GRDC
GRAINS RESEARCH & DEVELOPMENT CORPORATION

2021 GRAINS RESEARCH UPDATE, Geraldton

17th March 2021

Geraldton Yacht Club, Marine Terrace

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#GRDCUpdates

Welcome
GRDC Senior Regional Manager—West

GRDC Senior Regional Manager – West, Peter Bird

I am pleased to welcome you to the Grains Research and Development Corporation (GRDC) 2021 Regional Grains Research Update series in Western Australia.

The Grains Research Updates are flagship events for the GRDC and play an important role in the delivery of information about research and technologies that can directly benefit grain growers on-farm.

It is especially pleasing to be together here at this Update given the significant challenges posed by COVID-19 since 2020, which has impacted on many industry events.

However, it is important to guard against complacency and I remind everyone to adhere to the WA Department of Health guidelines and:

- Practise physical distancing
- Practise good personal hygiene (wash hands often with soap and water, or hand sanitiser and cover coughs and sneezes with a tissue or use your elbow)
- Stay home if feeling unwell and if you are experiencing flu-like symptoms get tested for COVID-19.

Programs for the Regional Update events are focused on information that is directly relevant to the challenges and opportunities of growers who farm in the areas in which the events are held.

Accordingly, the organising committees have invested considerable time and effort to ensure topics and speakers are applicable for each Update and I thank them for their significant contributions.

I also acknowledge and thank GRDC staff and event coordinators the Grain Industry Association of WA for their hard work in delivering these excellent events.

Networking is an enjoyable part of the Updates and plenty of time is factored into the programs so that you can meet and talk with others from the industry.

During the breaks, please feel free to speak with GRDC personnel, including staff and Western Region Panel members, to chat about your ideas or concerns.

I trust you will find this Update useful and interesting, and that the information you take away from it helps to ensure that you or your clients' cropping seasons are successful and profitable.

Peter Bird

GRDC SENIOR REGIONAL MANAGER—WEST

We value your Feedback

We aim to continually improve each Research Update event by listening to your thoughts. Help us by completing the Evaluation Form provided.

THE 2020-2022 GRDC WESTERN REGIONAL PANEL

January 2021

GRDC
GRAINS RESEARCH & DEVELOPMENT CORPORATION

CHAIR - DARRIN LEE

Mingenew/Dongara, Western Australia

Darrin Lee was appointed to the Western Region Panel in 2014 and was appointed Panel chair in 2018. He has been farming in Western Australia's Northern Agricultural Region for more than 20 years, with property now at Mingenew and Dongara. Darrin has a keen interest in digital agriculture and has a background in banking and finance. He is a past member of the CBH Group Growers Advisory Council and

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DEPUTY CHAIR - JULES ALVARO

Merredin, Western Australia

Jules Alvaro is a director of a broadacre, predominantly cropping business in Nokaning WA. Jules has also been involved in off-farm industry roles including as a Western Region Panel Member since 2015, a non-executive director on the boards of Partners in Grain (now Rural Edge) and Agricultural Women Wheatbelt East, and is currently on the Muresk Institute Advisory Committee. Jules is an alumni of Leadership WA's Signature Leadership program. She is a graduate of the Aust. Institute of Company Directors and has completed the General Manager Program at the Australian Graduate School of Management (AGSM) at the University of New South Wales Business School.

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JULIET MCDONALD

Coorow, Western Australia

Juliet is a Coorow grower and also works for Summit Fertilizers as an Area Manager. Juliet has a passion for agriculture having worked as a sales agronomist with Elders, area manager – Kwinana West, for GrainPool, marketing manager with Coorow Seeds and research agronomist and extension officer with the WA Department of Primary Industries and Regional Development. Juliet holds a Bachelor of Science in Agriculture from University of Western Australia and is qualified as a Fertcare® Accredited Adviser.

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ROHAN FORD

Binnu, Western Australia

Rohan and his wife Carole farm east of Binnu growing wheat, lupins and canola in a low rainfall zone with highly variable precipitation. They have been using controlled traffic farming methods for 20 years. The Fords have also been involved in trial work and projects related to a variety of areas that help to improve farming outcomes and increase knowledge. Rohan is also involved closely with the local grower group, holding various positions over many years and helping to provide mentoring for younger farmers.

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SUZANNE WOODS

Calingiri, Western Australia

Suzanne Woods is an owner of Emdavale Farms, a 3400-hectare mixed farming enterprise in Calingiri, north-east of Perth. Oaten hay comprises 50 per cent of the cropping program, with the remainder being wheat, barley, canola and lupins. The business operates a small cattle and sheep enterprise as well as a farm contracting business, concentrating mostly on mowing, baling and carting hay and straw. Suzanne is a founding shareholder in Hay Australia, a large export hay company and is a director of the Australian Fodder Industry Association and Regional Early Education and Development Inc. She sees R&D as the key to ensuring that Australian farming businesses and communities continue to be at the forefront of new technologies and applications.

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GARY LANG

Wickepin, Western Australia

Gary, a grower for 37 years has grown the farm from a 1000ha Merino stud enterprise to a 5600ha cropping-focused business. He grows wheat, barley, oats, canola and lupins across 87 per cent of the farm, Gary was a catalyst in initiating frost research confirming that high levels of stubble could increase frost damage to grain crops. He is the president of the Facey Group and was previously the grower group's cropping coordinator, secretary and vice president.

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JOHN BLAKE

Albany, Western Australia

John is a research and development consultant with Stirlings to Coast Farmers and an adviser in Western Australia's northern, central and southern agricultural regions. He has led RD&E projects with GRDC, MLA, National Landcare Program and Royalties for Regions investment. John has a degree in Agricultural Science from the University of WA and has extensive skills in agricultural sustainability, diagnostics for precision agriculture and farming systems analysis.

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NATASHA AYERS

Vasse, Western Australia

Tash is the co-founder and managing director of AgriStart, a WA company connecting key players in the agri-food innovation space. She has an agricultural scientist background, with a PhD in plant biology and a Bachelor of Science in Agriculture, and has qualifications in university teaching, research commercialisation and leadership. She is a graduate of the Aust. Institute of Company Directors. She is an experienced trainer and facilitator and has spent the past seven years leading strategic research and innovation projects in WA.

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RICHARD WILLIAMS

Perth, Western Australia

Richard has worked across the Australian grain supply chain in operations; market research and big data analysis; strategic planning; stakeholder management and international customer relations. His own consultancy business grolQ published big data research findings internationally. He has recently returned to the CBH Group in a logistics quality planning role. Richard has a PhD from Curtin University and a Bachelor of Agricultural Science from the University of WA.

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DAN MULLAN

Perth, Western Australia

Dan Mullan, a wheat breeder with InterGrain is committed to delivering improved grain technology to growers. He spent his early career with CSIRO and the International Maize and Wheat Improvement Centre (CIMMYT), which provided him with excellent skills in high level science and a global perspective of RD&E. Dan regularly engages with Australian grain end markets to understand and extend information about market requirements. He maintains a close working relationship with researchers, breeders and management groups across Australia and the global plant breeding community. His focus is on improving the stability and profitability of the Australian grains industry.

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DR PETER CARBERRY

Toowoomba, Queensland

Peter is general manager of GRDC's Applied Research , Development and Extension business group. Prior to joining GRDC, he was director-general of the international Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in Hyderabad, India. Previously he had spent 29 years with CSIRO as a research scientist.

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2021 Grains Research Update, Geraldton

Program Wednesday 17th March 2021

8.15–8.55am	**Registration open from 8.15 am;** coffee and morning tea available on arrival	
Time	**Plenary session 1: Gybes**	
9.00am	**Welcome and overview of current GRDC research projects relevant to the Geraldton Zone** Peter Bird, GRDC	
9.20am	**Season 2020 overview and setting up for the 2021 season** Craig Topham, Agrarian, and Rob Grima, Planfarm	
9.50am	**Maintaining wheat yield under high temperatures (including long coleoptile work)** Sarah Rich and Greg Rebetzke, CSIRO	
10.20am	**Morning tea: Gybes**	
Concurrents	**Gybes**	**Upstairs in Geraldton Yacht Club**
10.50am	**Strip and disc—lessons so far** Nick McKenna, Planfarm	**Local lime trial findings** Chad Reynolds, Department of Primary Industries and Regional Development (DPIRD)
		Subsurface soil acidity and aluminium toxicity Gaus Azam, DPIRD
11.25am	**Heat tolerant canola** Sheng Chen, University of Western Australia	**Soil amelioration alters soil biology, soilborne disease and nematode pests of cereal crops. What are the implications?** Steve Davies and Sarah Collins, DPIRD
12.00pm	**Exploring heat stress tolerance in Australian Barleys and Exotic Germplasm** Tefera Angessa, Murdoch University	**NPK after soil amelioration** Craig Scanlan, DPIRD
12.30pm	**Lunch: Gybes**	
Concurrents	**Gybes**	**Upstairs in Geraldton Yacht Club**
1.10pm	**Effective fungicide management of sclerotinia in lupins** Ciara Beard, DPIRD	**Deep ripping other soils** Wayne Parker, DPIRD
	Update on the report on options for managing blue lupins in lupin crops Georgia Megirian and Ken Young, GRDC	**Seeding approaches to improve crop establishment** Steve Davies, DPIRD
1.45pm	**Managing Bugs—Budworm, Diamondback moth, Russian Wheat Aphids and Fall Army Worm update** Dustin Severtson, DPIRD	**VRT case studies** Craig Topham, Agrarian and Bindi Isbister, DPIRD, host a panel of growers to discuss experiences and tips for introducing VRT
2.20pm	**Increased sowing opportunity of chickpeas (and other legumes) offered by deeper sowing** Sarah Rich, CSIRO, and Nick Eyres, Elders	
2.50pm	**Afternoon tea: Gybes**	
Time	**Plenary session 2: Gybes**	
3.15pm	**Chemical affected by market access concerns and MRL limits** Gerard McMullen, Chair of the National Working Party for Grain Protection	
3.45pm	**Emerging technologies for weed control** Guy Coleman, University of Sydney, and Guillaume Jourdain, Bilberry	
4.25pm	**Long range outlook and short term forecast for the start of season 2021** Neil Bennett, Bureau of Meteorology	
	Strategies for coping with climate change and seasonal variability—a grower's perspective Bob Nixon, grower from Kalannie	
5.05pm	**Closing comments**	
	Please join us for a short sundowner immediately following the Program	

This program may change subject to availability of presenters.

Contents

Season 2020 overview and setting up for the 2021 season

Craig Topham, Agrarian

Craig is a farm management consultant and director of Agrarian Management one of the leading Agricultural consulting firms in WA. Craig has been providing Agronomic and Precision Agriculture advise to farm businesses throughout the northern and central wheat belt of WA for 25 years.

Craig aims to assist clients to achieve and maintain as sustainable and profitable farming system through the implementation of the latest technology helping to increase efficiency and profitability. With increasing climate variability and continuing cost price pressures, Craig works with clients to adopt and embrace change through an understanding and use of the latest technology.

Craigs skills include managing herbicide resistance, implementing cost effective nutrient management, including the implementation of variable rate farming practices with a strong emphasis on Precision farming technologies. With many years of PA research combined with the practical implementation of the latest technologies we work with growers to continually developing strategies to increase the water use efficacy of board ace production systems.

Rob Grima, Planfarm

Consultant with Planfarm working predominantly in the Geraldton port zone. Local lad raised on a broadacre far but chose a professional career. Started working life as an economist with DAFWA but thought better of it. Growing crops was still in his blood and hence Agronomy beckoned, starting a career in the field with Elders and lasting almost a decade. Reconsidered the ‘office life” and moved back to DAFWA as an economist and then project manager, responsible for what was DAFWA’s farming systems activities. Moved to Planfarm into a management consulting role 5 years ago, focussing on all aspects of management within farming enterprises.

Abstract

Craig and Rob will give their observations of how the 2020 season finished up for grain enterprises across the Geraldton Port Zone and offer some tips for making the most out of season 2021.

Notes

Maintaining wheat yield under high temperatures (including long coleoptile work)

Sarah Rich, Post Doctoral Research Fellow, CSIRO

Sarah's background is in abiotic stress response in plants, completing a PhD at UWA. She has previously worked with CSIRO in the eastern states on wheat agronomy and pre-breeding for crops in low water environments.

She currently is based with CSIRO in Perth working on sowing and establishment of crops in WA.

Greg Rebetzke, Pre-breeder, CSIRO

Dr Greg Rebetzke is a CSIRO pre-breeder with a research focus on delivering genetic understanding and germplasm for traits to improve performance in rainfed wheat cropping systems. This delivery has included identification of genomic regions and improved breeding/selection methodologies, and elite germplasm to breeding programs including advanced parental lines and commercial varieties. Specifically, this work has focussed on genetic improvement of drought tolerance and particularly improved water-use efficiency (WUE), and more recently traits key in adoption with changing climates. The high WUE trait is an important target as water-limited performance is improved without cost to productivity in favourable seasons. Dr Rebetzke has demonstrated that differing traits contribute to greater WUE owing to changes in the timing and availability of water with location and season across the Australian wheatbelt.

Abstract

Sowing into deeper soil layers can access extra moisture not available in surface layers. Depending on soil type and location, deep sowing opportunities may be present even when surface layers are dry and in lower rainfall areas, deep sowing can increase sowing prospects across the autumn sowing window.

The long coleoptile trait allowed for sowing into moisture at sowing depths of 120-140mm and showed good establishment, water productivity and yield in on farm trials. Coinciding with this assessment is the pursuit by breeders in selection of the long coleoptile trait in delivering new wheat varieties to WA growers.

- Heat events during anthesis and grain fill can result in a reduction in grain number or grain size and altering sowing times to reduce heat exposure at these times is a key management option to reduce risk.

Maintaining wheat yield under high temperatures (including long coleoptile work) continued.

- The trend has been for increasing summer rain and later autumn sowing breaks throughout the wheatbelt. Deeper soils can have stored soil moisture, so deeper sowing (50-200 mm) may offer increased sowing opportunities.
- Long coleoptiles will permit deep sowing of wheat into subsoil moisture. This allows for earlier germination, and crop growth to occur under conditions optimal for maximising water productivity.
- On-farm trials at Southern Cross show the benefits of new dwarfing genes in wheat which increase coleoptile length and allow for successful seedling emergence at sowing depths of up to 140mm.

Associated papers available online in Perth GRDC Updates 2021 Proceedings

Chasing water: Deep sowing can increase sowing opportunity across the grain growing regions of Western Australia (Sarah Rich, Yvette Oliver, Jonathan Richetti & Roger Lawes)

On-farm assessment of new long-coleoptile wheat genetics for improving seedling establishment from deep sowing (Greg Rebetzke, Andrew Fletcher, Shayne Micin and Callum Wesley)

Notes

Strip and disc—lessons so far

Nick McKenna, Planfarm

Nick grew up on his family property east of Mullewa, where his parents still farm. In the past, Nick has worked as a research assistant in AHRI for Michael Walsh, and also as a student intern at Colorado State University, Fort Collins. Whilst in Colorado, he worked on various projects, ranging from testing the efficacy of Harvest Weed Seed control, to the development of herbicide resistance traits in sunflowers and sorghum.

Nick McKenna is an agronomist at Planfarm, based in Geraldton. He has a keen interest in the Strip and Disc farming system and ran a paddock scale trial to compare it against a conventional full stubble retention system in 2020.

Abstract

The strip and disc farming system represents a potential step wise increase in grain production and is in desperate need of research to verify the gains made by leading farmers, and to test its suitability to Western Australia. This farming system has been developed by pioneering Australian farmers who have a clear focus on reducing risk in dry seasons, but are also aiming to lift water use efficiency in all seasons. We are very fortunate that these growers and supportive agronomists such as Greg and Kirrily Condon from Grassroots agronomy, are continually developing an emerging, efficient, highly productive farming system, and we should ignore it at our peril. To date there has been no research focused on this farming system.

In brief, the system involves harvesting cereals with a stripper front that leaves tall standing stubble. This tall stubble shades the soil surface, reducing soil temperature and reducing evaporation of soil moisture in both summer and winter. To enable trash flow at seeding with this very tall stubble, the crop must be sown with a disc seeder. hence the name (coined by Kirrily Condon), strip and disc farming. Narrow row spacing (often 6” to 7”) is a necessity for this system to increase crop competition with weeds and improve the action of the stripper front, as are diverse crop rotations.

New South Wales growers using this system are achieving extra-ordinary yields. Planfarm has just completed the first of a multi-year trial aiming to interrogate this system in WA and determine what local issues may prevent this system from succeeding. Planfarm is aiming to show if we can find the yield advantages growers in the eastern states are finding using this system.

Notes

Liming Strategies—local lime trial findings

Chad Reynolds, Research Scientist in Soil Science and Crop Nutrition, Department of Primary Industries and Regional Development (DPIRD)

Chad is from a family farm in the Northern Wheatbelt of WA. He studied at the University of WA and worked in a number of agricultural industries before beginning work with DPIRD in 2006.

At DPIRD, Chad started as a technical officer for the wheat variety trials at South Perth. Since then he has worked as a development officer on a range of projects within Farming Systems, including a few years at Lake Grace before moving up to Geraldton. In recent years Chad has become part of the soil project team, as a research scientist, studying lime incorporation on a farm demonstration scale and non-wetting soil experiments. This work continues to play a role in the soil reengineering project that Chad is currently involved in.

Abstract

- In the north-east wheatbelt, a single lime application significantly increased grain yield and profitability, resulting in a cumulative net benefit of $800 - $1100/ha after seven seasons of wheat.
- Lime incorporation through suitable tillage treatments increased subsoil pH to the depth of incorporation faster than application to the surface.
- Once it has paid for itself, lime adds to cumulative profitability year on year.

Results from seven crops grown over eight seasons at Tardun have shown that applying lime to the surface of an acid soil increased crop yield and hence cumulative profitability by up to $1100/ha in this low rainfall environment. Incorporating lime with tillage treatments did not further increase production and profitability at this location and soil type, despite a reduction in subsoil acidity.

The greatest yield benefit from lime application occurred in the lower growing season rainfall years, especially where there was stored subsoil moisture from either a large summer rainfall or following a fallow year (2019 season). This suggests that the wheat was able to get better root establishment on the soil with better soil pH profile and was able to access more of the moisture and nutrients at depth, thereby improving the yield.

This large scale experiment clearly shows the benefits of lime application on crop yield where soil acidity is a constraint. The wheat yield benefits received over a number of seasons resulted in a significant cumulative benefit. This demonstrates that sufficient lime application to acidic soil results in a positive economic outcome and shows that yield potential will not be gained if soil acidity is not addressed.

Notes

Subsurface soil acidity and aluminium toxicity

Gaus Azam, Research Scientist in Soil Science and Crop Nutrition, DPIRD

Gaus grew up on small farm in remote village in Bangladesh. Gaus studied his Bachelor of Agriculture at Khulna University in Bangladesh. He was awarded scholarships to study MSc at Asian Institute of Technology at Bangkok and PhD at the University of Adelaide. Gaus worked in a number of agricultural industries in various countries before beginning work with DPIRD in 2016.

Gaus began working with DPIRD as a Research Scientist at Northam. Currently he manages 'Subsoil Acidity' project funded by GRDC. He is also contributing in 're-engineering Soils' project co-invested by DPIRD and GRDC. He is interested researching soil-plant interactions under different cropping systems on different soil types for efficient use of soil water and plant nutrients.

Abstract

In WA, around 50% of the subsurface soil are acidic. When soil pH decreases below 5.0, the concentration of extractable aluminium (measured in common laboratory methods) increases exponentially but the relationship between soil pH and extractable may vary from one soil to another and from one method of extraction to another. After decades of research on soil aluminium concentration and its effect on plant growth and crop yield, we are far from finding a suitable soil aluminium measuring method to establish a more accurate relationship between extractable soil aluminium and plant root growth that can help predicting crop yield response.

We conducted a series of controlled environment experiments using a wide range of soils to identify the most effective method of collecting soil extract to measure aluminium concentration and establish relationship with root growth as a predictor of crop yield improvement in acidic soil.

Our results suggested that the relationship between soil pH and extractable aluminium level is strong in all extraction methods. In most extraction methods, the level of aluminium may vary between soil types but not in soil solution collected at the field capacity. Soil pH and extractable aluminium were equally related to the growth of crop roots. Therefore, we recommend using the most readily available and cheapest test to diagnose subsurface soil acidity.

Notes:

Heat tolerant canola

Sheng Chen, Research Fellow in Plant Genetics & Breeding, University of Western Australia

Sheng obtained his PhD in 2000 from Huazhong Agricultural University, China. After graduation he worked at the University of Montpellier, France, where he investigated the expression of aquaporin (water channel protein) gene family under salt stress. He had three years of research experience on the regulation of plant defense gene expression in CSIRO Plant Industry. Sheng joined Prof Wallace Cowling's canola group at UWA in 2005 and since then he has been working on canola germplasm evaluation and utilization, with particular interest in the physiology and genetics of canola tolerance to drought and heat stress. He is currently leading a national research project on heat tolerant canola funded by GRDC. He published 35 research papers on international journals including Nature Genetics, Molecular Plant, Plant Physiology, Frontiers in Plant Science, Theoretical and Applied Genetics, Plant Phenomics and Food & Energy Security etc.

Abstract

- Timing of heat stress: The critical period for heat stress in canola begins one week before first flower and continues during the flowering period. Flowers subject to heat stress produce fewer pods and seeds.
- Intensity and duration of heat stress: A heat wave of three days with a maximum temperature of 32°C from midday for four hours, and an overnight minimum temperature of 22°C, is sufficient to reduce canola yield.
- Genotypic variation in heat tolerance: Genotypes vary in heat stress tolerance, based on their ability to set seed after heat stress during flowering.
- We are developing breeder-friendly methods for genetic improvement of heat tolerance in canola.

Significant genetic variation exists among canola varieties for tolerance to heat stress. Our research provides promising germplasm and breeder-friendly procedures to accelerate the future commercial release of heat tolerant varieties. We are developing a prototype pre-breeding facility for heat stress tolerance that could be incorporated into commercial canola breeding programs. In our experience, simulated heat waves of 32°C daily maximum and 22°C minimum are suitable for large-scale screening for heat tolerance in canola. We recommend assessing canola heat tolerance by measuring pod and seed formation on the main stem.

References:

Pre-breeding canola for heat stress tolerance – a prototype facility for large-scale screening at flowering stage. 2021 GRDC Grains Research Update, Perth, 22-23 February 2021.

S. Chen, K. Stefanova, K. H. M. Siddique and W. A. Cowling (2021)

Notes

Soil amelioration alters soil biology, soilborne disease and nematode pests of cereal crops. What are the implications?

Steve Davies, Soil Research Scientist, DPIRD

Steve Davies was born in Adelaide, lived throughout regional WA as a child but spent his formative teenage years in Adelaide. He attended an agricultural high school, and did Ag Science as a subject in year 11 and 12. Seven of the nine students in his Ag Science class went on to do PhD's in agricultural and plant sciences. Steve lived in Perth during his PhD, married a Perth girl while writing his thesis and has lived in Geraldton with his family since October 2004 when he began working for the Department.

Steve has worked for 19 years as an agricultural scientist since completing his PhD, including 5 years with CSIRO Plant Industry in Canberra and 14 years with DAFWA, now DPIRD, in Geraldton undertaking research on soil amelioration and soil constraint management. He currently manages two large GRDC and DPIRD co-investment projects looking at soil re-engineering and amelioration strategies and optimising crop management and farming systems following soil amelioration.

Sarah Collins, Senior Nematologist, DPIRD

Sarah has worked in the plant pathology field for 24 years and has been with the nematology team at DPIRD for the last 16 years. Sarah leads DPIRD's Nematology research team, within Crop Protection branch. Her group conduct research to help growers mitigate economic loss caused by plant parasitic nematodes and improve soil health in horticultural and broadacre agriculture. They also support DPIRD's plant laboratory diagnostic services (DDLS) and offer expertise to Western Australian Quarantine Services when required.

New research directions for DPIRD's nematology team include projects working more closely with DPIRD's soil amelioration/renovation and soil borne diseases to manage or mitigate soilborne disease and nematode pests impacts.

Research investments range from 1 to 5 years representing over a $4.2M from DPIRD's Boosting Grains Partnerships and GRDC investment.

Abstract

- Soil biology, soilborne pathogen (Rhizoctonia solani (AG8)) and nematodes pests (Pratylenchus neglectus, P. quasitereoides (RLN), and Heterodera avenae (CCN)) populations behaved differently after different amelioration options were applied at Yerecoin (yellow sand) and Darkan (duplex sandy gravel).
- Soil inversion and soil mixing treatments reduced R. solani inoculum in the topsoil; this effect persisted over both seasons. R. solani in the topsoil commonly impacts crops early in the season.

Soil amelioration alters soil biology, soilborne disease and nematode pests of cereal crops. What are the implications?,

continued.

- Amelioration treatments stimulated soil biological activity and increased pathogen levels and nematodes pests at 10-40cm depth where these nematodes and pathogensare not usually found in non-ameliorated soils in WA.
- Soil inversion consistently out-yielded the control, deep ripping and soil mixing treatments. Soil inversion increased grain yield by > 0.57 t/ha (>17%) over the control at Yerecoin and Darkan in 2019 and 2020.

Mechanical soil amelioration had a significant impact on the presence and distribution of nematode pests and soilborne pathogen in soils. Initial results suggest that the soil biological community was reduced in the topsoil by soil inversion but was stimulated by all amelioration treatments at other depths, particularly between 10-20cm. Generally, amelioration decreased R. solani levels in the topsoil but increased them deeper in the profile. The soilborne pathogen and nematode pests we focused on in this study survived and persisted at depth for over two years. The disease implications of their continued presence and multiplication at depth is unclear and needs investigation.

References:

Soil amelioration alters soil biology, soilborne disease and nematode pests of cereal crops. What are the implications?

Sarah Collins[1], George Mwenda[1], Carla Wilkinson[1], Daniel Hüberli[1], Sean Kelly[1], Chad Reynolds[1], Melanie Kupsch[1], Kanchana Wickramarachchi[1], Helen Hunter[1], Christine Zaicou-Kunesch[1], Andrew van Burgel[1], Katherine Linsell[2] and Stephen Davies[1]

[1] Department of Primary Industries and Regional Development, Western Australia (DPIRD)

[2] South Australian Research and Development Institute (SARDI)

Notes:

Exploring heat stress tolerance in Australian Barleys and Exotic Germplasm

Tefera Angessa, Senior Research Fellow, Murdoch University

Tefera has been actively engaged in various GRDC funded barley research projects at different institutions since 2008. Currently, Tefera is a Senior Research Fellow at the Western Crop Genetics Alliance (WCGA). WCGA is an alliance formed between Murdoch University and DPIRD to enhance WA grain growers' access to genetic solutions to abiotic stress factors affecting the grains industry. Tefera's deep interest and enthusiasm is applied research, and he operates at the interphase of breeding and pre-br\eeding research works in barley and Oats. In addition to studies on heat stress in barley, Tefera's research undertakings include barley phenology for improved adaptation, development of salinity tolerant barley lines, transferring acid soil and aluminium toxicity tolerance mediating barley genes into adapted backgrounds, development of novel boron toxicity tolerant barley lines, exploring diverse Oats germplasm for improved agronomic and quality traits. Tefera is also interested in the development of future health crops such as Eragrostis teff and climate resilient agricultural crops such as Enset ventricosum. Prior to joining Murdoch University, Tefera was a Researcher at UWA, where he led the GRDC funded barley germplasm project tasked to work with Australian Barley Breeders in importing and identifying exotic barley germplasm that were resistant to biotic and tolerant to abiotic stress factors.

Previously, Tefera conducted applied research on legume crops, namely Faba bean for drought tolerance, Cowpea and Lablab for human consumption. His PhD study that he undertook at Göttingen University of Germany was on germplasm development of Cowpea and Lablab for vegetable use in eastern and southern Africa. His study was part of a regional project, which was initiated and implemented by national and international collaborators that included the World Vegetable Centre (AVRDC), with the prime objective of using local crops for nutritional health in the region. Research results from Tefera's applied research works have been the backbone of several scientific publications that he authored or co-authored.

Abstract

Heat stress is one of the most important abiotic stress factors causing millions of dollars losses to the Australian grains industry. In barley, a temperature level higher than 32 ^{0}C during grain-filling reduces grain yield and quality traits.

In order to provide genetic solutions to grain-filling stage heat stress in barley, a project supported by the GRDC (UMU00049) was initiated in 2016 to evaluate diverse barley germplasm sets that included (1) current and historical Australian barley varieties and (2) exotic germplasm from across the world for response to heat stress at grain-filling stage.

To achieve the project objectives, serious of field studies were conducted in 26 different environments across Australia during 2017 – 2019 growing seasons targeting heat stress prone regions. To avoid other confounding abiotic stress factors that are common in natural environments, controlled environment studies were used to expose plants at grain-filling stages to heat stress at ~36 ^{0}C temperature level. Grain yield, grain plumpness and screenings measured, respectively, with 2.5 mm and 2.2 mm sieve sizes were used to assess response to heat stress in regional trials.

Exploring heat stress tolerance in Australian Barleys and Exotic Germplasm, continued.

Grain dimensions, plumpness and screenings were the primary traits used to assess response to heat stress under controlled environments. Genome-wide Association studies (GWAS) was conducted to identify genomic regions associated with the studied agronomic traits.

Our results reflected that environmental effects and varietal differences were highly significant for grain yield and quality traits. Australian barley varieties bred for low or medium rainfall environments that included La Trobe, Leabrook and Compass performed reasonably well by maintaining good agronomic traits. However, several exotic or non-commercial breeding lines exhibited superior performance for one or more agronomic traits under field and controlled environments. GWAS identified several QTLs associated with grain yield and plumpness almost on all seven chromosomes of barley. QTLs located mainly on chromosomes 2H and 5H were associated with grain plumpness across environments. Screening for heat stress tolerance in regional trials appeared to have slight similarity with screening for heat stress tolerance under controlled environments. Under controlled environments, heat stress effect was rather reflected by grain width and thickness. Exotic germplasm and genomic regions identified from this study will contribute significantly to the development of future varieties with better adaptation to heat prone environments.

Notes

NPK after soil amelioration

Craig Scanlan, Research Officer, DPIRD

Craig is leading two GRDC projects on managing crop nutrition in the Western Region. These projects are focused on nutrient supply from soil and crop residues in current farming systems and managing nutrition after ameliorating soil constraints. The research presented today is part of the work being done in those projects.

Craig has 15 years experience working in crop nutrition in WA. His work has included decision support, potassium nutrition of crops and the effects of soil pH and soil water repellence on the availability of soil nutrients. Craig is a Senior Research Scientist with Department of Primary Industries and Regional Development, at Northam and is an adjunct Research Fellow at University of Western Australia.

Abstract

Soil amelioration activities call for different fertiliser strategies in the immediate years following the disturbance of the soils. This presentation will focus on changes needed to Nitrogen, Phosphorous and Potassium applications rates under different conditions.

Notes

Effective fungicide management of sclerotinia in lupins

Ciara Beard, Research Scientist, Crop Pathologist, DPIRD

Ciara Beard grew up in the south west near dairy farms and always loved the beach. She moved to Geraldton 20 years ago for a graduate job with the Department and has no plans to leave. Ciara enjoys working in the grains industry, spending time in paddocks, and still loves the beach.

Ciara has worked for DPIRD for 20 years and most of that time has been spent on research and extension in plant pathology. She started off working in cereal diseases and then took on canola sclerotinia research and more recently lupins. She is passionate about conducting field research and sharing the results with the grains industry to minimise losses to crop diseases. Ciara is a respected researcher in the Geraldton port zone, and plays a key role in several state and national crop disease projects including leading the WA broadacre crop disease surveillance project.

Abstract

Three grower trials conducted in 2020 in the Geraldton port zone investigated fungicide management of sclerotinia in narrow leaf and Albus lupin. The trials were conducted by growers in their commercial paddocks with DPIRD and MIG conducting yield component and disease assessments. The collaborative research was an opportunity to better understand the infection process of sclerotinia in lupin, yield and quality impacts and the capacity of foliar fungicide intervention to reduce impacts. Results found foliar fungicide applied at early pod emergence significantly reduced but did not eliminate incidence of Sclerotinia and only gave a small yield response (3-6%) above the untreated. This yield response was unprofitable in narrow leaf lupin, marginally profitable in albus lupin. An earlier fungicide application timing, or multiple applications, may have been more beneficial especially for albus lupin but this requires further research.

Despite a yield response not being guaranteed, fungicide application may be worthwhile for grain quality benefits to reduce sclerote production, in turn reducing need to grade seed and reducing inoculum spilling into paddocks that could lead to infection of future canola and lupin crops. Research in 2020 found the grain produced in an albus lupin crop had significantly higher sclerote contamination than that of a narrow leaf lupin crop nearby. Fungicide application in albus lupin significantly reduced the amount of sclerotia inside stems, within pods and growing into grain. Further research into grain quality benefits from fungicide application is warranted.

Notes

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Update on the report on options for managing blue lupins in lupin crops

Georgia Megirian, GRDC

Georgia Megirian is the GRDC crop protection manager for the Western Region. In this role she liaises with growers and key crop protection stakeholders to identify the main weed, pest and disease issue limiting grain production in the West for potential GRDC investment. Georgia career began in a private research organisation that conducted field trials for chemical product development in West and South Australia. This position allowed her to learn about chemical regulation requirements, and the disease and pest impacts in several agricultural industries, including broadacre, horticulture and viticulture industries. She spent five years in this role before joining GRDC in January 2018.

Ken Young, GRDC

Ken Young, is the GRDC Senior Manager Biosecurity and Regulation. In this role Ken steers the Australian grains investment in biosecurity and chemical regulation. This has include recent investments in Fall Armyworm (continuity management plan and baseline insecticide resistance), minor use registration and permit applications for the grains industry, chemical stewardship and innovative plant protection investment. Ken's career as has worked a weeds agronomist throughout eastern Australia including Northern Territory and Tasmania, working on a range of diverse crops and environmental weeds. His PhD on germination and emergence of wild radish was done through the Weeds CRC. Ken spent 8 years with the University of Melbourne Dookie campus as a lecturer in agronomy and 5 years with the Australian Pesticide and Veterinary Medicine Authority before joining GRDC in December 2012.

Abstract

The WA blue lupin (Lupinus cosentinii) was introduced into Australia for summer sheep feed and soil improvement in the northern Ag region in the 1900s. WA blue lupins are now generally regarded as a weed due to several unpopular traits of the species and its ability to persist in the soil and infest other crops. The persistence of WA blue lupins has now made them a common contaminant in other lupin species crops in the Geraldton port zone and management is extremely difficult due to the similarity of the species and lack of herbicides available.

A review was conducted on behalf of GRDC by Independent Consultants Australia Network (ICAN) of past, current, and future chemical options for the control of key broadleaf weeds in NLL and albus lupin, with a particular focus on blue lupins. The outcomes and the status of the recommendations provided in the review will be summarized.

Notes

Deep ripping other soils

Wayne Parker, DPIRD

Since graduation Wayne has been working with the Department of Primary Industries from Geraldton. Has had the good fortune of working with many quality researchers and industry leaders from the region who continue his education. During his time at the department he has developed a thorough understanding of medium and low rainfall farming systems. In 2013 Wayne began working with growers in the low rainfall zone on how best to incorporate lime into hostile subsoils. Which lead him to another debilitating soil constraint, compaction. Wayne lead a GRDC funded project researching subsoil compaction alleviation and controlled traffic for soil improvement and economic benefit. Here to discuss the longevity of ripping, controlled traffic and outcomes from the five years of research into deep ripping, topsoil slotting and traffic management.

Abstract

Knowing your soil properties below 10cm is critical to selecting the right amelioration technique to maximise your return on investment. Many of the problems that come from paddock scale amelioration, such as poor plant establishment, arise when the treatment isn't suitable for the whole paddock due to high variability in soil types. Duplex soils are particularly challenging for strategic tillage methods particularly where depth to clay is highly variable and nutrient toxicity status is unknown.

Deeper ripping, >400 mm, plus or minus topsoil slotting, in combination with controlled traffic farming produced a positive yield response in sand, loamy earth and gritty grey clay soil. Over four seasons the cumulative return on investment was between $1-29 for every dollar invested. These trials were conducted within a controlled traffic farming system which confines compaction to consistent wheel tracks, minimising re-compaction and helping to protect this soil health investment for up to four years.

Deeper ripping was required to manage the hardpan that was below 350 – 450 mm. Shallow ripping of sandy soil at 300 mm or less was insufficient to alleviate compaction for improvement of crop yield. The deeper ripping gave greater access to moisture deeper in the profile.

Common soil amelioration bloopers include creating an acidic topsoil after mouldboard ploughing, delving too much clay to the surface, a cloddy soil finish from deep ripping heavy soil, very soft soil that causes bogging after ripping below 450/500mm, erosion after spading sandy soil or herbicide damage after mouldboard ploughing. Not all soil amelioration bloopers have long lasting yield penalties.

Controlled traffic, deep ripping and topsoil slotting plates are necessary features of future farming systems that require healthy soils and continued return on investment. The use of each is dependent on soil type as indicated during the last five years of research. Traffic management will help improve soil health to those not suited to ripping.

Notes

Seeding approaches to improve crop establishment

Steve Davies, Soil Research Scientist, DPIRD

Steve Davies was born in Adelaide, lived throughout regional WA as a child but spent his formative teenage years in Adelaide. He attended an agricultural high school, and did Ag Science as a subject in year 11 and 12. Seven of the nine students in his Ag Science class went on to do PhD's in agricultural and plant sciences. Steve lived in Perth during his PhD, married a Perth girl while writing his thesis and has lived in Geraldton with his family since October 2004 when he began working for the Department.

Steve has worked for 19 years as an agricultural scientist since completing his PhD, including 5 years with CSIRO Plant Industry in Canberra and 14 years with DAFWA, now DPIRD, in Geraldton undertaking research on soil amelioration and soil constraint management. He currently manages two large GRDC and DPIRD co-investment projects looking at soil re-engineering and amelioration strategies and optimising crop management and farming systems following soil amelioration.

Abstract

Crop establishment with inter-row sowing can be poor for soils with repellent sandy topsoils, in seasons with poor break-of-season rains and with dry seeding. In these situations, emergence is often staggered over an extended period of time and weed competition from the crop is reduced.

Near or on-row sowing takes advantage of preferential water infiltration on the previous seasons crop rows which can result in improved crop establishment, especially on moderate to severely repellent soils. Research by CSIRO demonstrates that previous seasons crop row can have a higher water content, lower repellence and higher numbers of wax degrading microbes that reduce repellence than corresponding inter-rows. Grain yield increases in response to near-row sowing can depend on seasonal conditions but can be large where poor crop establishment in comparative inter-row sown areas severely restricts yield.

Establishment improvements on sands from near or on-row sowing can be more reliable than from the use of banded soil wetters. Banded soil wetters are more reliably effective on repellent forest gravels than on sands. On sands soil wetters are more likely to be beneficial with dry seeding and some products are more effective than others.

Research from UniSA shows that in scenarios where there is moisture below the seed zone, an angled point working deep at 230mm sufficiently delved enough moisture to greatly improve crop establishment and grain yield. It is likely that under-seed tillage also provided some benefit for early root development and moisture access.

Notes

Managing Bugs—Budworm, Diamondback Moth, Russian Wheat Aphids and Fall Army Worm update

Dustin Severtson, Research Scientist, DPIRD

Dustin worked on the family farm east of Morawa before pursuing study and a career in agricultural entomology. He has been with DPIRD (formerly DAFWA) for mor than 14 years.

Abstract

Fall armyworm surveillance

Although fall armyworm moths were detected at Geraldton and Gingin, no moths or larvae were detected at the more than 70 grainbelt sites or from public reports of caterpillars via samples or images. At present Carnarvon is the most southern point where fall armyworm caterpillars have been confirmed.

Russian wheat aphid surveillance

A total of 121 sites were surveyed throughout the grain belt in 2020, however RWA was found in 24 sites in the Esperance port zone only. Sites with RWA were located in low, medium and high rainfall areas. RWA was found on early and late sown barley and wheat crops. Surveys found notably fewer RWA in crops which had an insecticide seed dressing. RWA was present at levels of less than 1% of tillers with RWA, which is well below control thresholds.

Native budworm and diamondback moth

Moth trapping surveillance has been conducted across the grainbelt for native budworm and diamondback moth and has been important in gaining greater understanding of their spatial and temporal distribution in WA.

Fall armyworm and Russian wheat aphids are new pests of grain, pasture and horticulture crops in Western Australia. Proper identification, surveillance and an integrated pest management approach will be key in managing these pests going forward as well as native budworm in pulse and canola crops and diamondback moth in canola.

Notes

Variable Rate Technologies: case studies

Craig Topham, Agrarian

Craig is a farm management consultant and director of Agrarian Management one of the leading Agricultural consulting firms in WA. Craig has been providing Agronomic and Precision Agriculture advise to farm businesses throughout the northern and central wheat belt of WA for 25 years.

Craig aims to assist clients to achieve and maintain as sustainable and profitable farming system through the implementation of the latest technology helping to increase efficiency and profitability. With increasing climate variability and continuing cost price pressures, Craig works with clients to adopt and embrace change through an understanding and use of the latest technology.

Craigs skills include managing herbicide resistance, implementing cost effective nutrient management, including the implementation of variable rate farming practices with a strong emphasis on Precision farming technologies. With many years of PA research combined with the practical implementation of the latest technologies we work with growers to continually developing strategies to increase the water use efficacy of board ace production systems.

Bindi Isbister, Research Scientist, DPIRD

Bindi is an environmental scientist with twenty years, experience working in agricultural research, development and extension in Western Australia in particular methods to manage soil compaction. Bindi specialises in working with farmers to adopt soil management practices and precision agriculture technologies in broad acre cropping systems around Australia. She was lead author of the Controlled Traffic Farming Systems technical manual and is currently the President of the Australian Controlled Traffic Farming Association.

Abstract

Variable rate (VR) technologies provide a way to manage within paddock variability to apply the right inputs in the right place. A key driver of productivity in the northern agricultural region is soil water holding capacity. It is not possible to change soil type but agronomic practices can be adjusted to match soil type to improve input efficiency and grain yield therefore increasing profitability.

To implement VR you need to know what to do where and how to get the machinery and software working in the paddock. Often it is the getting technology working consistently in the paddock that is the stumbling block as key components that connect the software and hardware may be missing and a level of knowledge is required by the machinery operator to work the technology in the machine.

Tips for implementing VRT include; identify a management issue then select the data/technology (don't use technology for technology's sake); to start set up a master set of paddock names and boundaries to use for all operations as this is the basis of data management; trial it on small area first; test the prescriptions work before of seeding/spraying; and ask for help if needed. The majority of growers who implement variable rate successfully have had help from outside the business to get it working on the farm, for example an agronomist, a machinery specialist, precision agriculture consultant, or another grower.

Increased sowing opportunity of chickpeas (and other legumes) offered by deeper sowing

Sarah Rich, Post Doctoral Research Fellow, CSIRO

Sarah's background is in abiotic stress response in plants, completing a PhD at UWA. She has previously worked with CSIRO in the eastern states on wheat agronomy and pre-breeding for crops in low water environments.

Sarah is currently based with CSIRO in Perth working on sowing and establishment of crops in WA.

Nick Eyres, Agronomist, Elders

Nick Eyres is an agronomist based in the Mid-west of WA, finished studies at UWA 2016 (BSc, majoring ag science) started his role at Elders Geraldton/ Mingenew 2017. Through recent years has watched the volatility of the seasons and taken a keen interest in long-term stability and sustainability of farming in the North. More recently, taken a front foot approach to helping to develop legume rotations in our systems through local projects and extension. Very interested participant in on-farm practice change to drive adoption of alternate opportunity as they arise, driving discussion about recognising opportunity changes under a changing farm environment.

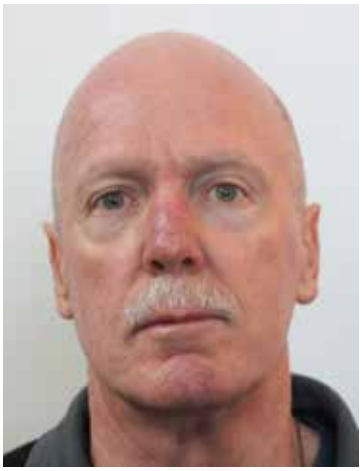
Abstract

Lupins have by far become the dominant legume rotation for much of the Medium to LRZ in the Northern ag region, suited to our acid sands. Recent seasons have driven a reduction in total ha of Lupins and hence overall planted legume ha, accompanied by increased amelioration and wheat yields. What opportunities can deep sowing provide to us to help drive improved economic stability, productivity and increased plantings of pulses, in particular in the highly volatile LRZ, where pulse ha are low due to high cost and high risk? 2020 saw a 5ha piece of deep sown chickpea at Mills', Mingenew, to explore the management and performance of a deep sown, early established chickpea, following from Sarah Rich demonstrating the capabilities of the chickpea in 2019 through her research at CSIRO.

Notes

Chemical affected by market access concerns and MRL limits

Gerard McMullen, Chair of the National Working Party for Grain Protection



McMullen Consulting began operations in 2005 and is the Director of McMullen Consulting. Gerard has worked in the grain industry for 35 years. He initially worked for the Australia Wheat Board for 20 years and held a number of roles including field operations and as Manager of the Quality Assurance and Food Safety Division.

He is currently the Project Manager for Grain Quality in Grain Trade Australia responsible for providing advice and training on grain Trading Standards and on market quarantine and food safety requirements.

Gerard is Chair of the National Working Party on Grain Protection, responsible for providing information to industry in the areas of post-harvest grain storage and hygiene, chemical use, outturn tolerances, international and domestic market requirements and chemical regulations.

His business also offers consultancy services to the grain industry on aspects relating to grain quality, food safety, market requirements and identity preservation.

Abstract

It is a legal requirement to follow all label directions when applying any crop protection chemical.

There are market access implications when using chemicals; applying a chemical according to label directions does not necessarily mean that grain will meet destination market requirements.

Each destination country has their own chemical legislation based on their specific chemical usage and consumption patterns. Hence different MRLs for the same chemical and commodity can apply in different markets. Markets are continually changing their maximum residue limits (MRLs), with some key chemistry available in Australia being impacted soon.

There is a need for advisers and growers to understand the risks of residues arising from chemical use and the impact on market acceptance. There is a range of information available to growers and their advisors to source to manage the impact of chemical use on market access. Before you intend to apply chemicals to a crop, if possible, talk to your marketer to seek their advice on market requirements.

Notes

Emerging technologies for weed control

Guy Coleman, University of Sydney

After completing his PhD, Andrew undertook a two year postdoctoral research project studying water use Guy Coleman is a Precision Weed Control Scientist at the University of Sydney Precision Weed Control Group, researching machine learning for weed recognition and new forms of weed control that site-specific control enables. Guy is also a part-time PhD student focusing on annual ryegrass in wheat recognition and planning to commence full time studies in 2021, before completing a 6-month visiting student research placement at Texas A&M University from May as a Fulbright Scholar.

Abstract

The development of artificial intelligence (AI) for in-crop weed recognition is creating an opportunity for real time, site-specific weed control in Australian broadacre production systems. The site-specific approach transforms the cost and quantity of inputs from area to plant-based, with typical reductions between 40 and 90% depending on weed density. Site-specific control in fallow has been possible for some time with sensor-based WeedIT and WeedSeeker technology, however, deep learning algorithms coupled with faster and cheaper computers have made in-crop weed recognition feasible. While using these methods for weed recognition shows substantial promise, the development of effective algorithms capable of recognising weeds in the diverse in-crop conditions in Australian farming systems requires large, annotated datasets of weed imagery.

The weeds research group at the University of Sydney has recently launched Weed-AI, an open source platform that enables anyone to contribute, download and search through weeds imagery to help address this bottleneck. A major benefit of site-specific weed control is an opportunity to use non-selective weed control tools such as lasers and electrical weeding on a selective, in-crop basis, which substantially reduces the energy requirement and improves their relevance as a new broadacre weed control tool. Preliminary research has found a 25W spot laser was capable of controlling three- to seven-leaf annual ryegrass and turnipweed with energy doses up to 76.4 J mm-2. Larger energy doses up to 304.8 J mm-2 demonstrated improved biomass reduction for mature annual ryegrass and flowering turnipweed. More advanced laser optics and higher power lasers offer opportunities to improve laser efficacy and efficiency.

Relevant papers:

Lasers, machine learning, weed recognition and new innovations in weed management (GRDC Updates 2020)
https://grdc.com.au/resources-and-publications/grdc-update-papers/tab-content/grdc-update-papers/2020/02/lasers,-machine-learning,-weed-recognition-and-new-innovations-in-weed-management

Low Energy Laser Treatments Control Annual Ryegrass (Lolium rigidum)
https://www.frontiersin.org/articles/10.3389/fagro.2020.601542/full

Notes

Emerging technologies for weed control

Guillaume Jourdain, Bilberry

Guillaume Jourdain is the co-founder and CEO of Bilberry, a French startup that develops Green on Green camera systems to spray herbicides only on the weeds. 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 cameras, fitted on sprayers, that spray only where it is needed. The company is now leading the Green on Green revolution, with 30+ patents, sprayers equipped in seven countries and a new office in Perth (actively hiring!).

Abstract

In fallow weed management green-on-brown optical spot spray systems for detecting and spraying weeds is well-established with both the Weedseeker® and WEED-it™ (www.weed-it.com) now well established in Australian agriculture. Optical spot spraying has also demonstrated not only reducing herbicide and water use, but to improve management of herbicide resistant and hard-to-kill weeds by making it economic to use more expensive herbicides and at higher rates. The next big step forward in spray technology is to be able to spot spray weeds within a crop or pasture, commonly known as a green-on-green spot spraying.

Several Australian universities are working on the green-on-green topic, and lots of companies are focusing on it as wellat the early commercialisation stage. Blue River Technologies™, acquired by John Deere in 2017 for $300M, is working on its 'See & Spray' system in the USA and has just released a Green on Brown solution.are operating their 'See & Spray' weed control system on a limited basis in US cotton crops. In Australia, Bilberry™ have partnered with the Netherland's Agrifac Machinery™ and the local manufacturer Goldacres to use their system on their sprayers. Currently Agrifac™ and Bilberry™ have 80 machines operating 10 countries with two machines under development in Australia. Bilberry™ sees Australia as an the most exciting market for green-on-green spot spraying and has opened an office in Perth in 2019.

During season 2020, several sprayers equipped with Bilberry cameras were used in Australia and in Europe. In Australia, a 48 meter Agrifac self-propelled spray rig fitted with Bilberry technology was used to spot spray broadleaf weeds, mainly radish, in wheat crops at a trial property in the Geraldton Zone. Sprayer results were monitored closely throughout the season by an independent agronomist, to assess the efficiency of the spot spraying system. Results were extremely satisfying, with an average hit ratio above 90% and average chemical savings also above 90% (compared with blanket application), on more than 12,000 hectares.

The aim for the next round of improvements to the Bilberry machine is to move the kill ratio closer to the hit ratio number (mainly by the adaptation of the sprayer setup and chemical rates/choice) and to increase the number of algorithms available for growers to use.

Notes

Long range outlook and short term forecast for the start of season 2021

Neil Bennett, PST Delivery Subject Matter Expert, Bureau of Meteorology

Neil Bennett joined the UK Met Office from High school in 1979 and started work as a weather observer, collecting data on winds, temperatures, humidity, pressure, rainfall and other information used in weather forecasts.

He continued in this role for 9 years (including 3 in Germany), before being trained as a weather forecaster.

He left the UK Met Office in 1989 and emigrated to Australia where he joined the Australian Bureau of Meteorology in 1990.

To qualify as a forecaster he had to study Maths and Statistics at Macquarie University in Sydney in order to be accepted onto the Bureau's Diploma Of Meteorology course in Melbourne.

After successfully completing the course and graduating (again!) as a forecaster Neil was posted to Perth in 1995, where he has been ever since working as a forecaster and eventually as the Media Manager for the Bureau in WA.

Now approaching retirement, Neil intends to spend more time coaching and writing about Football (roundball) and visiting the SW region of WA to sample more wine!

Abstract

The weather of WA has 2 distinct seasons, wet and dry and this presentation will show why this is so. There will also be explanations as to the reasons rain occurs and the major types of rainfall in SW WA.

Notes

Strategies for coping with climate change and seasonal variability—a grower's perspective

Bob Nixon, Grower from Kalannie

Bob comes from a family farm near Kalannie in the North Eastern Wheatbelt. The farming business crops wheat, barley, canola, lupins, field peas and serradella.

There is a strong focus on improving soil health and developing a resilient farming system and industry.

Bob manages a family farming business in the 300mm annual rainfall North Eastern Wheatbelt of WA. The family grow wheat, barley, canola, lupins, field peas and serradella cover crop. He has a strong interest in crop agronomy, soil health and resilient farming systems and communities.

Bob is past Chair of the Grain Industry Association of WA (GIWA) from 2017 to 2020. He currently sits on the WA Soil and Land Conservation Council, GRDC Soils Constraints West steering committee and is an active member of his local Liebe Grower Group. He completed a Nuffield Scholarship in 2014 looking into 'Mitigating Risk in a Dry and Variable Climate' in response to the drying out and increase in seasonal variability of the WA cropping belt. Bob was awarded the GRDC Seed of Light in 2019 for his work in managing soil constraints.

Abstract

Bob will give a brief explanation of how he factors in climate change and seasonal variability into his planning for the sustainability of his farming business.

The need for techniques to improve grain yields and manage costs in the face of a drying climate is common to many areas around the world, but in the Eastern Wheatbelt of WA it is even more critical with its comparably low rainfall and yields. 2014 Nuffield Scholar Bob Nixon has looked into ways of reducing risk in the cropping system focusing on adding low risk crop diversity, as well as techniques to manage costs and lower the break-even yield.

A 10-15 per cent decline in winter rainfall and an increase in seasonal variability has created serious challenges for farm businesses in the Eastern Wheatbelt of WA. Crop rotation and diversity are powerful tools in managing cereal production costs because they lower disease and weed burdens in a paddock whilst enhancing cereal yields. In the Eastern Wheatbelt, canola has replaced legumes as the main rotation crop due to factors like the soils high salinity, acidity, sodicity and the current dry and variable climate.

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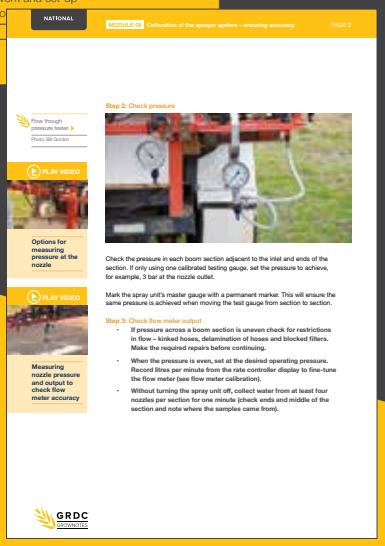
SPRAY APPLICATION GROWNOTES™ MANUAL



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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