yield loss actually occurs and how it can best be managed utilising agronomic and chemical approaches.

Sclerote depots have proven to be useful in providing early warning of when apothecia are present and potentially causing petal infection. This early warning may enable growers to consider their spray options in a timely manner.

Petal testing in 2018 showed that there was a moderate-high level of petal infection in the Albany, Geraldton and Kwinana West port zones at the time when spray decisions were being made.

Testing of the app in 2018 showed it gave an accurate estimate of the value of applying fungicide or not in the 2018 season. In the Albany port zone the dry weather and late apothecia germination (identified through sclerote depots) meant fungicide application was not worthwhile and this was reflected in the negative returns predicted by the SclerotiniaCM app. In the Geraldton port zone where the winter months were consistently wet, the app clearly showed that a single fungicide spray would give a good return. This was likely to be the case as shown by a significant disease response in trials/demos until a hot dry spring finished the season abruptly, resulting in no yield benefits.

Notes:

Tailored management of Sclerotinia in canola with the SclerotiniaCM app

Art Diggle, Department of Primary Industries and Regional Development

ABSTRACT:

Art Diggle[1], Steve Marcroft[2], Kurt Lindbeck[3], Ravjit Khangura[1], Audrey Leo[3], Ciara Beard[4], Andrea Hills[5], Angela van der Wouw[6], Andrew Ware[7], Susie Sprague[8], Jean Galloway[9], [1]DPIRD Kensington, [2]Marcroft Grains Pathology, [3]NSW DPI Wagga Wagga, [4]DPIRD Geraldton, [5]DPIRD Esperance, [6]School of BioSciences, University of Melbourne, [7]SARDI, Port Lincoln, [8]CSIRO Agriculture & Food, Canberra, [9]DPIRD, Northam

Key messages

- App users will make the most profitable decisions about fungicide use to manage Sclerotinia stem rot in canola.
- SclerotiniaCM is designed for quick and efficient use with clients in the field.
- SclerotiniaCM produces results that are tailored for individual paddocks and generates email reports right from the field.

Aims

This work aims to deliver a tablet-based app to help with spray decision to manage Sclerotinia stem rot of canola. The app will provide evidence-based information that estimates returns from spraying for individual paddocks.

Results

Results from the SclerotinaCM app are presented for two contrasting situations differing only in the potential yield that is anticipated at the time of spraying. In the example presented the most likely return is a gain of $14/ha from applying fungicide spray where the potential yield of canola is 2.5 t/ha, and a loss of $8/ha where the potential yield of canola is 1.5 t/ha. In both cases the app presents the manager with range of likely outcomes in that situation. Results can be presented in a variety of ways depending on the preference of the user.

Conclusion

The SclerotiniaCM app has been designed to provide site and season-specific information to grain growers to inform their management decisions. The app provides information in terms of the mean, minimum and maximum change in net return that can be expected from application of foliar fungicide. The app allows canola growers to apply their own risk preferences in making decisions, rather than recommending particular management options.

The app is delivered on tablets and has a straight-forward user interface that asks for inputs that can be readily estimated by agronomic specialists. We envisage that the main use case for SclerotiniaCM will be as an aid to conversations about disease management between growers and their advisors, and that these conversations will typically occur in the field.

Sclerotinia CM is available for download for iPads or Android tablets from the iTunes store or from Google Play.

Notes:

Tweaking the management of malt barley for enhanced productivity

Blakely Paynter, Department of Primary Industries and Regional Development

ABSTRACT:

Blakely Paynter[1], Jeremy Curry[2] and Stacey Hansch[1], DPIRD, [1]Northam and [2]Esperance

Key messages

- **Managing grain protein:** cover research conducted in 2018 looking at the influence of nitrogen timing on grain yield and grain protein. the research was conducted with rgt planet and spartacus cl, who differ in their pathways to yield formation. previous research (2012-2016) presented at the 2017 grdc research updates has shown that delaying nitrogen fertiliser applications from seeding to stem elongation can increase grain protein without sacrificing grain yield. the 2018 study further explores the benefits/risks of a delayed nitrogen strategy, including how late is too late for malt barley.
- **Going for grain yield:** talk about what it might take to grow more than 6 t/ha of barley. in the study, we examined the interactions between plant growth regulators, disease management, nitrogen fertiliser and plant density on the performance of rgt planet in higher rainfall regions of western australia.
- **Barley phenology:** introduce flowerpower for barley, allowing users to assess when barley varieties (23 varietal choices available) may flower (reach awn emergence) for a range of sowing dates (assuming soil is wet when sown) between 10-april to 10-july for 75 different locations in western australia. predictions are provided in tabular and graphical formats for three different seasons – a colder than average, a normal and a warmer than average growing season based on historical data (last 52 years of weather records) as the model is unable to predict phenology in real-time. heat and frost risks are also displayed, that is the probability of a frost event after a certain data or a heat event before the predicted flowering date.

Notes:

Looking inside grain bags

Aidan Sinnott, South East Premium Wheat Growers' Association

ABSTRACT:

Key messages

- Use of grain bags at harvest across WA is on the increase.
- Anecdotal quality issues in malt barley attributed to grain bag storage, yet unproven.
- Industry buyers of malt barley hesitant to purchase malt barley stored in grain bags.
- Very little data available regarding inside bag conditions.
- Preliminary data suggests that short-term barley and wheat storage has no impact on quality.

Aims

There has been a lot of conjecture in the agriculture industry relating to grain which has been stored in bags for extended periods of time. SEPWA has recently undertaken a project to investigate grain quality factors (moisture, temperature, germination, colour) and market liability risks associated with the use of silo bags in the WA grain export supply chain.

In the past 5 years the use of grain silo bags in the WA grain industry has increased dramatically. The key driver for this is the logistical advantage of rapid harvest followed by on site storage of grain. Farmers have found bags to be vital in areas such as moisture and grain quality management as well as capturing freight cost advantages. Grain silo bags are now a proven tool for harvest management in WA.

There is however a gap in local technical data on their best practice guidelines and potential grain quality risk factors. In a pro-active approach to a potentially negative market response and to ensure maximum on farm supply chain flexibility, SEPWA has conducted a research project to assess potential effects on grain quality associated with silo bags to highlight ways to minimise risk going forward.

This project has closely monitored a number of grain bags during the 2017/18 and 2018/19 harvest seasons to assess them for grain quality implications. In this process, the logistical and harvest management implications will also be documented to understand best practice guidelines for all WA grain growers.

Results

In the first year (2017-2018) SEPWA aimed to take regular samples (7-14 days) from shallow (30cm) and deep (120cm) areas of the bags at the same locations until the bags are unpacked, or alternatively for up to 3 months. The bags have temperature sensors (Tinytags) inside, logging the temperature every 20 minutes for the duration of the sampling. All samples from the bags are tested for quality on the day of sampling and then put in ambient storage until all samples are collected. Once all samples have been taken, they are germination tested to see if the storage in bags has had an effect on germination, which could factor in the marketability of the produce which comes off farm. Germination of malt barley in particular is a major influencer in the efficacy of the malting process.

Results from the germination assessments to date show that there is no effect on germination percentage after a maximum time of 74 days in grain bag storage.

Conclusion

Overall it appears that there would be very little or no effect on germination percentage under the conditions looked at over harvest 2017. and so far this has also been the case in 2018. (Some grain bags are still being monitored).

Notes:

SOUTHERN/WESTERN REGION*

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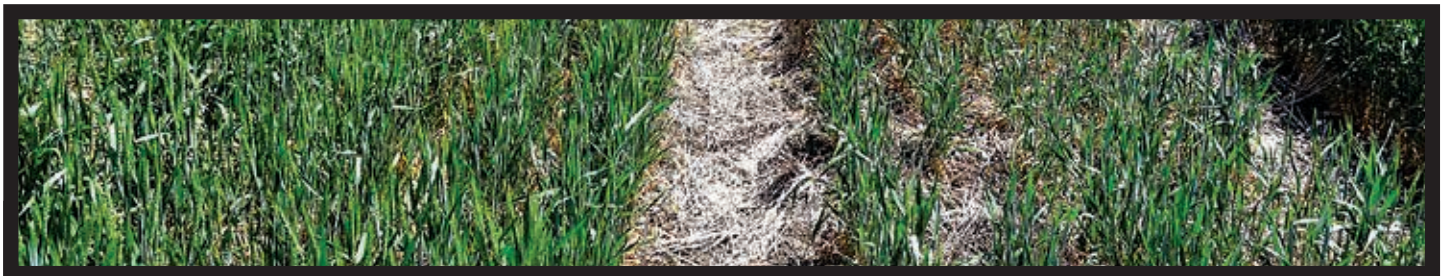

Cereal root diseases cost grain growers in excess of $200 million annually in lost production. Much of this loss can be prevented.

Using PREDICTA® B soil tests and advice from your local accredited agronomist, these diseases can be detected and managed before losses occur. PREDICTA® B is a DNA-based soil-testing service to assist growers in identifying soil borne diseases that pose a significant risk, before sowing the crop.

Enquire with your local agronomist or visit
http://pir.sa.gov.au/research/services/molecular_diagnostics/predicta_b

Potential high-risk paddocks:

- Bare patches, uneven growth, white heads in previous crop
- Paddocks with unexplained poor yield from the previous year
- High frequency of root lesion nematode-susceptible crops, such as chickpeas
- Intolerant cereal varieties grown on stored moisture
- Newly purchased or leased land
- Cereals on cereals
- Cereal following grassy pastures
- Durum crops (crown rot)

There are PREDICTA® B tests for most of the soil-borne diseases of cereals and some pulse crops:

- Crown rot (cereals)
- Rhizoctonia root rot
- Take-all (including oat strain)
- Root lesion nematodes
- Cereal cyst nematode
- Stem nematode
- Blackspot (field peas)
- Yellow leaf spot
- Common root rot
- Pythium clade f
- Charcoal rot
- Ascochyta blight of chickpea
- White grain disorder
- Sclerotinia stem rot

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0401 122 115

Profitable break crops for management of root lesion nematodes (RLN) and *Rhizoctonia solani* AG8

Bec Swift, Department of Primary Industries and Regional Development

ABSTRACT:

Profitable break crops for management of root lesion nematodes (RLN) and *Rhizoctonia solan*i AG8

Key messages

- Legumes such as field pea, lupin, serradella and subclover offer break crop options for paddocks infested with root lesion nematode species (RLN) commonly found in Western Australia, *Pratylenchus neglectus* and *P. quasitereoides*.
- Where *Rhizoctonia solani* AG8 coexists in a paddock with RLN, lupin and subclover did not increase inoculum numbers in the soil as much as other crop options tested, including barley and wheat.
- Canola, wheat and barley crops greatly increased RLN numbers during the season.

Bec Swift[1], Alice Butler[1], Sarah Collins[1], Carla Wilkinson[1], Sean Kelly[1], Daniel Hüberli[1], Jeremy Lemon[1], Paul Mattingley[1], Garren Knell[2], [1]DPIRD, [2]ConsultAg

Aims

The aim of these trials was to investigate the most effective and cost-efficient break crops in a rotation with cereals (wheat) to manage root lesion nematodes (RLN) and *Rhizoctonia solani* (AG8) in the same paddock with damaging levels of both. This paper presents the results from two field experiments in paddocks infested with RLN and *R. solani*. The sites are in Grass Valley and Dumbleyung, where these soilborne disease and nematode issues are common. The trials were conducted in the 2018 broadacre cropping season and included cereals, canola, lupin, field pea, serradella and subclover.

Results

At harvest, all the legumes grown reduced numbers of the root lesion nematodes at Grass Valley and Dumbleyung sites, with the exception of subclover (Dalkieth) for *P. neglectus* at Grass Valley. At this site, the subclover reduced *P. quasitereoides*, the most prevalent RLN species in the paddock, by 80% at harvest, reducing the total RLN numbers. All cereals and canola increased the RLN, in most cases pushing the levels into the next yield loss risk category (McKay et al. 2018). At the Dumbleyung site, the canola doubled the number of *P. neglectus* in the soil, pushing levels from medium to the high-risk category. Calingiri wheat increased RLN numbers by a drastic 350% but out yielded Mace, which increased RLN numbers by 150%.

All crops multiplied the *R. solani* AG8 inoculum in the soil at the Grass Valley trial. However, subclover and lupins had significantly lower multiplication rate compared to all crops including barley and wheat.

Conclusion

Overall, the legumes used in these trials significantly reduced numbers of the two major RLN present in WA in one season. Subclover and lupin also may provide a break for *R. solani*, but this needs further investigation. In 2019, the sites will be oversown with wheat to determine the profitability of each break crop in a cereal rotation.

Reference: McKay et al (2018) *Broadacre Soilborne Disease Manual V. 1.01*. SARDI, South Australia.

Notes:

GrainCam – a device for detecting contaminants in grain as at is being harvested

and

Using image analysis to map snails

Svetlana Micic and John Moore, DPIRD

ABSTRACT:

GrainCam – a device for detecting contaminants in grain as it is being harvested

John Moore, Carlos Babativa Rodriguez and Svetlana Micic, Department of Primary Industries and Regional Development

Key messages

- Grain contaminants such as weed seeds and snails can be detected using GrainCam that is attached to the harvester.
- GrainCam uses common components and is controlled by a smartphone.
- Maps of the locations of where the contaminants were harvested can be produced.
- It has been successfully deployed in rough country under difficult field conditions but requires some further work to improve reliability and create more accurate image analysis algorithms.

Aims

To produce a prototype device that will enable smartphones to map weed seed or pest densities occurring in grain during harvest.

Results

A device (GrainCam) was built to monitor grain as it was being harvested. It used mobile smartphones and image analysis to control the movement of grain across a platform where it could be photographed for later examination for the presence of weed seeds such as bedstraw, snails or other contaminants. Machine learning and deep neural networks were used to detect bedstraw seeds or snails in the images of the grain and produce a map of the location and density of the snails.

Conclusion

Understanding the density of contaminants across a paddock allows growers to target their control more effectively or avoid areas that are contaminated. Continuous detection will allow growers to identify the arrival of unwanted pests and diseases at low levels before they are easily detected manually or have become well established. This will allow more cost-effective control of new invasions.

There is potential to develop the system to provide real time feedback of contaminants in grain as it is being harvested.

Notes:

ABSTRACT:

Using image analysis to map snails

John Moore[1], Svetlana Micic[1], Carlos Babativa Rodriguez[1], Mehdi Ravanbakhsh[2] and Alice Butler[1],
[1]DPIRD, Albany, [2]MapIzy Pty Ltd, UWA School of Computer Science, Crawley

Key messages

- Image analysis of field photographs taken with mobile phones attached to agricultural equipment has the potential to be used to economically make maps of snail distribution and density in a paddock.
- This data can be used to make snail management decisions that reduce their economic impact.
- Machine learning deep neural networks were used to produce models that would quickly detect snails in images.

Aims

To produce maps from visual images taken of snails on the ground using readily available equipment.

Results

The regression equation between the number of snails manually counted and those detected with the new complex model for image analysis was:

No. of snails counted = 0.80 * No. of snails predicted by the complex model (r2 = 0.41) (P>0.001).

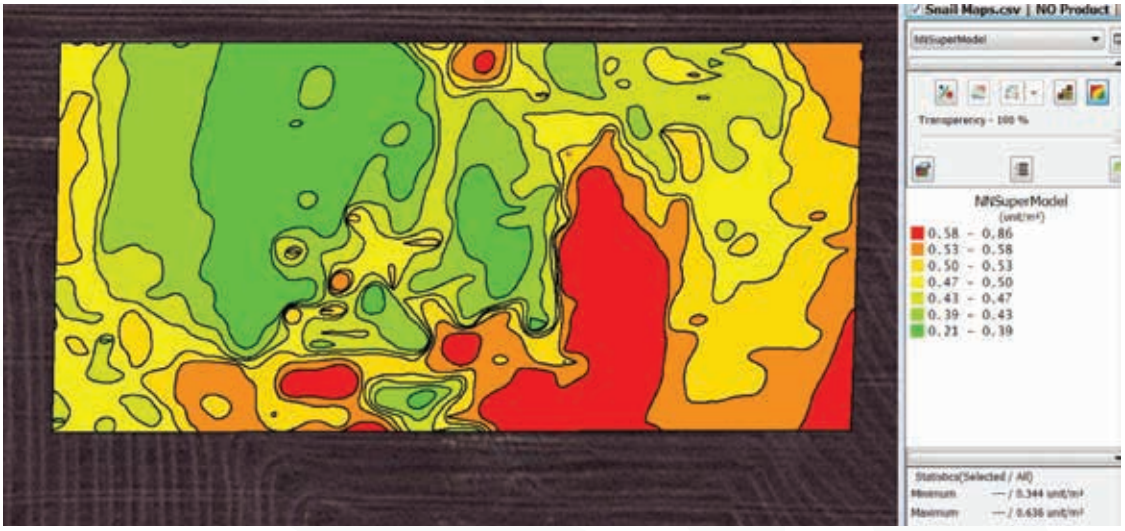


Figure 1. Contoured snail density map created by kriging of snail densities detected with image analysis with the **complex model** with **general training** data and using an automatic variogram at a three meter grid at Gairdner

Conclusion

Hardware and associated systems to create high resolution digital images are comparatively inexpensive and create the opportunity to collect paddock scale data on snail populations. The WheelCam effectively collected this geospatially referenced, high resolution digital image data for analysis and mapping. The analysis of the images using computer algorithms to detect snails was used to map the distribution and density of snails.

The maps for snail distribution could be used to avoid heavily infested areas during harvest to reduce the risk of grain contamination or alternative crops that are more tolerant of snails could be planted in infested areas..

Notes:

Improving the effectiveness of soil amelioration by optimising soil machine interaction

Mustafa Ucgul, University of South Australia

ABSTRACT:

Mustafa Ucgul[1], Chris Saunders[1], Jacky M.A. Desbiolles[1], Stephen Davies[2], Wayne Parker[2], [1]Agricultural Machinery Research and Design Centre, School of Engineering, University of South Australia, Mawson Lakes, SA 5095, Australia, and [2]DPIRD, Geraldton WA

Key messages

- Increasing ploughing speed from 5-15km/h significantly decreases the depth of topsoil burial
- Increasing ploughing depth beyond 200mm removed more topsoil from the surface but does not have a significant effect on the depth of topsoil burial
- The correct use of skimmers on mouldboard ploughs can increase the amount of topsoil burial below 100mm depth
- Faster forward speeds lead to less uniform mixing with 'hot-spots' of concentration within a spaded profile.
- Field research is required to identify which soil amendment incorporations (e.g. lime, clay, organic matter, fertiliser, etc.) can benefit from uniform spading in terms of crop response, and when less uniform (= lower cost) spading is adequate for sandy soils.
- Increasing ripping depth, whilst keeping the inclusion plate depth constant, does not increase the inclusion of topsoil but increases the draft force
- More effective topsoil incorporation is achieved at slower ripping speeds
- There is potential for improved inclusion plate design to reduce draft and improve top soil inclusion.

Aims

A range of different agricultural machines are used to address soil constraints. Physically testing the operational performance of each machine is costly and time consuming and can only be performed at certain times of the year. With the use of current computer technology and Discrete Element Method Simulations, soil-machinery interaction can be accurately represented and different operating conditions can be tested without the need for such field tests. In this paper four different agricultural tools used for addressing constraints and ameliorating the soil have been analysed at different operation conditions using DEM. The tools used in the study were a mouldboard and disc plough for burying water repellent top soil, a rotary spader for mixing surface applied amendments and a deep ripper with inclusion plates for soil loosening and top-down surface layer incorporation.

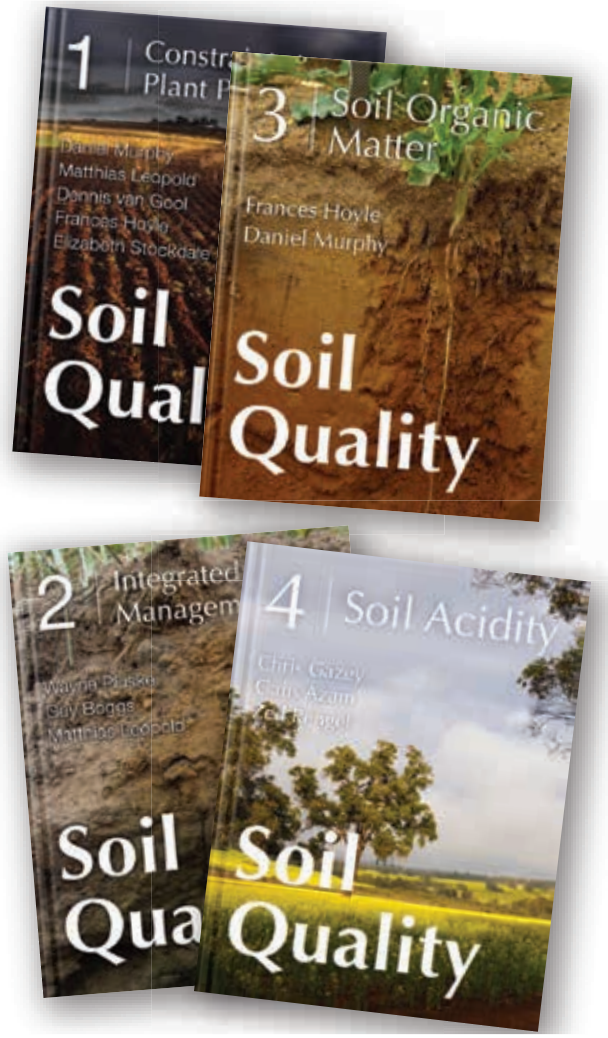
Results

Results of DEM simulations to date have shown that once calibrated the computer simulations have the ability to determine the resultant effect of a machines configuration and setting on soil profile modification. Results of the study have shown that increasing the machines forward speed reduces (1) water repellent top soil buried by mouldboard ploughs across all depths and for a disc plough to deeper depths, some improvement of shallow burial can be achieved at higher speeds. (2) the uniformity of soil mixing of the rotary spader and (3) top-down surface layer incorporation with inclusion plates. Additionally, increasing the depth of a machines operation does not significantly (1) increase the top soil burial of a mouldboard plough, (2) improve the soil mixing of a rotary spader and (3) increase the top-down surface layer incorporation with inclusion plates, if their position on the ripping tine is not changed.

Conclusion

Computer simulation methods such as Discrete Element Method (DEM) have been proven to reliably represent and predict the soil profile modification, allowing for a greater understanding of their capability and limitations of a wide range of machines that are currently being used to overcome soil constraints in Australian farming practices. Future work will focus on investigating more machines under different operating conditions in different soil types and related their operational differences to the yield response of the crop.

Notes:



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- SoilsWest Director UWA's Frances Hoyle

The Grains Research and Development Corporation (GRDC) and SoilsWest – a partnership between the University of Western Australia (UWA) and the Department of Primary Industries and Regional Development (DPIRD) – worked together to publish 'Soil Quality 3: Soil Organic Matter'. Supported by the Australia-China Joint Research Centre.

Get it on iBooks

Getting the edge on improving crop productivity on sandy soils

Therese McBeath, CSIRO

ABSTRACT:

Therese McBeath[1], Lynne Macdonald[1], Rick Llewellyn[1], Vadakattu Gupta[1], Jack Desbiolles[2], Michael Moodie[3], Sam Trengove[4], Stuart Sheriff[4], [1]CSIRO Agriculture and Food, [2]University of South Australia, [3]Mallee Sustainable Farming, [4]Trengove Consulting

Key messages

- Edge-row sowing increases crop establishment and competition with weeds.
- Ripping and spading have had significant yield effects, even in a very low rainfall season
- Organic inputs or fertiliser supplied with ripping and spading have shown varied responses.

Aims

The aim of this work is to increase crop water use on constrained sandy soils in the Southern cropping region. To achieve the best possible profit-risk outcomes we are testing strategies that can be relatively low cost and implemented with a seeder through to very expensive disruptions that require specialised machinery (eg. ripping with active placement of inputs at depth).

Results

We have measured consistent benefits of edge-row sowing for reduction in grass weed seed set, surface moisture conservation and improved crop establishment in non-wetting sands, but not consistent yield effects.

Compaction appears to be a prevalent constraint in sands in the Southern cropping region and responses to ripping and spading have been significant (>15 % yield response) even in a very low rainfall season. Despite a 50% yield increase, an increase of 0.3- 0.5 t/ha at our low rainfall sites in a decile 1 year is a timely reminder that the level of investment needs to reflect the range of yield benefits that the climate (rainfall) can support. Most of our long-term sites have shown ripping and spading effects to persist beyond three growing seasons.

While fertility is lacking in sands of the Southern cropping region, responses to inputs of organic inputs or fertiliser in combination with physical (ripping/spading) treatments has been variable in terms of when there is a yield response and how big it is.

Conclusion

There are a range of strategies that have been used to manage non-wetting, compaction and poor fertility in sands of the Southern cropping region. These strategies have varied in cost, reliability and longevity of effect, all key factors in profit and risk.

Notes:

Notes:

Turnip yellows virus (TuYV) epidemic in 2018 – it's time to get one step ahead of the green peach aphid

Ben Congdon, Department of Primary Industries and Regional Development

ABSTRACT:

Benjamin S. Congdon, DPIRD

Key messages

- Under glasshouse conditions, both the open-pollinated (OP) and hybrid variety examined incurred significant yield losses to *Turnip yellows virus* (TuYV) infection when inoculated at the two-leaf (GS12) and five-leaf (GS17) stage. At beginning of bolting (GS30), the OP variety still incurred significant losses; however, the hybrid exhibited infection tolerance.
- TuYV resistance was identified in a small number of canola varieties and appears to be mediated by temperature.
- A TuYV epidemic early warning system was developed using a new protocol to detect TuYV in migrating aphids caught on traps before they establish in young crops and spread virus to high levels by GS30. In 2019, DPIRD's Diagnostic Laboratory Services (DDLS) will offer this as a service to growers. This will forewarn growers to make targeted applications of systemic insecticide (i.e. sulfoxaflor) to effectively control green peach aphid and prevent epidemics such as those seen in 2018.

Aims

- Identify TuYV resistance in current Australian commercial and a range of international canola varieties.
- Examine the impact of TuYV infection at different pre-flowering growth stages on yield of an open-pollinated and hybrid varieties under glasshouse conditions.
- Demonstrate and validate the application of loop-mediated isothermal amplification of TuYV by testing aphids caught on yellow sticky traps deployed at grainbelt field locations to develop an early warning system for epidemics.

Results

TuYV resistance screening

Testing over 100 canola varieties/lines at a plot trial with a high virus disease pressure revealed potential resistance in just 3% of them. Follow-up aphid inoculation on these varieties and lines showed a spectrum of partial resistance. Just one variety currently grown in the grainbelt exhibited partial resistance (ATR Stingray) with all others being highly susceptible. Further examination revealed that this resistance suppresses virus replication in the plant and breaks down under high temperatures.

Yield loss

Under glasshouse conditions, significant yield loss occurred in the open-pollinated variety when inoculated at GS12 (36% decrease in seed yield), GS17 (26%) and GS30 (31%). Significant yield loss occurred in the hybrid variety when inoculated at GS12 (44%) and GS17 (38%) but was tolerant to infection at GS30.

Early warning system

By collecting aphid trap and virus incidence data at 30 sites sown to canola in the south-west Australian grainbelt, we validated the in-field capability of a RT-LAMP assay protocol designed to detect TuYV in aphids. On all occasions in which TuYV reached high crop incidences by GS30, TuYV was regularly detected in migrant aphids caught on traps deployed in a six-week period prior to crop emergence until approximately GS15. Conversely, no TuYV detection during this period was associated with negligible TuYV spread in this period. Although the presence of aphids was a prerequisite for spread to occur, many scenarios occurred where there were significant aphid numbers but none carrying TuYV, and therefore, subsequent negligible levels of TuYV spread by GS30.

Conclusion

This study highlights that canola at early growth stages, especially if not protected by neonicotinoid seed dressing, are extremely vulnerable to seed yield losses. However, it suggests that hybrid varieties are tolerant to TuYV infection at GS30 unlike OP varieties. Due to early sowing (exposing young plants to autumn aphid flights), an increase in tolerance to neonicotinoid seed dressings in green peach aphid populations, and a variety of other factors, there is a higher risk of TuYV epidemics occurring during these growth stages. Therefore, there is urgent requirement for judicial use of valuable systemic insecticides, such as sulfoxaflor, and exploration into the potential incorporation of host plant resistance into breeding programs.

The host plant resistance mechanism described in this study can help slow down TuYV epidemics and its implementation into breeding programs should be strongly considered. However, it use in the field needs to be examined further to determine its best fit in an integrated disease management package.

The TuYV epidemic early warning system developed will enable proactive TuYV management. In particular, non-prophylactic, precisely timed and highly effective systemic insecticide applications. These will eliminate initial GPA crop colonisation, protect vulnerable plants from future infestations, and prevent epidemic level TuYV spread in vulnerable pre-GS30 canola and subsequent seed yield and quality losses. In 2019, DPIRD will be supplying yellow sticky traps and offering testing services to agronomists and growers. Continued testing of automated smart traps in a trapping network currently being established will also provide information on virus risk for some high-risk grainbelt locations.

Notes:

Ten years of different crop rotations in a no-tillage system – what happened to plant diseases and nematode pests?

Ken Flower, University of Western Australia

ABSTRACT:

Ken Flower[1,4], Daniel Hüberli[2], Sarah Collins[2], Geoff Thomas[2], Phil Ward[3], Neil Cordingley[4], [1]UWA, [2]DPIRD, [3]CSIRO, [4]WANTFA

Key messages

- Windrow burning had little effect on level of stubble-borne disease.
- *Fusarium* spp. and *Rhizoctonia solani* levels increased in cereal dominated rotations.
- *Pythium* spp. and *Pratylenchus neglectus* were favoured by more diverse rotations.
- Farmers require up-to-date information on the host status of crops if rotation is going to be an effective broad-based control measure.

Aims

To study the long-term effects of crop rotation and residue level on the main stubble-borne foliar and root diseases and nematodes in Western Australian no-tillage systems.

Results

The research compared wheat monoculture with a cereal rotation (cereal/cereal/cereal), a diverse crop rotation (cereal/legume/canola), a 'typical' farmer rotation (cereal/cereal/legume or fallow) and a pasture.

Fusarium spp. and *R. solani* were favoured by the cereal-dominated sequences. *Fusarium* spp. DNA in the soil increased most in the cereal rotation and wheat monoculture, it hardly changed in the farmer rotation and pasture and it declined in the diverse rotation.

In contrast, root lesion nematode, *P. neglectus*, was favoured by the more diverse rotations (which had greater inclusion of nematode susceptible species). Levels of *P. neglectus* increased most in the pasture and diverse rotation, followed by the wheat monoculture and decreased in the farmer and cereal rotations. Soil *Pythium* spp. levels decreased significantly in the cereal and farmer rotations and the wheat monoculture and increased in the diverse rotation and pasture.

As expected, there were higher levels of yellow leaf spot when wheat was grown on wheat stubble. The farmer rotation and diverse rotation had the lowest levels of yellow leaf spot. Field pea blackspot was lowest in the cereal rotation and wheat monoculture. Overall, windrow burning had little effect on the level of leaf, root or crown diseases in cereals.

Conclusion

The various crop rotations affected soil nematodes and pathogen levels differently. The combination of canola and wheat, along with susceptible chickpea, appeared to favour root lesion nematode. In contrast, fallow and lupin in the farmer rotation appeared most effective at reducing nematode levels for the following season. The relatively high nematode numbers in the pasture was likely due to continuous presence of a number of susceptible weeds and subterranean clover. The crop selections in the diverse rotation of this experiment have generally been a poor choice in terms of their susceptibility to *P. neglectus*, our main nematode threat.

There were higher levels of *Pythium* spp. in the pasture and diverse rotation, because susceptible plants like legumes and canola were grown. *Pythium* spp. levels were lowest in the cereals.

R. solani was significantly greater in the soil following cereals compared with canola, chickpea and fallow. Nonetheless, the break crops appeared to have only had a relatively short-term effect on levels of *R. solani*.

These differences in disease and nematode susceptibility between crop types and even varieties means that farmers require up-to-date information on the host status if rotation is going to be an effective broad-based control measure. Windrow burning does not appear to be effective as a long-term control option for the stubble-borne diseases.

Notes:

Creating the conditions for innovation to thrive: How we bring the right people together to get great ideas to market

Sarah Nolet, AgThentic and Natasha Ayers, AgriStart

Sarah Nolet:

Australia already has a global competitive advantage in our agricultural production, and globally recognised capabilities in research. But with the entrance of new players into the agricultural innovation system, such as startups, investors, and multinational tech companies, new opportunities and challenges are arising. The business models and value chains of tomorrow may look very different than those of today. Australia is faced with a choice: do we embrace and engage with these new players? And if so, how?

This presentation will explore Australia's opportunities in the new world of agrifood tech, including highlighting stories of the existing innovations, entrepreneurs, and early-adopters already working to build a more economically and environmentally sustainable future. It will also explore the evolving roles that farmers can play in the development and commercialisation of innovations, including as advisors, investors, and entrepreneurs.

Ultimately, this presentation will pose and challenge the audience to answer -a question that is vital to the success of agtech in Australia: how can we meaningfully engage farmers so that more solutions are developed that create lasting value?

Natasha Ayers:

There is a lot of buzz around Agtech at the moment, fuelled by the mining downturn (in Western Australia particularly), food security issues, data availability and connectivity improvements, and a need to create value-add opportunities and supply chain efficiencies to remain globally competitive. The question is – where are the real opportunities for Agtech in Australia, and where is it just hype?

Technology will shape the future of agribusiness in WA, and incredible opportunities do exist where the technology is linked to either improved profits, time savings, safety improvements or sustainability gains. Facilitating collaboration, research and tech trials between innovators and farmers is key to capitalising on potential opportunities. This presentation will share our experiences in supporting the agtech sector in WA and discuss future prospects for further innovation in agriculture in WA.

Notes:

New research in the understanding and management of fungal diseases

Focus Session 1 – Crown Ballroom 1

Convenor: Mark Gibberd

Join researchers from the Centre for Crop and Disease Management (CCDM), Department of Primary Industry and Regional Development (DPIRD), University of Southern Queensland (USQ) and a special guest expert Michael Hess from Europe

As we address two major areas of rapid change in crop pathology in Western Australia

- Fungicide resistance
- Barley foliar diseases

The focus session will hear about recent developments in fungicide resistance and follow a live demonstration of latest advances in detection technology from the CCDM (Fran Lopez-Ruiz, Kat Zulak and Kejal Dodhia). We will also hear from Dante Adorada (Centre for Crop Health - USQ) on fungicide resistance research in Queensland and its relevance to lessons to be learnt in Western Australia. The CCDM (Simon Ellwood and Ayalsew Zerihun) will then present the latest research outcomes on both genetic and management solutions to Barley Powdery Mildew. Finally, we examine the emergence and potential significance of the recently recognised foliar pathogen of Barley – Ramularia. DPIRD pathologists Geoff Thomas and Kith Jayasena will discuss the detection of this pathogen in Western Australia and then renowned Ramularia expert Michael Hess will outline the global significance of Ramilaria.

Notes:

Best management and control of weeds

Focus Session 2 – Crown Ballroom 3A

Convenor: David Bowran

Weed management remains one of the most expensive components for grain production and despite the advent of modern herbicides weeds have not disappeared from global cropping systems. Surveys of farmers in Australia continue to show weed management as being of high priority to ensure productivity, quality and biosecurity impacts are minimised.

The focus session will have six speakers challenge issues around weeds in WA cropping systems with aspects of weed biology, herbicide management, herbicide resistance, integrated weed management and emerging weed problems being presented. The presenters, other members of the panel and the audience will then be given the opportunity to address three real or potential scenarios related to weeds in cropping systems, and to identify if the key issues arising from the scenarios require research, extension or policy initiatives.

Notes:

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Regional Cropping Systems Network Open Forum

Focus Session 3 – Crown Ballroom 3B

Convenor: Julianne Hill

What keeps you awake at night? What are some of the biggest issues hurting your growers? What do you think hasn't had enough work done on it?

Provide input on ideas you'd like to see considered by GRDC at this Regional Cropping Solution Network (RCSN) Open Forum.

In operation since November 2011, GRDCs RCSNs have initiated 149 projects in WA, looking at a range of activities including:

- Bus trips to look at how lime is ameliorated by farmers in the northern wheatbelt;
- Case studies of different seeding systems that farmers are using;
- Crop agronomy packages for current and emerging high rainfall zone (HRZ) growers;
- Bringing expert presenters from overseas and interstate to talk to our WA farmers;
- 'Ripper Gauge' Demonstration Sites in the Western Region; and
- everything in between.

Led by GRDCs RCSN coordinator Julianne Hill, you will be able to put forward issues and have a chance to convince us why you think they are important and need further investment.

All input will be discussed by RCSN members tomorrow when they formally consider priorities for possible investment by GRDC.

So if you'd like to get some of your ideas across to GRDC, or would like to highlight an issue for your port zone that will deliver good value to WA levy payers, then we'd like to see you at this RCSN Open Forum.

Come prepared - bring ideas!

The following people will be available to chat to during the session:

Julianne Hill

Julianne has a broad range of experience in agriculture, working for the Department of Agriculture (now DPIRD) from 1993-2007 as a Biosecurity Officer based on the south coast, then from 2007-2011 as a Farming Systems Officer where she was closely involved in district trials programs as well as providing general advice to broadacre growers and later beef farmers in the southwest. Julianne has experience in broadacre cropping with wheat, barley, canola and oats; sheep; and beef cattle.

Lucy Broad

Lucy Broad is general manager for GRDCs Grower Extension and Communications business group. Ms Broad has a Bachelor of Science in Agriculture, majoring in agronomy, and has spent her career in communications, first with the Australian Broadcasting Corporation and for the past 13 years overseeing communications and behaviour-change strategies for clients across the agriculture, natural resource management, government and not-for-profit sectors

Jo Wheeler

GRDC Grower relations manager – west - Jo Wheeler coordinates and analyses grains research ideas from stakeholders throughout WA. Jo has a background of sustainable agriculture and natural resource management. She worked with Wheatbelt Natural Resource Management for four years, collaborating closely with grains industry stakeholders to manage a range of on-farm projects, before joining GRDC 14 months ago.

Curtis Liebeck

GRDC grower relations manager – west – Curtis Liebeck comes from a long line of farmers on both his mother's and father's sides, and was raised on a 5870 hectare mixed cropping and livestock property near Muntadgin. Curtis studied at Curtin University and graduated with a Bachelor in Agribusiness and then joined Kalyx Australia's WA team as a graduate research agronomist. Curtis has been part of the GRDC team since November 2018.

Chris Wilkins

Western Panel Deputy Chair Chris Wilkins is an agronomic and agribusiness adviser based in Badgingarra. He has 24 years' experience in WA agriculture, including 17 years offering farm business, agronomy, farming systems and crop protection advice through his Vision Agribusiness Services company. Chris is also a director of agricultural consultancy business Synergy Consulting WA, and chairs the Council of Grain Grower Organisations Ltd.

Michael Lamond

Western Panel member Michael Lamond is an experienced hands-on agronomist who started his career in discovery and innovation related to agricultural systems, including herbicide resistance, herbicide systems with minimum tillage, legume rotations, pasture systems, soil acidity and crop variety evaluation.

Juliette McDonald

Western Panel member Juliet currently works for Summit Fertilizers as an Area Manager for the Perenjori, Carnamah, Three Springs, Morawa, Mingenew and Coorow shires. In this role she is in charge of agronomy based fertiliser sales in the North Midlands, nutrient recommendations based on soil and plant analysis and research and demonstration on-farm to assist growers and grower groups with better fertiliser decisions.

Notes:

New pathways for commercialising Agtech in Australia

Focus Session 4 – Crown Ballroom 3C

Convenor: Steve Thomas and Manjusha Thorpe

Join an interactive session and hear firsthand accounts of how ideas have been transformed into commercial realities that are benefitting the grains industry. This session will show that there are several pathways to innovation and that these are accessible to everyone.

Local innovators and leaders will share their personal stories of successfully building and navigating the agtech innovation system in Australia. Katrina Spencer will share the story of developing and producing gluten free beer and David Mainwaring will describe the process of commercialising soil wetting agents. The session will culminate in a free-flowing panel discussion where speakers can be challenged to recommend the best ways to progress new ideas and technologies.

Notes:

Snail management strategies

Focus Session 5 – Meeting Room 2

Convenor: Ken Young and Georgia Megirian

Snail management – current and future possibilities

The number of snails have increased in broadacre cropping in Western Australia with the use of minimum tillage and stubble-retention practices. Four introduced snail species of European-Mediterranean origin have established, particularly in southern Australia, and cause damage to grain, recently germinated plants and are a contaminant of grain at harvest. The market access threat from these snails is substantial and increasing, particularly for the acceptance of Australian wheat and barley shipments by valuable east Asian markets (e.g. China, South Korea).

A panel of researchers and agricultural industry members will share their knowledge and experiences on snail management opportunities in fallow, at seeding, in-crop, at harvest and post-farmgate. The panel and the audience will then be given an opportunity to highlight the on-farm practicality of current methods, other key issues, and the future possibilities for snail management in Western Australia.

Notes:

Papers submitted and not presented at the Perth Update

For the 2019 Grains Research Updates events, the Program Committee received over 100 Expressions of Interest (EOIs) to present at the Grain Research Update, Perth. All EOIs were carefully considered, and unfortunately due to time constraints and in some cases late submission, only half of these could be accommodated to present at the Perth Update.

All authors who offered to contribute papers were still invited to submit their papers for digital publication. All papers provided will be uploaded to the GIWA website at **http://www.giwa.org.au/2019researchupdates** and the GRDC website at **https://grdc.com.au/resources-and-publications/grdc-update-papers** when they are supplied and approved for public access.

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