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THE AUSTRALIAN AGRONOMIST

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INSECT CONTROL VITAL FOR SOUTH EAST SA GRAPE GROWERS

WINE GRAPE GROWERS IN SOUTH AUSTRALIA'S SOUTH EAST HAVE BEEN ADOPTING A RANGE OF STRATEGIES TO COMBAT PROBLEMS ASSOCIATED WITH ESCALATING MEALYBUG AND SCALE POPULATIONS, BUT THEY REMAIN A CONCERN, ACCORDING TO LOCAL LANDMARK VITICULTURE AGRONOMIST MICHAEL ZERK.

Originally from Naracoorte, Michael has been working in the region for five years mainly from the Padthaway area down to Mount Gambier. Prior to this he worked in the Adelaide Hills, Langhorne Creek and Barossa Valley wine regions for three years based from Landmark's store at Strathalbyn.

He has seen a number of vineyards with high, and increasing, populations of mealybug and scale, but he said in most cases there were very few control options available.

Varying conditions in recent seasons have also presented challenges for insect control.

"The spring of 2015 was warmer and insects were active early, but, as vines also developed and flowered earlier, we were unable to make two applications of the insecticide, Movento. Last season it was cold and wet, so growers were favouring fungicide applications and insects were slower to present themselves. When we could see that mealybug and scale were active, the withholding threshold to apply Movento had been reached," Michael said.

He said scale had severely affected some vineyards, particularly reducing shoot vigour in cabernet, sauvignon and chardonnay, and mealybug became more apparent in bunches.

"A significant problem with mealybugs and scale are that they exude honeydew, which can induce sooty mould and reduce grape quality. These insects are also the most important vectors for spreading viruses. Shoot vigour is often reduced when populations are high, which means heightened risk of sunburn, and flavour can be affected," Michael explained.

Michael said many vineyards in the region had been established for around 20 years and he noticed the insects and other problems were increasing with age.

"These insects have gone somewhat unnoticed by many people, myself included, but once a threshold is passed, they become a significant problem," he said.

"It is important that we look at all aspects of how we manage our vineyards, from canopy architecture to crop treatments, to understand why these species have prospered. We generally find good numbers of beneficial species, but whether these are the right ones for scale and mealybug must be confirmed, he added.

He said growers had previously tried using winter oil, although it cannot be used after budburst and there were issues around using high rates for optimum coverage.

Chlorpyrifos has been used prior to budburst and has been highly effective, but some companies prefer that it no longer be used in vineyards. A post-harvest application can be effective, or an early knockdown prior to budburst followed by 'softer' insect control.

Michael said scale remained reasonably exposed and while longtail mealybug were easier to control, other mealybug can get under bark and into plant roots, proving difficult to control. Mealybug numbers also increase in more shaded canopies.

He said this was where the use of the two-way systemic insecticide, Movento, had been beneficial.

Movento, from Bayer, has only been available for use in wine grapes in recent seasons for control of mealybug and suppression of scale and thrips.

After leaf uptake, most systemic insecticides are mainly translocated in plants' xylem along with water and nutrients and are transported upwards. Movento is translocated in plants' phloem as well as xylem, resulting in transportation upwards and downwards to plant parts not contacted by the insecticide. Movento can better control sucking pests hiding on covered inner

leaves than other insecticides, as well as populations that may have developed resistance to existing registered products.

It is also highly compatible with other products and with Integrated Pest Management (IPM) production systems, being 'soft' on most beneficial species when used as directed, including parasitoids, syrphid flies, lacewings, predatory midges, ladybird beetles, predatory bugs and earwigs.

"It was exciting when Movento became available, because we thought it would give us better control than some of the other products available,'' Michael said.

"We initially started using it for mealybug, with the idea that it would hopefully suppress scale, but we think it has good potential for controlling scale. Mealybug have been in big numbers and we have been happy with the effect on them. Even though last season was difficult, Movento still provided good control of mealybug. For control of scale it looks like seasonal conditions, as well as the size of the population to begin with, need to be considered," he went on to explain.

He also said that while Movento had worked well, careful planning was required for larger vineyards so it could work in with other foliar applications, particularly fungicides.

"In vineyards with a maintenance program, it works really well. With mealybug, it is now the default decision. We will rotate if there are alternatives, but otherwise we will use Movento," Michael said.

Michael said he first became aware of Movento on a trip to New Zealand in 2012. He was impressed with the important role it played in leafroll virus management programs, helping to control the mealybug vector.

Trial work by Landmark, with funding from GRDC, had also shown about 90% control with Movento in the Barossa Valley. Michael said he was hoping to carry out some further field work with the product in the south east.

TOMATO POTATO PSYLLID SURVEILLANCE RAMPS UP

Agriculture Victoria and industry are gearing up for another round of surveillance for tomato potato psyllid (TPP).

Whilst there have been no confirmed reports of TPP in Victoria to date, it remains a significant production pest that attacks a range of plants (including potato, sweet potato, tomato, eggplant, capsicum, chilli and tamarillo), and has been found in Perth, Western Australia.

Victoria's Acting Chief Plant Health Officer Dr Rosa Crnov said the focus of this round of surveillance would be on tomato, potato and nursery industries, as well as community gardens.

"Proving Victoria's area freedom from TPP will ensure that Victorian growers can continue to trade with other states, territories and overseas markets," Rosa said.

Agriculture Victoria has placed restrictions on the importation of TPP-host material sourced from any state or territory, unless the material meets market access requirements for TPP.

These restrictions allow the movement of product into Victoria, whilst mitigating the risk of TPP spreading.

AUSVEG National TPP Coordinator Alan Nankivell has encouraged growers and horticulturists to get involved in area freedom surveillance activities to confirm that TPP is not present in Victoria.

"We encourage growers of host material to make contact with Agriculture Victoria to register their property for the surveillance program. Growers can also assist by reporting any suspicious insects or symptoms to the Exotic Plant Pest Hotline on 1800 084 881," said Rosa.

Rosa said growers should remain vigilant and be on the lookout for potential pest insects during spring and summer when crops are flourishing.

"Victorian horticulturists are advised to implement best practice biosecurity measures and to regularly check their crops," she added.

TPP is a tiny sap-sucking winged insect which resembles a tiny cicada. A noticeable sign is the presence of small insects jumping from the foliage when disturbed. Adult psyllids are sometimes called 'jumping plant lice', as they readily jump and fly when disturbed.

TPP can also transmit a bacterium called 'CLso' (Candidatus Liberibacter solanacearum) that is associated with the zebra chip disease in potatoes. The bacterium can also cause stunting, stem death, yellowed leaves and yield losses in capsicums, chillies and tomatoes.

CLso bacterium does not pose a risk to human health and it has not been detected in Australia.

Growers and community members are reminded that it is an offence under the Plant Biosecurity Act 2010 to not report a suspect TPP outbreak to the Exotic Plant Pest Hotline by calling 1800 084 881 or Agriculture Victoria by calling 136 186 or by emailing plant.protection@ecodev.vic.gov.au

For more information on the movement of TPP-host material into Victoria, please read the latest Industry Notice or contact your local Agriculture Victoria Plant Standards Officer on 136 186 or email market.access@ecodev.vic.gov.au

A fact sheet is also available to help growers identify TPP and the noticeable signs of infestation on plants and crops.

MANAGEMENT PLAN FOR POTATO BACTERIA

The Department of Primary Industries and Regional Development in Western Australia is working with the state's horticulture industries to manage the Dickeya dianthicola bacteria, following a national decision that it cannot be eradicated.

Department Irrigated Agriculture Executive Director John Ruprecht said the bacteria was detected for the first time in Australia in June in a potato crop north of Perth, prompting an immediate biosecurity response.

Dickeya dianthicola has been found in dahlia tubers in Western Australia and freesia bulbs imported from Victoria. The bacteria have also been detected on dahlia tubers grown on a commercial property in Victoria.

"Dickeya dianthicola can cause blackleg and soft rot diseases in potatoes, and affect other horticultural crops including some ornamental varieties, chicory and globe artichoke," John said.

"The department has carried out extensive tracing, surveillance and testing of samples to determine the spread of the bacteria," he added.

Further tracing activities are also being undertaken in Victoria, South Australia and New South Wales.

John said the National Management Group, which includes government and industry representatives, announced this week that it was not technically feasible to eradicate the bacteria, and supported a management approach to minimise the impact of the bacteria on production.

"This detection came at a very difficult time for our horticulture industry following the detection of the insect pest, tomato potato psyllid, earlier this year," John said.

"The department will work with industry to develop management options for Dickeya dianthicola through the WA Potato Certified Seed Scheme and Registration Rules, on-farm biosecurity and best management practices," he added.

John said during the response, the department's laboratory staff modified an existing PCR testing process to allow for rapid, high-throughput testing of potato tubers for Dickeya dianthicola.

VEGETABLE FARM PROFITS INCREASE, NUMBER OF FARMS DECREASE

The average Australian vegetable farm is making more money and earning higher prices for its produce, but cash costs are continuing to rise across the board, with the vegetable industry's peak body warning many smaller growers are struggling to stay competitive in an increasingly consolidated industry.

As found by a recent survey conducted by the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES), the average farm cash income of Australian vegetable growing operations is estimated to have increased to around $254,100 as a result of increased vegetable production and higher prices.

The ABARES report, which was a strategic levy investment using the Hort Innovation Vegetable Fund, indicated that the value of the Australian vegetable industry increased to around $3.6 billion in 2015-16, accounting for around six per cent of the gross value of agricultural production. The survey also indicated that in the same time total cash costs continued to rise, with average cash costs rising by 29 per cent to an average of over $1 million per farm due to rises in all cost categories captured in the report.

According to AUSVEG, the vegetable industry's peak industry body, the rise in the industry's value and the overall increases in average farm incomes are positive signs for the future profitability of the industry, but the steep increase in costs poses a significant risk to many businesses, particularly smaller sized farms.

"The rising value of the industry and the increasing trend for Australian vegetable exports shows that our industry has a bright future as a supplier of high quality fresh vegetables to consumers in Australia and around the world," said AUSVEG CEO James Whiteside.

"Large-scale farms have been mostly responsible for the increase in average farm income, as they can benefit from increased efficiencies and economies of scale. This has resulted in increased re-investment into these businesses, including in technological and operational improvements so that they can continue to innovate and develop their businesses to supply vegetables for local and international consumers," James explained.

"The increased production and demand for a wide variety of vegetables, particularly Asian vegetable varieties that were considered niche products not too long ago, shows growers are responding to Australians' increasing appetite for a larger variety of fresh and value-added vegetables, which can demand a higher value at a retail level," he added.

The number vegetable growing farms has fallen 37 per cent from 2006-07 to 2015-16, driven primarily by declines to smaller growers, and the proportion of vegetable growers who recorded a negative farm business profit remained at a similar level to the 10 year average, with nearly 60 per cent of vegetable growers recording a negative farm business profit in 2015-16.

"The costs of doing business, particularly for hired labour, seed, freight and fertiliser, have increased significantly over the last 12 months, so while larger businesses are able to increase production and cover these increases, smaller growers often struggle to be competitive, which is driving increased consolidation," said James.

WILD GRAPE YEAST MAY HOLD KEY TO PREVENTING GRAPE MOULDS

It has been found that wild grapes contain a huge variety of yeasts that can inhibit grape moulds and offer an eco-friendly alternative to chemical pesticides.

Researchers have identified a wild yeast that is more effective than a pesticide at preventing common grape moulds. The yeast strain is one of many found on wild grapes, as well as a smaller number found on farmed grapes, that can inhibit common grape moulds. The study, recently published in open-access journal 'Frontiers in Microbiology', suggests that wild yeasts could be an eco-friendly alternative to chemical pesticides.

"The 'wild' environment represents a huge and largely untapped source of biodiversity, which could provide a reservoir of helpful microbes for pest control," says Ileana Vigentini, a researcher at the University of Milan in Italy.

At present, many farmers use chemical pesticides to control fungal diseases. However, pesticides leave hazardous residues in the environment that can have significant consequences for local ecosystems. Traces of pesticides can also end up in food, and could affect human health. In addition, many fungi are becoming resistant, meaning that pesticides may not work effectively.

The European Union has restricted certain pesticides, meaning that the race is on to come up with eco-friendly alternatives. One possibility is to use natural yeasts, themselves a type of fungi, to inhibit disease-causing fungi in crops.

Microbes like yeasts often compete with one another, and naturally produce substances to kill or slow down their rivals. However, so far, researchers have not been able to find yeasts that are as effective as chemical pesticides.

In the study, Ileana Vigentini, Gustavo Cordero-Bueso and colleagues investigated whether yeasts isolated from the skins of wild or farmed grapes could inhibit three common moulds that can ruin grape harvests. Initially, the research team isolated and identified yeasts from a type of wild grape in Georgia, Italy, Romania and Spain, and farmed grapes from vineyards in Italy.

The team tested whether the yeasts could inhibit mould growth in the lab, and identified the top 20 yeasts with the most potent anti-mould effects. Of these, a whopping 18 strains came from the wild grapes, suggesting that wild plants could be a promising reservoir for useful microbes.

The team went on to investigate the possible mechanisms the yeasts use to inhibit the moulds. They found that many of the yeasts release enzymes that can digest the moulds' cell wall, or release substances such as acetic acid or hydrogen sulphide that can kill the moulds. Finally, the researchers tested the yeasts' ability to stop the moulds from growing on grapes and compared them with a commercial pesticide.

Strikingly, one yeast strain was more effective than the chemical pesticide at preventing mould growth. Previous work has shown that this yeast strain does not interfere with wine fermentation, and can survive harsh conditions. This might make it well-suited as a biocontrol agent in vineyards, but outdoor trials are needed to confirm this.

"We plan to test some of these yeast strains as a substitute for chemical pesticides in field trials using grapevines," said Ileana in conclusion.

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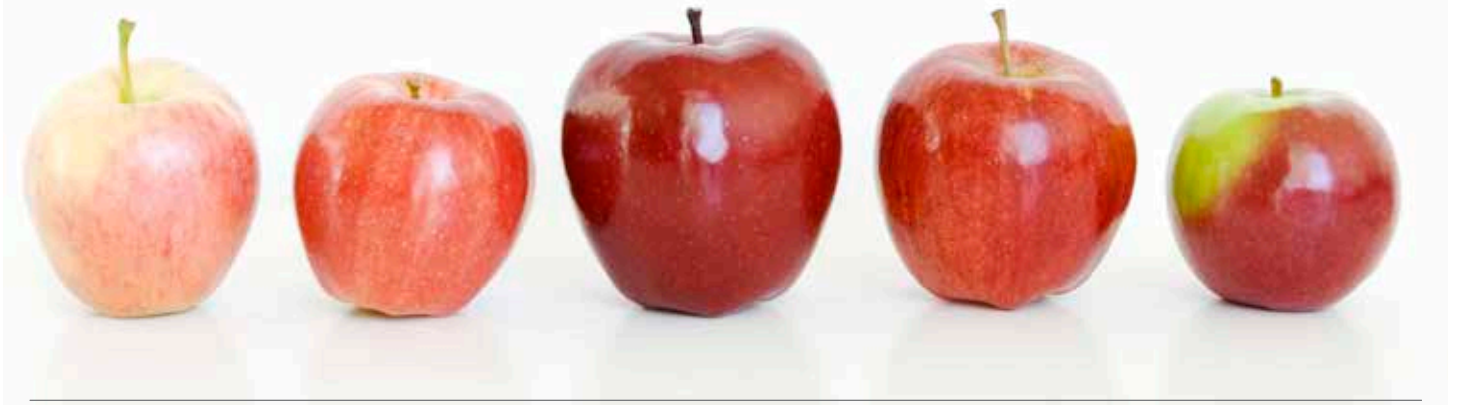


You may not find them in the greengrocer or supermarket yet, but it's only a matter of time before new disease-resistant apple cultivars overtake current favourites in popularity, according to an American apple expert from University of Illinois.

Of course, commercial favourites in the United States of America are in many cases different to Australia, but the science behind this new research still has applicability.

Mosbah Kushad is an associate professor of horticulture in the Department of Crop Sciences and horticulture extension specialist at University of Illinois (U of I).

He said, "I know everyone wants Honeycrisp, but they're notoriously hard to grow. There are so many issues in producing the fruit. The tree might produce a lot one year, but none the next, plus the fruit doesn't keep well and is susceptible to disease."

Apples are attacked by all sorts of pests, but apple scab, a fungus, is particularly nasty. It can cause yield losses up to 80 percent. For traditional apple cultivars and many newer ones, including Honeycrisp, combating apple scab and other diseases means applying multiple pesticides several times throughout the growing season.

Fortunately, after the gene for scab resistance was discovered by a U of I scientist in 1944, a number of resistant cultivars have been developed. Mosbah said the early cultivars weren't particularly good, but more recent ones show a lot of promise.

"WineCrisp, for example, is a very attractive and flavourful apple. It's not very large, but who wants to buy an apple that weighs a pound?" he said.

A new wave of scab-resistant apples has been developed and tested as part of a cooperative breeding program through U of I, Rutgers University, and Purdue University. So far, several cultivars have proven to be as nutritious, or even better for you than older types, but until now, it wasn't clear whether their quality held up over time.

In a new article published in the Journal of Food Quality, Mosbah and several collaborators including Moises Zucoloto, Kang-Mo Ku, Moo Jung Kim, looked at whether scab-resistant GoldRush, WineCrisp, CrimsonCrisp, and Pixie Crunch retained their quality under standard post-harvest storage practices, and compared their performance to scab-susceptible Golden Delicious.

The researchers exposed the apples to 1-methylcyclopropene (1-MCP), a gas now commonly used in the industry to inhibit ethylene production and slow ripening of stored fruit.

"1-MCP could be the best invention for the fruit industry since apples were discovered. Aspects of nutritional quality and commercial viability were tested in the fruits after 70 and 140 days of storage," said Mosbah.

In general, the eating quality - flesh firmness, sugar content, and acidity - of the scab-resistant cultivars was as good or better than Golden Delicious, before and after storage. And two of the scab-resistant cultivars, GoldRush and CrimsonCrisp, had significantly more antioxidant capacity, even after 140 days. The cultivars varied in their responsiveness to 1-MCP, with CrimsonCrisp showing the most promise for long-term storage using the product.

"What the article is saying is that the quality of the scab-resistant cultivars is very comparable to standard varieties. In terms of nutrition, health benefit, aesthetic, and taste, these apples are competing very well. As an alternative to scab-susceptible types, they will be very attractive, especially for organic growers," Mosbah said.

NEW SUPERCHARGED STRAWBERRY IS A SWEET FIND

Scientists have discovered an 'alpha strawberry' that is very sweet in flavour and has folate levels that may be up to three times higher than standard strawberries.

Folate is an important B-group vitamin which is critical for a range of biological functions in adults and children, including the production of DNA and other genetic material. It is also essential for the healthy development of the foetus in early pregnancy and can help to prevent neural tube defects such as spina bifida.

The strawberry research is funded as part of a $10M Hort Innovation program aimed at developing naturally nutrient-dense food, and delivered and co-funded by the Queensland Alliance for Agriculture and Food Innovation (QAAFI), University of Queensland which is supported by the Queensland Government.

Hort Innovation chief executive John Lloyd said while the strawberry is yet to undergo taste testing through consumer panels to see if it is as good as conventional breeds, the finding is exciting.

"This is essentially an 'alpha strawberry'. It contains way more folate than we would expect to see in a standard berry, based on folate levels of standard strawberries reported in the literature" he said.

John said the variety was developed to help growers meet consumer demand.

"Consumers are becoming more health conscious and are looking for the maximum amount of nutrients in their food. Conversely, research has also shown that four out of five Australian adults are not getting the recommended daily intake of fruit and vegetables a day to get the nutrients they need," John said.

"This new strawberry variety could help growers continue to tap into that health-conscious market through a novel offering," he added.

QAAFI lead researcher, Dr Tim O'Hare said his team had identified a number of high folate strawberries so far in the Naturally Nutritious project, but this yet-to-be-named variety appears to be particularly high.

"High folate is generally found in dark green leafy vegetables, so having this folate dense strawberry variety is really novel," Tim said.

"If people ate a 250g punnet of these high folate strawberries, it would give them their recommended daily intake of folate," he said.

Tim explained that the new strawberry was discovered by analysing the unknown biochemical properties of various strawberry lines.

"The next step will be to see how well the folate in this strawberry is absorbed by the body and also how well it grows in a production setting and, most importantly, to ensure that consumers like its taste," he added.

Strawberries are grown in all states of Australia by an estimated 500 growers concentrated in the Sunshine Coast area of Queensland, the Yarra Valley and the Mornington Peninsula in Victoria, Wanneroo and Albany in Western Australia, the Adelaide Hills in South Australia, and Launceston in Tasmania.

HELP FOR GROWERS INVESTIGATING DOUBLE CROPPING

TRIALS IN SOUTHERN NEW SOUTH WALES AND NORTHERN VICTORIA HAVE SHOWN THAT DOUBLE CROPPING SUCCESS RELIES ON QUICK AND SEAMLESS TRANSITIONS BETWEEN THE WINTER AND SUMMER CROP PHASES, AND THE RESULTS ARE HELPING GROWERS WEIGH UP THE BENEFITS OF THE APPROACH.

The trials feed data into a Decision Support Tool (DST) for Double Cropping, which provides an easy way for irrigators to assess the gross margins of different rotations, attribute an average water price to those rotations and customise inputs, yields and commodity prices for their own circumstances.

The research was made possible through significant contributions of growers through trial cooperation and investment by the Grains Research and Development Corporation (GRDC).

The project Correct Crop Sequencing (Double Cropping) was conducted by NSW Department of Primary Industries (DPI) at the Yanco Agricultural Institute (YAI) as well as the Irrigated Cropping Council (ICC) in Northern Victoria.

NSW DPI research and development agronomist, Tony Napier, and his team conducted large scale field trials of irrigated winter and summer crops at YAI's Leeton Field Station.

"We ran trials for two and a half years, or five seasons, which focused on wheat, canola, barley, faba beans, soybeans, maize and cotton rotations and their gross margins to inform and develop the DST," Tony said.

Researcher Damian Jones said individual crops within a double cropping system can be quite profitable and therefore double cropping does make financial sense, but enthusiasm, infrastructure, equipment, profitable crops and capability have to be available.

"Double cropping has been practiced previously across the irrigation zone, but widespread adoption has been hampered by numerous issues such as water availability, commodity prices and profitable crop choices," Damian said.

"This project was established to re-visit the study of the profitability of some common double cropping rotations and new techniques to accelerate harvest and or sowing. On the other hand, the trials also show that sometimes making the difficult decision to 'pull the pin' and not proceed with double cropping is the best option," he added.

"Results from the rotational trials to date show cotton is the most profitable crop, and by a significant margin. The cotton crop returned a gross margin of $4,765/ha or $477/ML compared with maize at $1,692/ha or $176/ML and soybeans at $933/ha or $125/ML," Damian said.

"Winter cropping gross margins are competitive with summer crops on a $/ML basis. Faba beans had the highest gross margin of $1,491/ha or $481/ML followed by wheat with gross margin of $723/ha or $222/ML. A potential weakness of the gross margin comparison is the fluctuation in commodity prices. In the 2015 season, faba bean prices were around $450/t while the prices in 2016 were closer to $220 to $240/t, which made a large change to the profitability of faba beans from one year to the next," he went to explain.

Double cropping success relies on quick and seamless transitions between the summer and winter crop phases. The Victorian component of the GRDC double cropping project focussed on some of the technical barriers to adoption.

"The trials found that techniques such as windrowing and equipment designed to bring forward harvest and manage stubble make the transition easier," Damian said.

"Double cropping is not for everyone. It takes planning and personal drive and in some situations, specialised machinery and infrastructure, however the DST will go a long way to help address some of the barriers to adoption," he said in conclusion.

"Double cropping has been practiced previously across the irrigation zone, but widespread adoption has been hampered by numerous issues such as water availability, commodity prices and profitable crop choices."

Damian Jones

IDENTIFICATION ASSISTANCE AVAILABLE FOR NEW APHID PEST AFFECTING PULSES

GROWERS AND AGRONOMISTS SUSPECTING THE PRESENCE OF A RECENTLY DISCOVERED APHID SPECIES, WHICH AFFECTS VETCHES, FABA BEANS AND BROAD BEANS, CAN SEEK ASSISTANCE WITH APHID IDENTIFICATION THROUGH A GRAINS RESEARCH AND DEVELOPMENT CORPORATION-SUPPORTED SERVICE.

Entomologists at cesar research organisation in Melbourne can inspect high quality images and aphid samples to determine whether crops are infested with the new pest, Megoura crassicauda.

The identification service is being made available through the GRDC's investment in the PestFacts south-eastern invertebrate crop pest information platform.

Entomologist Julia Severi, from cesar, says M. crassicauda is an aphid species native to north-east Asia and since its initial detection in suburban Sydney in October last year, its known distribution has now expanded to Tamworth and Breeza in northern New South Wales.

"It is unclear where else the aphid is present, or how quickly it is likely to spread into new regions. And while little is known about the potential economic impact, observations of its activity in Australia so far indicate that the aphid has a high reproductive capacity and could threaten faba and broad bean production," explained Julia.

Julia said the aphid had a very distinctive appearance.

"Adults are dark green and spindle-shaped. with long antennae and black legs. They are relatively large aphids – approximately 2.5-3 millimetres in length – and have vibrant, red eyes," she said.

M. crassicauda can form mixed colonies with pea aphid and cowpea aphid, two species which are widespread in Australia and infect faba beans and vetch.

While information on the lifecycle and behaviour of M. crassicauda is limited, they are known to reproduce asexually (female aphids giving birth to live nymphs without mating) and sexually (females laying eggs after mating), according to Julia.

In terms of management, there are no current registered insecticides for this pest.

Dimethoate is registered to control aphids in faba beans. Paraffinic oil is registered for use on faba beans and vetches to provide suppression of green peach aphid. Initial work conducted by New South Wales Department of Primary Industries (DPI) using pirimicarb was efficacious.

Hotline

1800 084 881

pestfacts@cesaraustralia.com

"Undoubtedly, we will learn more about M. crassicauda in the Australian context with time, including the role of natural enemies, its potential as a virus vector, and how it will behave and spread in our climate."

Julia Severi

Permits for the use of pirimicarb, dimethoate, chlorpyrifos and lambda-cyhalothrin in faba beans and vetch are being sought.

The role of natural enemies in controlling M. crassicauda remains unclear.

"Undoubtedly, we will learn more about M. crassicauda in the Australian context with time, including the role of natural enemies, its potential as a virus vector, and how it will behave and spread in our climate," said Julia.

Meanwhile, further surveillance is now being undertaken by NSW DPI in the growing areas of northern NSW.

More information about cesar's aphid identification service is available by phoning 03 9349 4723 or emailing pestfacts@cesaraustralia.com.

Detections of unusual aphid species should be reported to the appropriate biosecurity agency. The Exotic Plant Pest Hotline number is 1800 084881.

NEW LUPINS FOR NEW SOUTH WALES, VICTORIA AND SOUTH AUSTRALIA

Substantial yield improvements in two new lupin varieties launched at the Henty Machinery Field Days will be welcomed by growers in New South Wales, Victoria and South Australia.

A collaboration between NSW Department of Primary Industries (DPI), Grains Research and Development Corporation (GRDC), Pulse Breeding Australia (PBA), and Department of Agriculture and Food Western Australia (DAFWA) has contributed to the development of these high yielding lupin varieties.

GRDC chair, John Minogue, said PBA Bateman and Seednet Murringo were the result of effective plant breeding programs supported by GRDC and their investment partners.

"New varieties with beneficial traits, including enhanced disease resistance and improved yield potential, are critical to the future of the industry and remain a key focus of GRDC investment," John said.

"These new lupin varieties fill an important niche in the market and their higher yielding capabilities will appeal to growers who are taking advantage of and expanding the use of legumes in our southern farming systems," he added.

Bred by DAFWA and developed by NSW DPI in Wagga Wagga, Murringo is the highest yielding albus lupin for the eastern states.

NSW DPI pulse research agronomist, Mark Richards, said Murringo has the pure white, sweet seeds demanded by human consumption markets and no bitter seeds.

"Best suited to medium to high rainfall lupin growing areas of New South Wales, Murringo can be grown in Victoria and South Australia, with resistance to root rot and phomopsis stem blight, which causes lupinosis," Mark went on to add.

"PBA Bateman is a sweet, narrow leaf lupin with significant yield and virus resistance improvements on current varieties suited to the eastern states. Protected under Plant Breeders' Rights, PBA Bateman is resistant to anthracnose, phomopsis stem blight, grey spot, bean yellow mosaic virus, black pod syndrome and cucumber mosaic virus, and is moderately susceptible to brown spot," Mark explained.

Mark said that PBA Bateman has a medium to large seed with similar agronomic characteristics, harvestability and herbicide tolerance to existing lupin varieties.

CHICKPEA GROWERS ADVISED TO CHECK FOR DEFECTS

Frost and late rains have raised the risk of 'field mould' in chickpeas so growers have been encouraged to have their seed tested to assess germination and any impacts from frost or mould.

New South Wales Department of Primary Industries (DPI) Senior Plant Pathologist Dr Kevin Moore said seed quality concerns have been raised following the delivery of chickpeas from recent harvests.

"Growers can send samples to the DPI for testing to assess whether their harvest has been affected and also check seed that is to be retained for next season's sowing. Some samples have been discounted or rejected for having 'field mould'," Kevin said.

"We encourage growers to have their seed germination tested by the DPI pathology unit to determine if field mould is present or if other factors such as frost that occurred during August and September, have contributed to the discolouration," he added.

Kevin said to date, one seed lot from the Narrabri district has been tested and the discolouration was more likely frost injury or immature seeds, rather than mould.

"However, if seeds are exposed to moisture in-crop or during storage they are more prone to mould than non-frosted seeds," Kevin explained.

DPI Senior Research Scientist, Dr Jenny Wood researches chickpea seed quality and defects.

Jenny said frosted grains are typically small, shrivelled and often darker brown in colour. Immature seeds can have a similar appearance, being small, shrivelled, with green cotyledons.

"The late rain on maturing plants in some areas this season caused a new flush of growth and podding at the tops of mature plants, resulting in these immature seeds at harvest. Both frosted and immature seeds are classified into the same defective seed category at receival, with a maximum tolerance of 6% by weight, including a maximum of 2% poor colour," she explained.

"To capture information on these defects it is important to obtain grower samples that are representative of the paddock, straight off the header and those identified as seed for 2018," Jenny added.

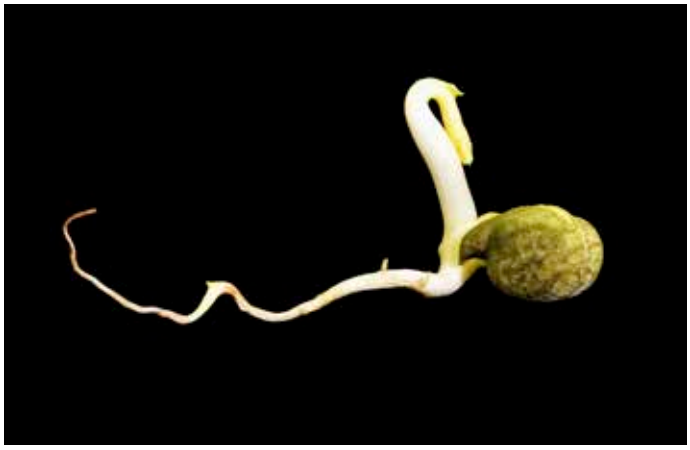
These samples will be tested by both Kevin (germination and pathology) and Jenny (non-pathological seed defects) as part of joint DPI and GRDC projects.

"It is important to capture as much information as possible to determine the relative contributions of frost, immaturity and mould to this chickpea defect," Kevin said.

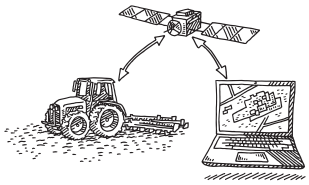
Growers should ensure samples arrive by the end of February 2018. This will ensure all tests are completed and results dispatched well ahead of planting. There is no charge for this service.

Growers can send 500g chickpea seed samples from each paddock for testing to:

Gail Chiplin/Kevin Moore, NSW Department of Primary Industries, 4 Marsden Park Road, CALALA NSW 2340



THE LATEST IN AG-TECH AND PRECISION AG



Driverless tractors, mobile rainmakers, drones and a seed-drill which can fold from 24 metres wide to 5.4 metres in less than five minutes – welcome to agriculture of the future!

The industry has been spoilt for ag-tech demonstrations in New South Wales over the past two months with Gunnedah's AgQuip and the Henty Machinery Field Days (HMFD).

Both promoted the latest in technology and innovation, machinery and farm equipment, outdoors and camping products, farm produce, agronomy, country lifestyle, government and health services, agribusiness and finance services.

Just as agricultural technology has come a long way, so too have the field days.

AgQuip began in 1973 and has grown to showcase 3000 companies to more than 100,000 people over three days in August. In line with technology, maps were swapped for apps to guide patrons around the venue.

HMFD was founded as a one-day header school at the Henty showground in 1963 and now boasts 60,000 people visiting its agribusiness supermarket.

'It's an exciting time for Australian ag," said Kate Nugent, Group Manager of Fairfax Rural Events, which runs AgQuip.

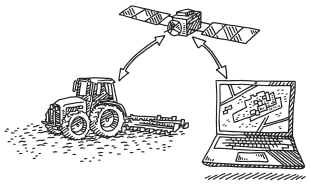
"This year's display included a number of high-tech product demonstrations such as the autonomous tractor and drones. We are very aware Australian farmers are early adaptors by their purchases on site, but it is also a reflection that Australian farmers and primary producers are thirsty for more information," said Kate.

Autonomous tractors created great public interest and for many were the field day highlight, but agricultural enthusiasts also saw:

- Mobile rainmakers, which are claimed to increase rainfall in rural areas by 10 to 20 percent by utilising high voltage and fine wire on a trailer-mounted array that looks like a large aerial.
- One of the widest drills on the market with the wings able to be folded from 24m to 5.4m and unfolded in three-and-a-half minutes – making it legal to transport on narrow Australian rural roads with minimum down time.
- Multi-purpose three-in-one chaser bin, which is a combination of a chaser bin, seed and super grouper and fertiliser spreader.
- Dam building exhibitions whereby the machines follow a pre-programmed computer model, using GPS technology, to be very precise in moving dirt and directing water where it is needed.
- Soil mapping to match grain varieties to variations in the soil.
- Precision farming machinery.
- Many varieties of drones, which are part of the expansion of unmanned aerial vehicles used in agriculture.

"New technology is so exciting! Drones can soil test for moisture, track stock and not only be cost effective but provide analytical information and drive efficiency. Of the visitors to AgQuip, 32 percent were interested in the latest in precision farming," said Kate in conclusion.

FARMER FOCUSED PRECISION CROPPING



Popular demand has driven the development of a new precision agronomy course for grain growers to be delivered by the NSW Department of Primary Industries (DPI) Tocal College.

NSW DPI Tocal lecturer, Matt Notley, said the course will have run late this year, and then again in 2018 at Yanco, Trangie, Condobolin and Narrabri. He said the course was developed following the success of precision agriculture field days held earlier this year.

“Feedback from growers, agronomists and industry advisers has led to the creation of a new four-day course which will run in two units a month apart,” Matt said.

“Nationally accredited, the training program has been designed by farmers for farmers, and it’s proving to be popular, with full subscription to the first courses at the Yanco Agricultural Institute this November and December,” he added.

“Growers and agronomists are attracted by the hands-on nature of the course, which offers practical approaches and realistic outcomes, where participants learn to better use existing services, technology and data,” Matt explained.

Matt said the course aims to help boost the function and integration of the latest generation technology and deliver real returns on investment.

“New equipment and data management systems offer farmers the opportunity to lift production and reduce input costs by using available data in ways we had previously not envisioned,” he said.

“The growth and development of digital agriculture is delivering a huge leap forward for local farmers with sophisticated systems, which allow them to use data from soil tests, yield and weed maps and GPS to effectively manage their farming operations,” Matt added.

“Growers, farm staff and agronomists will learn how to use soil maps and analytical software to develop prescription maps for variable rate fertiliser and soil amendment applications and weed management systems,” he said in conclusion.

More information on the course, locations and scheduled dates for 2018 is available from NSW DPI Tocal College, www.tocal.nsw.edu.au/courses and precisionag@tocal.com

DISEASE IN WHEAT COULD INCREASE IN THE FUTURE CLIMATE

Higher levels of carbon dioxide in the atmosphere might be good for plants under certain conditions, but new research has also shown that it is also good for the diseases.

A study published recently in the scientific journal Virus Research shows that increased levels of carbon dioxide could lead to higher levels of virus in wheat.

The research, funded by Agriculture Victoria and Grains Research Development Corporation, shows a virus which already causes damage to wheat crops could do even more harm as levels of carbon dioxide increase in the atmosphere.

Dr Piotr Trebicki’s work involved measuring the incidence of aphid transmitted, yellow dwarf virus in wheat. Different amounts of carbon dioxide were given to various wheat plots in a Free Air Carbon Dioxide Enrichment facility at Grains Innovation Park at Horsham.

The incidence of the yellow dwarf virus rose by as much as 34 per cent under elevated levels of carbon dioxide when compared to the current atmospheric conditions.

But the scientists are yet to work out exactly why this is happening.

“The mechanism behind increased yellow dwarf virus incidence under elevated carbon dioxide levels is not well understood,” Piotr said.

He said increasing carbon dioxide levels in the atmosphere in future years would affect plants and their interactions with pests and diseases.

“This is the first study that reports on the natural incidence of yellow dwarf virus in the field, under varying carbon dioxide levels, both ambient and elevated,” Piotr said.

“Over four growing seasons, and across four different virus strains and multiple wheat cultivars, virus incidence was higher under elevated carbon dioxide levels compared to current atmospheric levels. As virus infection can significantly reduce grain yield and quality, further research to understand the mechanisms involved is critical to maintain or increase future food production,” he explained.

“There is real merit for further research to determine if virus incidence increases as a result of elevated carbon dioxide levels and to better understand what is happening,” Piotr concluded.

ENHANCED MOLECULAR TECHNOLOGY SET TO BETTER SAFEGUARD VICTORIAN AGRICULTURE

AGRICULTURE VICTORIA HAS RECEIVED AN INFRASTRUCTURE BOOST TO ITS METABOLOMICS AND PROTEOMICS FACILITY AT THE AGRIBIO CENTRE FOR AGRIBIOSCIENCE IN BUNDOORA, MELBOURNE.

The enhancements represent a $1 million investment by the Victorian Government, and include new robotics for automated sample preparation and a new mass spectrometer for high throughput analysis of samples.

Molecular Phenomics Research Leader Simone Rochfort said the new enhancements made it the largest metabolomics and proteomics facility dedicated to agribioscience for agriculture productivity and biosecurity outcomes in Australia.

“The facility is now more accurate, faster and has the capacity for automated handling of samples for higher throughput,” Simone said.

“The technology allows Agriculture Victoria scientists to take samples from agricultural products, such as milk, blood and plant extracts, and study the small molecules involved in biological processes, such as the sugars and amino acids, and the proteins,” she explained.

“For example, we use metabolomics and proteomics to identify differences in milk components in order to maintain milk quality. This has led to the discovery of molecules in cows’ milk that can be concentrated and used to improve infant formulas,” she went on to add.

Simone said Agriculture Victoria scientists at AgriBio used metabolomics and proteomics in complementary ways with genomics techniques.

“Tests for grain quality that have been developed in the metabolomics and proteomics facility are now being used in association with genomic selection to improve the performance of grains crops,” Simone said.

“The capabilities also allow for the rapid identification of potential new or emerging invasive pest and disease threats, so they can be conclusively identified and eradicated or contained. Microbial pathogens linked to animal and plant diseases can now be identified in just a few minutes; a process that used to take up to three days,” she further explained.

The metabolomics and proteomics facility is part of the suite of bioscience platforms at AgriBio, where Agriculture Victoria scientists work in close collaboration with other innovation assets across Victoria including grains experts in Horsham, pasture breeders in Hamilton and dairy experts at Ellinbank.

The research supports the Victorian Government’s goals of improving productivity in Victoria’s agriculture industries, and improving biosecurity to protect our export markets.

“The facility is now more accurate, faster and has the capacity for automated handling of samples for higher throughput.”

Simone Rochfort

MYCROP DIAGNOSTIC TOOL UPDATED

Grain growers monitoring crops for signs of pests, diseases, frost and other production constraints are advised the popular MyCrop crop diagnostic tool has been updated.

The Department of Primary Industries and Regional Development in Western Australia has enhanced its MyCrop suite of apps and webpages with several new high quality photographs of frost damage and incorporated the latest data from the 2018 wheat and barley variety guides.

Development officer Andrew Blake said the additional frost photographs have been added to the MyCrop wheat, barley, canola and pulses apps to assist growers to identify frost damage.

Andrew said the apps did not require the internet to operate, once downloaded, so farmers could compare crop damage in the paddock with the photographs on their smart phone or mobile device, or later from the farm office computer.

“Frost damage can easily be confused with similar symptoms resulting from disease or crop nutrition deficiencies, such as take-all and copper deficiency. The new, extreme close-up pictures clearly show the different ways frost can impact on a plant, which includes a detailed description of the damage and what to look for,” Andrew said.

“This tool will enable growers who are not familiar with frost symptoms to clarify whether the damage is caused by frost or not, especially when used in conjunction with our Extreme Weather Event online tool to identify the likelihood that frost conditions have occurred,” he added

The updated MyCrop app includes the latest profiles of current wheat and barley varieties, as well as pest and disease ratings for each variety.

The functionality of the MyCrop apps for wheat, barley, canola, oats and pulses, which includes field peas and lupins, has also been improved, making several areas easier to navigate.

There have been more than 4000 downloads of the suite of apps since it was developed by the department, with the support of the Grains Research and Development Corporation, in 2013.

Andrew said MyCrop was an essential tool for all grain growers and agronomists, providing a virtual library of valuable crop management information.

“MyCrop harnesses hundreds of valuable factsheets on a huge range of crop constraints, including pests and diseases, crop nutrition, herbicide damage, heat stress and more. The information links directly to other useful tools, such as PestFax reporting app, to overcome constraints, and information on how to monitor crops for various diseases,” he explained.

Growers who have already downloaded MyCrop app will receive a prompt to update the app, automatically.

FOOD, DRINK AND MEDICINE BREAKTHROUGH SEEDED

Worldwide production of food, beverages and medicinal plants could become cheaper and more reliable using information from a germination breakthrough by Australian scientists.

The study was conducted by researchers from the La Trobe University Department of Animal, Plant and Soil Sciences at the Centre for AgriBioscience, the ARC Centre of Excellence in Plant Energy Biology and the University of Western Australia.

The study found that growers of seeds, such as rice for food, barley for beer and poppies for codeine, would benefit greatly from having control over when they germinate. The research published in the journal Genome Biology is beginning to decipher how a crop's genome can control the time that a seed wakes up.

"Scientists and crop breeders have been interested in seed dormancy and germination for a very long time. They breed carefully to control it in many crops because it affects their yields enormously," said La Trobe University's Dr Mathew Lewsey.

With the knowledge gained from this research, Mathew hopes to perfect the genome-editing technology necessary to produce new plant cultivars that germinate differently, giving farmers the ability to precisely control when their crops are ready for harvest.

"We want to be able to control when seeds wake up and how quickly they do it," Mathew said.

Dr Quentin Gouil, also of La Trobe University's Centre for AgriBioscience, said the boon for food security around the world would be incredible for staple foods such as rice, corn and wheat.

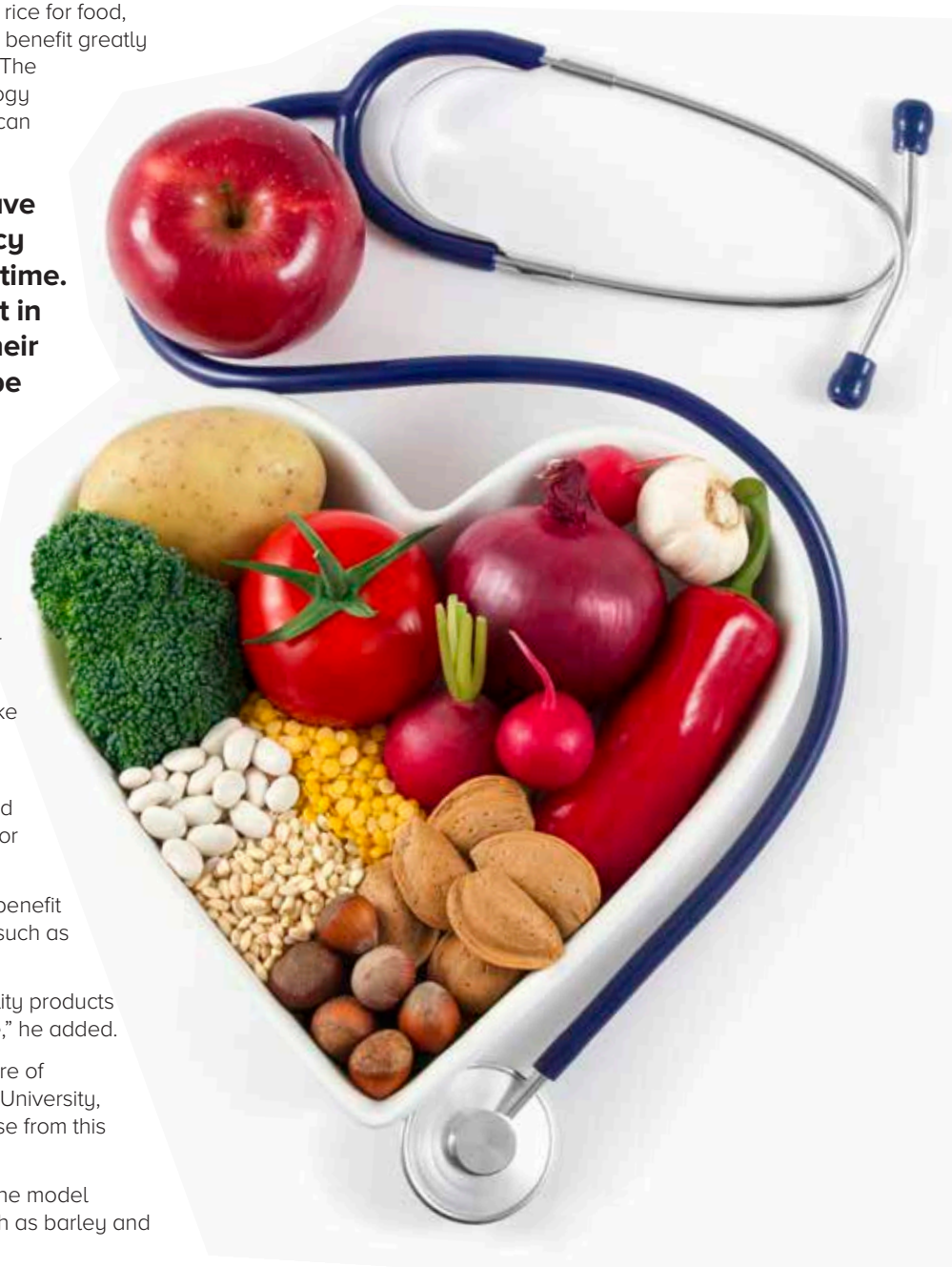
"The production of beer and spirits would also benefit from this level of control, along with medicines such as morphine and codeine," said Quentin.

"Farmers and brewers can produce higher quality products if they know exactly when their seeds will wake," he added.

Colleague Dr Reena Narsai, from the ARC Centre of Excellence in Plant Energy Biology at La Trobe University, is excited about the opportunities that could arise from this research in coming years.

"Our next move is to transfer our findings from the model research plant Arabidopsis into crop plants such as barley and rice," she said.

"New cultivars of plants that germinate as growers want would be permanently modified so that, when those plants are propagated, their seeds and the offspring from those would all have the new behaviour. We will look to generate varieties that have accelerated or slowed-down germination and will study how they control the genetic switches that turn this off and on," Reena explained in conclusion.



NEW LABSTREAM APP FOR FERTILISER ADVISERS

A new software application that allows fertiliser advisers to register soil and tissue samples 'on the go' is the latest innovation from Nutrient Advantage Laboratory Services.

The new labSTREAM app means samples can be logged on mobile devices from the paddock, making it easier and more convenient than filling in the required paperwork at the office.

This will allow users of the labSTREAM app to post samples to the Nutrient Advantage laboratory on the way home instead of heading back to the office to fill in sample details and print consignment notes.

Charlie Walker, Head of Agronomy Solutions at Incitec Pivot Fertilisers, said labSTREAM makes the whole system of logging samples faster and more accurate for Nutrient Advantage customers.

"The app means fertiliser advisers can geo-locate each sample through Google Maps and record the coordinates at each sampling point in the paddock so they can resample at the same points in the future," he said.

"Another handy feature is that the app enables advisers to scan the sample barcode instead of entering it manually each time.

"And if there's no mobile coverage in the paddock while the labSTREAM app is in use, it stores the data offline until it comes back online again."

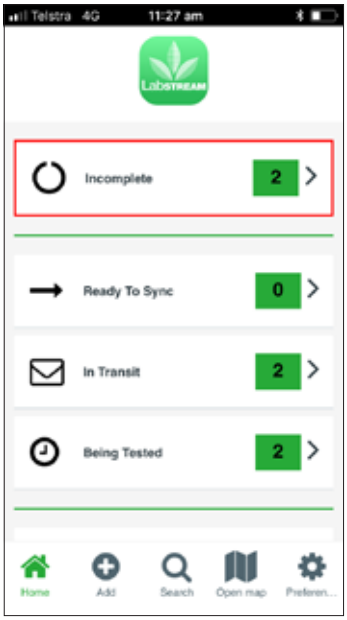
Mr Walker said advisers can refine the app and set up preferences for the clients and the crops they work with on a routine basis, through the EASY Recs feature.

"The app gives advisers the ability to customise it to their individual needs and if they wish, they can add their own notes, photos, video or audio records to a sample," he said.

"It also allows them to track the progress of their samples through testing until they are completed and ready for review.

"We believe features like these will make labSTREAM so much easier and convenient for our customers."

The new app will be released to Nutrient Advantage customers in coming weeks.



The new labSTREAM app means soil and tissue samples can be logged on mobile devices from the paddock, so it's easier and more convenient for fertiliser advisers.

HIDDEN SOIL CONSTRAINT COULD BE OVERCOME BY IMPROVED WATER HARVESTING

The influence of transient salinity on sodic soils could be severely constraining some Western Australian grain crop yields in dry landscapes.

Sodic soils are often associated with yield limitation, due to the soil type's increased susceptibility to waterlogging.

Recent research by the Department of Primary Industries and Regional Development and the CSIRO has found grain yields on sodic soils can be lowered by transient salinity in dry years.

Department principal research officer Ed Barrett-Lennard told the recent World Soil Day forum in Perth that growers may not be aware of the extent of the impact of transient salinity on crop yields.

"Clayey soils in semi-arid environments, like the eastern and northern Grainbelt, can become dispersive because of sodicity and alkalinity," Dr Barrett-Lennard said.

"These soils subsequently lose their porosity and become dense, causing salt from the rain to accumulate over hundreds of years in the root zone.

"In dry years, the salt concentration in the soil solution becomes higher, as there is not as much water in the soil to dilute the salt, which restricts plant growth and crop performance."

The department has reviewed nine years of the Grains Research and Development Corporation's National Variety Trials for wheat, barley and field peas conducted across the southern States and found the interaction between salt and rainfall to be very strong.

Dr Barrett-Lennard said while the effect of transient salinity on sodic soils was consistent, its severity depended on the crop type.

"Cereals are more salt tolerant so the impact is not as great compared with field peas, which are more susceptible," he said.

To counteract the risk of transient salinity in dry years the department has been exploring improved water harvesting techniques.

Dr Barrett-Lennard said the department and the CSIRO have examined methods to encourage surface water movement via tailored mounds and furrows, such as plastic sheeting and polymer treatments.

"In a trial at Bonnie Rock with barley in 2017, we doubled crop yields on a sodic soil using plastic sheeting over the mounds to direct more rainfall into the furrow to the plant roots," he said.

"Obviously, using plastic sheeting is not a practical field solution. Trials are now required to determine if what we achieved with the plastic can be replicated with spray-on polymers."

For more information about the science and management of dispersive and sodic soils click here.

The World Soil Day forum, hosted by the department, SoilsWest and Soil Science Australia, drew together a range of experts in the field to discuss the latest soil issues and research in WA.

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EXPERT INFORMATION AT YOUR FINGERTIPS

WHERE DO YOU GET UPDATES ON THE SCIENCE AFFECTING YOUR CROP MANAGEMENT RECOMMENDATIONS? ARE YOU CONFIDENT YOU GET THESE UPDATES AS SOON AS POSSIBLE? HOW LONG DOES IT TAKE FOR YOU TO GET YOUR HEAD AROUND THE KEY MESSAGES?

These often posed questions now have a new way to be answered, given a new platform is giving Australian crop advisors and grain growers access to evidence-based seasonally relevant information, when and where they need it.

ExtensionAUS™ is a national online extension service about crop nutrition and crop diseases for the Australian grains industry. Their website offers grain growers and their advisors credible information and expert knowledge to support their crop management decisions.

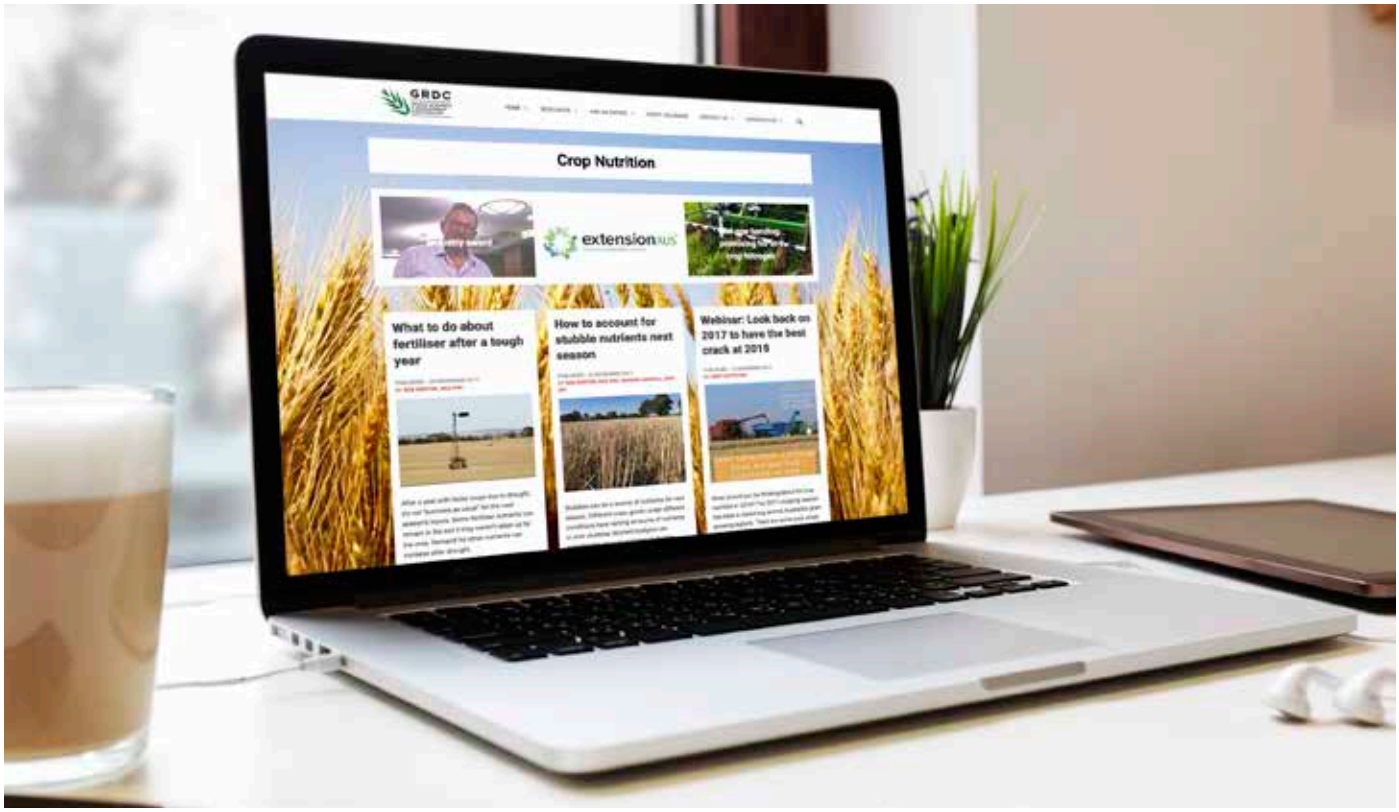
But it's more than just a website, it's also a network of knowledgeable people. Australia's leading researchers and advisors are the core of the service. They direct and review what is published and promoted online.

Agronomists and growers can ask regional and crop specific questions via the 'ask an expert' service on the website. New articles are published every week. Each community has over two and a half thousand followers, growing daily and a growing presence on Facebook.

The service understands that growers and advisors need to know how new research can feed into decision making. Key points can get lost in the way research is written up and presented and it can be hard to put new information into context. ExtensionAUS bridges this gap and gives growers and advisors access to more than 180 Australian crop nutrition and 150 field crop disease resources.

Find out more at www.ExtensionAUS.com.au/ or @aucropnutrition and @auscropdiseases.

Included here are two sample articles that have been recently published on the ExtensionAUS website to give an example of what growers and agronomists will find on the site.



HOW GOOD ARE IN-CROP MINERALISATION PREDICTIONS?

By Katherine Dunsford (Agriculture Victoria)

Crops may source much of their nitrogen (N) from in-crop mineralisation (ICM) of soil organic matter. Of total crop N at harvest, an estimated average 63% came from ICM in a recent Agriculture Victoria study. Total crop N includes grain, straw and roots. Root N is about 10% of grain and straw N combined.

But ICM isn't well accounted for in nutrient budgets. This means fertiliser N may be over applied. Advisors agree predicting ICM is tricky, notably when seasonal conditions are shifting.

How much nitrogen is involved?

Net in-crop N mineralisation is the difference between what's mineralised and immobilised. A positive ICM value means there is a net mineralisation giving more plant available N. A negative ICM value means N is immobilised, or lost from the system e.g. via denitrification. This study found net ICM ranged from +192 kg N/ha down to -230 kg N/ha.

Ways to predict in crop mineralisation

Many advisors have used the traditional 'rule of thumb' calculation: *ICM = 0.15* organic carbon (OC)%* growing season rainfall (GSR (mm).*

This method is most accurate after the fact ie: when rainfall is known It is less useful in advance, relying on long-term GSR averages to predict likely rainfall. At the moment there isn't a more accurate method to predict GSR.

The rule of thumb is a better predictor of ICM than total N. In very wet years N losses can make the formula less useful. Surprisingly, the researchers did not find a clear effect from crop sequence. But adverse seasonal conditions might have had an impact.

Cheap, rapid and reliable ICM predictions are not here yet. Research in central Victoria looked at Hot KCl, Solvita kits and MIR to predict ICM. So far, all methods are promising. Further research is required before they can be used for Australian soils.

Which tests to use now?

For now, soil tests are the best option to predict ICM. Test OC to estimate potential mineralisation. Deep soil mineral N levels give more information than surface (0–10 cm) samples. Growers may have more soil N than they realise. Through the season growers can expect soils to mineralise more N when soils are moist and where OC levels are high.

PRELIMINARY PREDICTA® B RESULTS SHOW PREVALENCE OF ASCOCHYTA INOCULUM

By Kevin Moore (NSW DPI) and Jenny Davidson (SARDI)

Growers are now able to utilise the PREDICTA® B DNA-based soil test to detect the presence of Ascochyta blight inoculum (Phoma rabiei) in their paddocks.

Initial testing has shown that the Ascochyta fungus was detected in 35% of samples from the Northern Region. This finding is a concern for growers who are contemplating planting chickpeas, and led to the test results being reported on PREDICTA B reports to growers in the northern regions as a test under evaluation.

Figure 1 shows the results from samples submitted prior to sowing the 2017 crop. This has provided an overview of relative prevalence of Ascochyta inoculum in the Northern Region where the majority of samples were taken. The categories presented are based on a range of population densities, not disease risk categories. These results will be ground-truthed throughout 2017 in the Northern Region by Dr Kevin Moore, in an attempt to calibrate the pre-sowing PREDICTA B results with disease incidence in the following chickpea crop.

Following a high incidence of Ascochyta Blight last year, and a reported 60% of the Northern Region cropping area planted to chickpeas in 2017, the results are a timely reminder of the inoculum left behind with chickpea residue and its potential to impact subsequent crops. The high levels of disease in some areas are also a reminder that growers need to think twice about risk of all diseases, particularly when planting chickpeas back-to back.

Although limited samples were submitted for Ascochyta assessment in the Southern Region, the results are a reminder that the pathogen is carried over in paddocks and this should be taken into account when planning paddock selection and crop rotations.

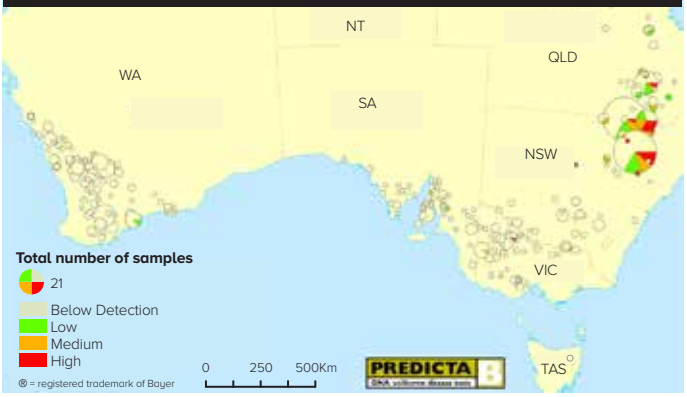
Knowledge of the distribution of inoculum in the Southern Region will only grow with further PREDICTA B testing.

For both the Northern and Southern chickpea growing regions, growers need to be well aware of the Ascochyta risk, and plan ahead for fungicide applications. Growers are urged to not only budget for fungicide applications ahead of time but also have an appropriate number of applications ready in the shed.

Accessing PREDICTA® B to test for Ascochyta blight

If Dr Moore's assessments this growing season confirm that the results do help chickpea growers with paddock selection and early fungicide application, then results will be included on all PREDICTA B reports nationally in 2018. Growers can access PREDICTA B testing in the two chickpea growing regions via Crown Analytical Services in the Northern Region and accredited agronomists in the Southern Region.

Figure 1: Ascochyta blight population density PREDICTA B/NVT 2017
Phoma rabiei



RESEARCH TO UNLOCK THE MYSTERY OF FROST IMPACT ON WHEAT

RESEARCHER BRENTON LESKE HAS BEEN KEENLY MONITORING THE IMPACT OF COLD TEMPERATURES ON WHEAT PLANTS AT THE DEPARTMENT OF PRIMARY INDUSTRIES AND REGIONAL DEVELOPMENT'S (DPIRD) FROST NURSERY AT DALE, WEST OF BEVERLEY, IN WESTERN AUSTRALIA.

Brenton is one of the inaugural recipients of the department's Grains Research Scholarships, intended to boost the productivity and competitiveness of the Western Australian grains industry.

His thesis seeks to better understand how different wheat varieties respond to frost to help the development of more robust, higher yielding varieties, less susceptible to frost in the future.

The research builds on his involvement in research projects undertaken by the department and supported by the Grains Research and Development Corporation (GRDC), which examined the impact of frost on the yield components of different varieties.

Brenton said while previous studies had established relationships between frost and yield responses, from which varietal frost rankings have been developed, relatively little was known about which physiological responses to frost influence grain yield.

"The underlying reasons for why one variety is more sensitive to grain loss under frost than another is not well understood," he said.

"I aim to identify mechanisms that contribute to wheat plants being more susceptible or tolerant to frost damage," he added.

Fifteen wheat varieties have been sown at the frost prone Dale nursery, selected out of a group of 70 from a previous department trial Brenton was involved in.

The trial had eight sowing dates from 15 April to 22 June, to ensure the varieties, with a range of maturities, flower across the window from July to September when frost events are likely.

An additional population of 173 lines developed from a cross between Calingiri and Wyalkatchem is also being evaluated, due to the differences in frost sensitivity of the parents.

This population will help validate past research which identified genetic regions affecting frost susceptibility, particularly loss of grain numbers.

Plants are being monitored to examine the correlation between frost and a range of yield traits, including biomass, grain size, grain number and plot yield.

Brenton said a particular focus of his research would be on the interrelationship between plant sugar levels and frost susceptibility.

"I'm interested in how frost damage affects the wheat's photosynthetic capacity to convert light and water into sugar, biomass and finally yield," he said.

"There has been an assumption amongst growers that higher sugar concentrations lower the freezing point of sap. Preliminary results from a colleague's trial last year showed this to have a negligible effect. Part of the project is to assess the sugar content in different varieties and to examine the correlation between tissue sugar contents and frost induced sterility," he went to explain.

Another key area of the project is an evaluation of the presence or absence of selected hormones, particularly the hormone abscisic acid (ABA), which relates to plant stress.

"ABA regulates the closure of leaf pores, or stomates, used for transpiration, which could have implications for how wheat responds to frost. I expect ABA regulation to be different amongst varieties and there might be implications for frost damage and recovery processes," Brenton said.

Brenton's four year PhD, supported by DPIRD and the GRDC, is being undertaken at the University of Western Australia in collaboration with the department.

Department grains research and development executive director Jason Moynihan said the Grains Research Scholarships were an investment in the long term scientific research capacity of the State.

"Brenton's work will make a strong contribution to future wheat pre-breeding and breeding programs, which will contribute to the development of improved, more profitable varieties for Western Australian growers," Jason said.

"It is essential to encourage and support the next generation of scientists, to ensure WA remains at the forefront of international grains research and production," he added.

2016 Grains Research Scholarship recipient Xin (Bob) Du is examining the opportunity to use a non-chemical dust to protect stored grain from insects, while Leon Hodgson is working on reducing yield losses in barley caused by fungicide resistance to the disease, net blotch.

The Grains Research Scholarships are supported by Royalties for Regions, as part of the department's Boosting Grains Research and Development project.

"I'm interested in how frost damage affects the wheat's photosynthetic capacity to convert light and water into sugar, biomass and finally yield."

Brenton Leske

LIVING MULCH BUILDS SOIL AND PROFITS

LIVING MULCH IS A SYSTEM FARMERS CAN USE TO BENEFIT BOTH PROFITS AND THE SOIL. WHILE THE SYSTEM HAS BEEN AROUND FOR A WHILE, SCIENTISTS AT THE UNIVERSITY OF GEORGIA IN THE UNITED STATES OF AMERICA ARE MAKING IT MORE EFFICIENT AND SUSTAINABLE.

The living mulch system uses a perennial plant between rows of crops. In their work, the Georgia researchers used white clover between rows of corn. As white clover is a legume it can supply nitrogen fertiliser to the crop. The idea is that each planting season, farmers remove a portion of the clover and plant the row crop in that spot. While the corn grows, there is then clover between the rows serving as living mulch.

Ideally, after the corn is harvested, the clover takes over the whole field and the cycle starts again the next growing season, with the farmer removing portions of the clover to plant corn. However, this process isn't perfect and often the living mulch fails to fully re-establish. The scientists in Georgia are working to change that.

"We chose white clover particularly to use as living mulch because it has the capability to re-grow and re-establish itself when the conditions are right, and to perpetuate itself from year to year," said Nicholas Hill, lead researcher.

"We wanted to start defining what the conditions were from the standpoint of agricultural practices that could help the clover regrow year-to-year in a corn production system," he added.

The scientists mainly looked at two different variables: how wide of a band of clover to spray with herbicide and then how wide to make the rows of corn. They found the ideal band to spray with herbicide was 20 cm wide and the ideal crop row width was 90 cm.

"The whole idea is to strike a balance between having the clover be able to reestablish, preventing it from out competing the corn, and being able to produce enough corn to make a profit. In wider rows, more light penetrates the corn to get to the clover later in the year and it can persist a little longer, while in narrow rows it doesn't.

And then if we spray too much of the clover to plant the corn, it won't be able to reestablish after harvest. But if we spray too little it'll out-compete the corn in the rows," explained Nicholas.

Getting this balancing act right can be very beneficial to the cover crop (the clover), the row crop (the corn), and the farmer. When spacing conditions are ideal, the shading characteristics of the corn over the clover control the nutrient release of the clover to the corn. The clover responds to shade by dropping its leaves onto the soil. Those decompose and add nutrients to the soil that the corn can use. Nicholas described it as a time-release capsule of fertiliser. That means less applied fertiliser from the farmer.

Furthermore, the ideal combination of conditions prevents the clover from out-competing the corn but doesn't do so much damage that when the corn is gone the clover can't take over the paddock after the growing season. The researchers' goal was to get up to 100% clover cover, and they were able to achieve that.

The researchers found the living mulch system does produce a little less corn than more conventional systems. However, the cost savings from the system outweigh the lower production. Nicholas reported that they applied 75-80% less herbicide to the paddock, thanks to the clover out competing harmful weeds, and less nitrogen fertiliser because of the nutrients the corn gets from the clover. So the farmer can end up making more money.

"Living mulch is the best thing since sliced bread. We are seeing a lot of benefits. It can benefit the corn, the soil, and the business, so it's really a win-win-win situation we're trying to scale up for farmers to use. We are beginning to study and document all of these benefits and will continue to carry out research on living mulch," Nicholas said.

PASTURE LEGUME OPTIONS FOR NORTHERN AUSTRALIA

SOWN LEGUMES ARE A MUCH-NEEDED SOLUTION FOR NORTHERN BEEF PRODUCERS SEEKING TO EXTEND THEIR PASTURE PRODUCTION SEASON AND STOP NATIVE PASTURE RUNDOWN, BUT HISTORICALLY SUITABLE OPTIONS HAVE BEEN DIFFICULT TO FIND AND ESTABLISH.

One such option, whose reputation is growing on the back of impressive pasture improvement and animal productivity results, is Progardes Desmanthus. Across the north, producers have been seeding Progardes into their native pastures. Its excellent nutritive characteristics are a game changer for northern beef producers, allowing them to arrest the decline in animal condition that normally occurs towards the end of the dry season. And as a nitrogen-fixing legume, it improves soil condition and hence the resilience of the existing pastures.

Progardes is a perennial tropical legume blend of a number of cultivars from the Desmanthus family that display superior genetics and diversity. Discovered on a number of abandoned trial sites, the Desmanthus accessions had survived decades of drought, floods, grazing, fire and insect pressure. The current commercial blend is well adapted to the heavy clay soils of the Brigalow region, cleared Blackwood, Gidgee and Downs country in the northwest, and is drought tolerant and persistent.

It contains up to 20 per cent crude protein in the leaf and 12 per cent in the stem, and is highly palatable. It tolerates heavy grazing due to the low growing crown, which sits at or below the soil surface. Because of its extensive taproot, it can access soil moisture well beyond the root systems of grasses, allowing it to stay green and productive once the grass pastures start haying off.

Recently the CRC for Northern Australia gave the rollout of Progardes a boost when it awarded Agrimix Pastures and their extended team almost $3 million to trial establishment of Progardes in the north.

It's already been proven in the paddock. In trials in central Queensland, steers grazing on a Progardes buffel mix achieved live weight gains of an additional 36kg/head over 135 days, compared to steers on a buffel only pasture. It is palatable and persistent once established, and requires no rumen inoculum.

However, establishment has often proved tricky. Good soil-seed contact is important and follow up moisture is critical to success. The Northern Australia CRC project hopes to fine-tune establishment methods with a view to being able to make reliable recommendations across a range of semi-arid conditions and soil types.

Desmanthus variety Progardes being grazed with buffel grass in central Queensland

What's more, Progardes isn't the only legume in the Agrimix Pastures portfolio. Since 2012 the company has invested substantial time and research dollars into a breeding program to develop new and novel varieties combining enhanced productivity, while maintaining inherent drought tolerance. A surprising outcome has been that some selections from interspecific crosses have shown a substantially different plant type, with much softer and erect growth, later maturity and indications of greater cold tolerance.

These crosses are now being evaluated in the field in a number of diverse locations and have the potential to add valuable new legume genetics to pastures in temperate to subtropical environments such as northern New South Wales, where there is also a pressing need for summer-growing legumes.

Drought tolerance is a trait of major importance in the breeding and selection for new Desmanthus cultivars. Even in the nurseries, it is beneficial to provide a degree of selection pressure for heat and drought tolerance, and the ability to establish in high soil temperatures.

Heat wave conditions experienced throughout much of eastern Australia over the past 12 months have provided ideal conditions for such selection pressure. Field nurseries used for breeding trials have recorded soil surface temperatures up to 63° Celsius. In spite of this, establishment and survival rates have been very pleasing. The young Desmanthus seedlings coped very well with these extreme soil surface temperatures, which augurs well for the suitability of these new cultivars to the harsh northern Australian conditions.

Progardes is well established in this Boree Gidgee country in the semi-arid north of the country.

It contains up to 20 per cent crude protein in the leaf and 12 per cent in the stem, and is highly palatable. It tolerates heavy grazing due to the low growing crown, which sits at or below the soil surface.

Progardes sown into native Mitchell grass pastures in Richmond, North Queensland.

Once established, Progardes is extremely drought tolerant. Its long tap root allows it to access moisture well below the reach of grass species, providing a high-protein feed source long after pastures have died back.

Progardes is well established in this Boree Gidgee country in the semi-arid north of the country.

Young Desmanthus seedlings surviving well in extreme soil surface temperatures, demonstrating their suitability for harsh northern Australian conditions.

SPOTLIGHT ON AGRICULTURE'S EMERGING INDUSTRIES

DID YOU KNOW IT'S POSSIBLE TO MILK A CAMEL? DID YOU KNOW THERE'S A TYPE OF FRUIT GROWN IN WESTERN AUSTRALIA THAT'S AN ANCIENT CHINESE DELICACY? WELL, TAKE NOTE, BECAUSE CAMEL MILK AND JUJUBES ARE TWO EMERGING AUSTRALIAN AGRICULTURAL INDUSTRIES TO WATCH.

John Harvey is Managing Director of the Rural Industries Research and Development Corporation (RIRDC). He said the organisation is taking a closer look at these two quirky industries and their potential.

Part of RIRDC's mandate is to identify, research and invest in emerging agriculture industries across Australia that have the potential to boost our agricultural production and contribute to the sustainability and profitability of regional Australia. These emerging industries often start out small as alternative enterprises or income sources for rural and regional communities, but with the right support and circumstances, they become our future production powerhouses. Like avocados 30 years ago, or canola oil 25 years ago, in time camel milk and jujubes could be mainstream consumer products and make large contributions to Australia's agricultural GDP.

"Perhaps in 10 years camel milk will be eaten with Weetbix at breakfast tables across Australia, and perhaps in coffee shops it will be another option alongside soy and almond milk?"

Camel milk

The first fledgling industry to mention is camel milk. Milk from camels has been consumed by people for more than 6,000 years, much longer than we have consumed cows' milk. Currently, the global production and consumption of camel milk is dominated by countries in North and East Africa, the Middle East and parts of Asia, but that is changing.

While camel milk tastes and looks similar to cows' milk, its promoters claim some impressive health properties that consumers in Australia and the United States are starting to catch on to. Some of these include the capacity to alleviate food and seasonal allergies, usefulness in reducing insulin dependency, ease of digestion and assistance with gut allergies associated with the autism spectrum, Crohn's Disease, ADD and ADHD. No doubt more research is required to validate some of these claims.

Sold in both pasteurised and unpasteurised form, demand for camel milk in Australia currently outweighs supply and the new-found popularity of the product is driving the expansion of existing camel dairies and development of new enterprises in Victoria and Queensland. Over the next five years, don't be surprised to see a major increase in Australian camel milk production.

The fact that camels are so well suited to Australian conditions and we have a large population of wild camels is also assisting with the growth of the industry. In fact, some dairies are domesticating wild female camels (also known as cows) to use as dairy camels.

As well as camel milk, other camel dairy products are starting to emerge on the market including cheese, yoghurt, ice cream, camel milk powder and skincare. Some of these are already very popular and considered luxury items in the Middle East.

The next challenge for the Australian camel milk industry is transitioning from cottage industry to commercial scale. International investment is starting, and momentum and awareness are certainly building, but it will take time. Perhaps in 10 years camel milk will be eaten with Weetbix at breakfast tables across Australia, and perhaps in coffee shops it will be another option alongside soy and almond milk?

Jujubes

Another new and emerging agricultural industry for Australia is a fruit called jujubes. While the tree has been grown successfully in Australia for the past 15 years, recent investments, research and increasing interest from farmers, especially in Western Australia, has seen the production of the fruit expand rapidly in the past three years.

The jujube is an extremely popular fruit in China and target markets for Australian production include China, Singapore, Malaysia, Hong Kong and Taiwan. For thousands of years, it has been used in traditional Chinese medicine and as food it is eaten fresh or dried or in processed form, where it is often known as a Chinese date. The latter is used in confectionary and for compotes and jam.

The fruit itself has a thin, dark red skin which surrounds its sweet white flesh. They have a high nutritional value, and when eaten fresh they are crisp like an apple. When dried they become chewy and sweet.

The jujube's success in Australia isn't just down to how well the trees are suited to our climate and soil types, but also to increasing local consumer demand for the fruit. In Western Australia, there is now a market for jujubes and they are sold in Asian grocery stores in Perth, as well as at weekend farmers markets.

That said, a lot of the excitement building about this industry is to do with its export potential. Australia's proximity to South East Asia and our counter-seasonal production to the northern hemisphere provide an opportunity for Australian growers to market their jujubes as a premium product. Our clean and green reputation certainly helps too. But there is still a lot of work to be done to grow the industry in order to meet existing demand and future export potential.

Jujube grower and President of the West Australian Jujube Growers Association Inc. Pete Dawson was one of the first to compare the current state of his fledgling industry to the avocado industry 30 years ago. He predicts that its future will be just as bright. Who knows, perhaps jujube jam on toast will be the next smashed avo in time?

CROP GENE DISCOVERY GETS TO THE ROOT OF FOOD SECURITY

Researchers from The University of Queensland have discovered that a key gene which controls flowering time in wheat and barley crops also directs the plant's root growth.

Project leader Dr Lee Hickey from the Queensland Alliance for Agriculture and Food Innovation (QAAFI) said the discovery was a major breakthrough in understanding the genetics of root development and could boost food security by allowing researchers to breed crops better adapted to a range of environments.

"Wheat and barley are ancient crops and humans have been growing them for thousands of years," Lee said.

"Over the years, farmers and more recently plant breeders, have made significant progress selecting for above-ground traits, yet have largely ignored the 'hidden half' of the plant, its roots. Our discovery that the VRN1 gene, which is known to regulate flowering in wheat and barley crops, also plays a role in the plant's ability to respond to gravity, thereby directing root growth and determining the overall shape of the root system," Lee further explained.

Lee said this unexpected insight into the underground functions of the VRN1 gene has major implications for optimising cereal crops, as crop varieties with improved root systems could dramatically improve farm productivity.

"A particular variant of VRN1 in barley, known as the Morex allele, simultaneously induced early flowering and maintained a 'steep, cheap and deep' root system. This is exciting because flowering time is a key driver for yield and the VRN1 gene appears to offer a dual mechanism that could not only boost crop yield but also improve water and nutrient acquisition through a deeper and more efficient root system," Lee added.

The root gene discovery was part of an international collaboration with a team of scientists from Justus Liebig University in Germany, led by Professor Rod Snowdon. The group in Germany provided insight of the gene's involvement in shaping root development for winter wheats grown throughout Europe, as well as validation of rooting behaviour in field trials.

Another collaborator was Dr Ben Trevaskis from CSIRO who provided important experimental wheat and barley materials critical for validating the gene's role in root development.

PhD student Hannah Robinson, along with Dr Kai Voss-Fels who has recently joined QAAFI as a Research Fellow were joint first authors for the recently published study in high impact journal Molecular Plant.

"While our discovery is exciting, more research is needed to identify other key genes involved to effectively optimise root growth in future crops for farmers," Hannah said.

"Also, we need to determine the preferred root system architecture for different growing regions, which will help plant breeders develop more productive crops, despite the increased variability of future climates," she added.

The cereal root research at The University of Queensland and wheat phenology research at the CSRIO is supported by the Grains Research Development Corporation, and Hannah's PhD scholarship.

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CSIRO'S FOOD AND AGRIBUSINESS ROADMAP CHARTS A COURSE FOR FUTURE SUCCESS

New technologies could see us eating algae-based sources of protein, developing allergenic-free nuts and tolerable varieties of lactose and gluten, and reducing environmental impact through edible packaging.

Speaking at the launch during the recent Australian Institute of Food Science and Technology's (AIFST) 50th Anniversary Convention in Sydney, Assistant Minister for Industry, Innovation and Science, Craig Laundy, highlighted the importance of innovation and entrepreneurship in driving new economic growth in the industry.

Keeping a greater share of food processing onshore and better differentiating Australian food products are major themes across the Roadmap, which calls on businesses to act quickly or risk losing future revenue streams to the competitive global market.

Developed with widespread industry consultation and analysis, the Roadmap seeks to assist Australian food and agribusinesses with the desire to pursue growth and new markets.

Deputy Director of CSIRO Agriculture and Food, Dr Martin Cole said Australia was well positioned to act as a delicatessen of high quality products that meet the needs of millions of informed and discerning customers both here and abroad.

"Australian businesses are among the most innovative in the world, and together with our world-class scientists, can deliver growth in the food and agribusiness sector amid unprecedented global change," Martin said.

"Less predictable growing conditions, increasingly global value chains and customers who demand healthier, more convenient and traceable foods are driving businesses to new ways of operating. Advances are already being made through the use of blockchain technology and the development of labels that change colour with temperature or time, or are programmed to release preservatives. This Roadmap will set us on the path to sustainable growth in the sector," he went on to explain.

The Roadmap was developed in collaboration with the government-funded food and agribusiness growth centre: Food Innovation Australia Limited (FIAL).

Recently, FIAL launched their Sector Competitiveness Plan, which outlines the over-arching industry vision to grow the share of Australian food in the global marketplace and the necessary strategy to achieve the vision.

"With the growing Asian middle class, Australia is in the box seat to take advantage of the many emerging export opportunities," FIAL Chairman Peter Schutz said.

"Consumers are looking for differentiated products that cater to their needs. This is especially exciting for Australian food and agribusinesses which have the capability to respond with customised and niche products," Peter added.

Australia exports over $40 billion worth of food and beverages each year with 63 per cent headed for Asia.

Martin explained that Australia is a trusted supplier of sustainable, authentic, healthy, high quality and consistent products.

"We must focus on these strengths and enhance the level of value-adding to our products. Recent Austrade analysis shows early signs of such a shift, as for the first time in Australia's history value-added foods have accounted for the majority, 60 per cent, of food export growth," he said.

The Roadmap outlines value-adding opportunities for Australian products in key growth areas, including health and wellbeing, premium convenience foods and sustainability-driven products that reduce waste or use less resources.

Five key enablers for these opportunities are explored in the Roadmap: traceability and provenance, food safety and biosecurity, market intelligence and access, collaboration and knowledge sharing, and skills.

These enablers align with FIAL's knowledge priority areas that are central in helping the food and agribusiness industry achieve its vision and deliver increased productivity, sustainable economic growth, job creation, and investment attraction for the sector.

The Roadmap calls for improved collaboration and knowledge sharing to generate scale, efficiency and agility across rapidly changing value chains and markets.

"To survive and grow, the challenge facing Australia's 177,000 businesses in the food and agribusiness sector is to identify new products, services and business models that arise from the emerging needs of tomorrow's global customers," Martin said.

EFFECTIVE NEW WAY TO CONTROL MARSHMALLOW AND OTHER PROBLEM WEEDS EXPLAINED

Every grower and agronomist needs as big and broad a chemical 'toolbox' as possible to effectively tackle problem weeds. Now, a new product is soon to add value to those toolboxes by offering an excellent alternative to current options.

Pixxaro™, the latest Arylex™ herbicide from Dow AgroSciences, combines the new active ingredient Arylex with fluroxypyr, the active ingredient in Starane™ Advanced herbicide.

This combination makes it the product of choice for advisors tackling issues with marshmallow, thistles (e.g. milk/sow thistle, prickly lettuce) and volunteer legumes. It was recently registered for control of broadleaf weeds in wheat, barley, oats, triticale and durum.

The label lists in-crop control of bedstraw, burr medic, climbing buckwheat, deadnettle, flax-leaf fleabane, fumitory, Mexican poppy, milk thistle, poppy, prickly lettuce, small-flowered mallow and sub clover across a wide window of application, from Z13 to Z39.

"Pixxaro is an alternative to group B broadleaf herbicide chemistries with greater selectivity to wheat, barley, oats and durum," advised Dow AgroSciences market manager Dan Dixon.

Pixxaro can also be tank-mixed with a wide range of other agricultural inputs, including Crusader™ GoDri™ herbicide, Hotshot™ herbicide, Lontrel™ Advanced herbicide, Lontrel™ 750 SG herbicide, LVE 600 MCPA herbicide, PropiMax™ fungicide, Rexade™ herbicide, Starane™ Advanced herbicide, Stinger™ herbicide, Transform™ WG insectcide, Axial® herbicide (wild oats only), Prosaro® fungicide, glyphosate (450 g/L IPA) herbicide, metsulfuron-methyl herbicide and Rutec® Zn.

"The ability to tank-mix a broadspectrum broadleaf herbicide with grass herbicides, insecticides, fungicides and zinc provides incredible time and cost saving benefits to growers who may struggle to perform operations at the right time due to competing demands," Dan added.

Pixxaro also has a registration for use in fallow in mixtures with glyphosate and ammonium sulphate. With a better spectrum to Starane Advanced in fallow, Arylex active gives Pixxaro extra power on key weeds such as deadnettle, poppies, thistles and volunteer legumes.

A trial at Breeza, New South Wales, compared efficacy of various fallow treatments across a range of weeds, including caltrop, Boggabri weed, deadnettle, milk thistle and liverseed grass. The trial (below) clearly shows the superiority of Pixxaro over Starane Advanced as a fallow herbicide. Control of both treatments are improved with the addition of glyphosate (450 g IPA) at 1.6 L/ha.

A similar trial was conducted early 2017 by the Landmark Esperance agronomy team, who tested a range of new herbicides on marshmallow. The marshmallow was consistent across the paddock and had survived a summer knock of 1.2 L glyphosate 450 + 350 mL ester 680, so the weeds were large (5-20 cm) with a well-developed tap root, which would normally require more than a one pass strategy to gain acceptable control.

All treatments were compared as a single application, at 7, 21 and 42 days after application. Sharpen® gave the best results at 7 days, but required the higher 34g rate to achieve 100% control. The Pixxaro treatments were the only other treatments to achieve 100% control, but not until 42 days.

Pixxaro has short plantback periods to both summer and winter cereals and canola, and is rainfast in one hour. It has a premier proprietary solvent package. It does not contain any petroleum distillates, which results in a non-volatile formulation with low odour and an exceptional toxicological package. As an emulsifiable concentrate (EC) is it easy to pour, measure, mix and dilute. The 20L pack will treat 33-100 ha, depending on rate used.

"Pixxaro has a great fit, particularly in cropping areas with hard-to-kill weeds, such as marshmallow. Its ability to also be used in fallow this summer adds flexibility of use often not available in this segment" summarised Dan.

Pixxaro will be available for use early in 2018.

NOBBY NEIGHBOURS STILL RAPT WITH FODDER PARTNERSHIP

A FODDER PARTNERSHIP BETWEEN NEIGHBOURING FARMERS AT NOBBY ON THE DARLING DOWNS IS STILL GOING STRONG AFTER 15 YEARS.

The Mengel family is the producer part of the equation, growing, cutting and baling forage crops of sorghum, oats and barley, while the Harrigan family is the consumer component, buying it to feed their Friesian dairy cows.

The deal has produced benefits for both sides, including a guaranteed market come harvest, the elimination of freight, a reliable feed source and fresh, high quality fodder.

Melvin, Dianne and son Joshua Mengel farm Kia-Ora, along with Melvin and Dianne's daughters Aimee and Renee and their grandchild Cameron, who is sixth-generation.

Josh Mengel said for forage sorghum, their preference for several seasons has been brown midrib X Sudan hybrids because they met the needs of their neighbour and the wider market.

"Harrigan Farming Co is chasing premium quality, high protein hay. The BMR gene provides improved digestibility and palatability, leading to higher milk production," Josh said.

"BMR Octane is our preferred variety because of its high energy feed value for the dairy, beef and sheep industries. It can be used for grazing, hay, pit silage or baled silage," he added.

In addition to forage crops, they grow millet, corn and mung beans in summer and wheat and barley in winter, as well as running 40 breeding cattle.

Melvin said a recently purchased McHale round bale wrapper for making silage has also given them the ability to produce the same high quality crops but with more flexibility.

"We've been growing sorghum, oats and barley for round bale hay and sending it up to Harrigan Farming Co for many years, but this was the first year we have done round bale silage for him," Melvin said.

"The benefit of round bale silage is you can secure your feed for long periods, you don't need a big pit for storage, you can bale at high moisture, and our proximity allows it to be wrapped at the storage site to limit damage," he added.

The McHale wrapper was bought for the 2016 winter oats crop before being used on its first summer crop, which was 2.4 hectares of forage sorghum, consisting predominately of BMR Octane and BMR Rocket.

The sorghum was planted on January 31 in a paddock fallow out of corn with a tyned no-till Janke planter on 38cm rows at a rate of 9.9kg/ha. It received 247kg/ha of nitrogen pre-plant and 62kg/ha of Starter Z at-plant.

Melvin said the season got off to a tough start, with no rain falling for two and a half weeks.

Melvin Mengal

"The weather was shocking to start with. We didn't see any rain until February 18 and then we got around 130mm from Cyclone Debbie. We received about 190mm before the first cut and about 25mm before the second cut," he explained.

The first cut on March 27 produced 60 bales and the second cut on May 29 produced 23 bales. The crop was then frosted out on May 30.

Melvin said cutting the crop at a height of 1-1.5m produced the best result.

"As forage gets taller, available bulk increases, but quality declines, so we want to get that balance right," he explained.

The Mengels cut the forage at 80 per cent moisture with a Massey Ferguson disc mower conditioner, let it dry down for two days and bale it at 50 per cent moisture with a round baler.

The family loads their semi-trailer and truck with a maximum of 42 bales, which weigh between 700 and 800kg, and drive to the dairy to unload them.

Now, they can use the wrapper to seal the crops in airtight plastic for the dairy to feed out to the Friesians at a later date.

"The benefit of round bale silage is you can secure your feed for long periods, you don't need a big pit for storage, you can bale at high moisture, and our proximity allows it to be wrapped at the storage site to limit damage."

Josh Mengel

QUEENSLAND AND CHINA COLLABORATE ON GAME-CHANGER RESEARCH

University of Queensland (UQ) research projects to develop better batteries for renewable energy and a way of predicting crop yields from space have been funded under a joint Queensland-China scheme.

The projects have recently received Queensland-Chinese Academy of Sciences (Q-CAS) Collaborative Science Fund grants.

The Queensland Government and the Chinese Academy of Sciences jointly fund the Q-CAS scheme, which provides individual grants up to $250,000 over two years for Queensland and Chinese researchers to undertake innovative research and development projects.

Professor Debra Bernhardt from UQ's Australian Institute for Bioengineering and Nanotechnology and Professor Dan Wang from the Institute of Process Engineering in Beijing will lead the energy storage research to develop a new generation of lithium ion batteries.

Debra said current home energy storage battery systems were plagued by inefficiency and cost drawbacks. "Our research is looking to lithium-rich cathode materials," she said.

"These offer greater energy density than traditional cathode materials however they need further improvement to become commercially viable. That's where our research comes in," she added.

Queensland Minister for Innovation, Science and the Digital Economy Ms Leeanne Enoch said the battery research aimed for a cost-effective solar battery with improved off-grid electricity storage capability and a longer lifespan.

"This is the holy grail of current energy storage research, coming up with a high-performance, cost-effective battery that could be used to store solar electricity. This could have huge implications for driving down household energy bills, providing people with greater energy self-sufficiency as well as its potential to revolutionise the car industry by making electric vehicles more affordable," she explained.

QAAFI's Dr Andries Potgieter said the project aimed to help producers and industry cope with weather extremes and climate change. The UQ-based Queensland Alliance for Agriculture and Food Innovation will work with the Beijing-based Institute of Remote Sensing and Digital Earth (RADI) to develop crop yield prediction systems using satellite data and biophysical crop modelling systems.

"Queensland is more exposed to climate variability and extremes than any other state in Australia. Farmers in both Queensland and China are facing the increased risk of volatile seasonal weather hanging over their heads. We will use earth observation data to predict crop yield at field scale. This will hopefully lead to improved prediction of farmer yields," he explained.

"We hope in this way to mitigate the impacts of climate risks and extreme weather events within a cropping season," Andries said in conclusion.

GRANTS FOR FARMERS TO IMPROVE SOIL, VEGETATION AND BIODIVERSITY

The farm sector can now apply for grants of up to $4 million to implement innovative and sustainable land management practices.

National Farmers' Federation (NFF) President Fiona Simson said the grants were a part of the Federal Government's smart farm program called Smart Farming Partnerships.

"I urge farmers and regional communities, through farming systems and natural resource management groups, to put their heads together and develop project ideas covered under the program," she said.

Eligible works include those that address the mutual challenges of productivity and sustainability.

Fiona said the aim of Smart Farming Partnerships was to foster more sustainable farming through projects that focused on improving soils, vegetation and biodiversity.

Multi-year grants of between $250,000 and $4 million will be awarded. The Smart Farming Partnership is part of the next phase of the Federal Government's $1 billion National Landcare Program.

Fiona said such investment helped further Australia's global reputation as a source of safe and sustainable food and fibre.

"The resources provided under the National Landcare Program, along with the investment made by industry and individual farmers, assist us to demonstrate real progress towards a more sustainable future," she added.

In March this year, the NFF signed a Memorandum of Understanding with Natural Resource Management Regions Australia (NRM Regions), committing both organisations to working more closely together.

"With NRM Regions Australia, the NFF continues to seek to foster new partnerships with NRM groups across the country to carry out land management initiatives that benefit both the environment and farm productivity and sustainability," Fiona explained.

She said ultimately, the success of the Smart Farming Partnerships initiative would be determined by the quality of applications received.

DIGITAL AGRICULTURE COULD UNLOCK PRODUCTION GAINS OF $20.3 BILLION

Realising the full potential of digital agriculture in Australia could boost the value of production by $20.3 billion, according to the findings of Australia's first whole-of-industry digital agriculture research project.

Producers across all agricultural sectors would benefit from the estimated overall increase in production value of 25%, while also securing their global competitiveness.

The Accelerating Precision Agriculture to Decision Agriculture (P2D) Project team has found that transition from analogue business and production models to digital is creating both opportunities and challenges for farmers.

"While the size and type of potential benefits vary between industries, if we work together as one agricultural sector, profit gains will be delivered more quickly and evenly in every market," said project researcher Richard Heath, from the Australian Farm Institute.

"Our economic analysis, supported by international value proposition case studies and domestic best-practice benchmarking, gives us a window into the right formula for delivering maximum returns, specific to each industry.

"But to capture the maximum potential, and secure our position as a world leader in agricultural production, we are going to need to act quickly and cooperatively to coordinate a national approach."

The P2D project, led by the Cotton Research and Development Corporation (RDC) and supported by all 15 RDCs, has delivered 13 key recommendations designed to catapult Australian agriculture into the digital age.

If implemented, Mr Heath says they will break down the current barriers to digital transition, including poor connectivity, a lack of confidence in returns from investment in digital agriculture, poor knowledge and support to assess options, and trust and legal issues around data ownership.

"If we get this right, agriculture in the future will be digitally enhanced throughout the value chain from producer to consumer, through increased automation, smarter use of inputs, accelerated genetic gains and improved market access and biosecurity.

"The collection of data from machines and sensors is increasing rapidly in Australia and we have been a leading player in the development of precision agriculture tools.

"But our AgTech market to provide tools for analysing data is in its infancy, compared to countries like Israel and the United States," said Mr Heath.

"A lack of producer control, on-farm connectivity and the under-utilisation of data has put us at a global disadvantage.

"We've now got a pathway to transform Australian farm business management and decision making through effective digital agriculture adoption. We just need to act."

Mr Heath said the P2D recommendations call for a "big picture fix", including a new Digital Agriculture Taskforce for Australia and collaborative efforts to secure data speeds and volumes and open access to game-changing datasets.

Members of the project team have released the results of there economic analysis and wider research at industry stakeholder and agribusiness forums in Canberra and Sydney.

For more information the P2D reports can be found on the project website - www.farminstitute.org.au/P2Dproject.

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TIA SCIENTIST NAMED YOUNG AGRONOMIST OF THE YEAR

Tasmanian Institute of Agriculture (TIA) Senior Research Fellow Dr Matthew Harrison has been named 2017 Young Agronomist of the Year in recognition of his contribution to industry-relevant research.

The Agronomy Australia Young Agronomist Award was presented at the 18th Australian Agronomy Conference in Ballarat, Victoria. The award recognises an agronomist aged 36 or under for their record of publications, supervision of PhD candidates, research funding, service to the industry and research impact.

Dr Chris Korte, President of Agronomy Australia, said Matthew received his award in recognition of an outstanding scientific research and publication record.

Matthew explained, "Over the past five years at TIA, I have worked on systems modelling research across several fields including crop genetics, climate science, soil microbiology, plant physiology and livestock production. Before that I completed post-doctoral fellowships at the Institute National de la Recherche Agronomique in Montpellier in France and at CSIRO in Canberra, as well as working as a research scientist at other institutions in Australia and internationally."

Recently, Matthew was part of a collaborative research team that developed an online framework known as the Pasture Predictor, a free online tool and mobile app to help Tasmanian farmers predict pasture growth to maximise productivity. The Pasture Predictor was developed in collaboration with Sense-T, CSIRO and Dairy Australia.

"The Pasture Predictor uses real-time climate data and nine-month weather forecasts to predict pasture growth and leaf appearance rates, estimate optimal nitrogen application and support decision-making about livestock rotations," Matthew said.

This is a great example of how data can be presented in a user-friendly platform to support industry in its decision-making. Being able to forecast accurately pasture growth is extremely important for dairy farmers and enhances productivity, efficiency and sustainability.

Dr Harrison has conducted research across a wide range of agricultural commodities and is involved in the internationally recognised research model for Water for Profit, a collaboration between TIA, the Tasmanian Government and Tasmanian Farmers and Graziers Association, that aims to help farmers maximise their return on investment in irrigation.

Matthew presented two papers at the 18th Australian Agronomy Conference, with a focus on climate forecasts and barley research. He was also a co-author of another three papers presented at the conference.

David Chapman

Awards-Fellows Jim Pratley & John Angus-Young Agronomists Felicity Harris & Matthew Harrison

Agronomist Don Cook with Michael Cook

Extension Aus Tony Cox, Lucinda Barty with Michael Cook

From left Dr Robert Norton, Dr Cindy Grant, Michael Cook, Dr Tom Jensen

Hamper winner Andrew Sneyd

Winner of a bottle of wine Andrew Dougall

SHINING A LIGHT ON PLANT GROWTH AND DEVELOPMENT

Plants don't have eyes, but they do ‘see’ their surroundings using light.

That's made possible by proteins called photoreceptors that absorb light and convert it into a signal that turns genes on or off. Until now, scientists haven't fully understood the molecular mechanism underlying that process, which allows plants to recognise when they're in the shade and grow toward the sun, and to sense what season it is so they can bloom in spring.

Researchers at the University of California, Riverside (UCR) have identified the portion of a plant photoreceptor responsible for light-dependent changes in gene expression, as illustrated in a paper recently published in Nature Communications. The study was led by Meng Chen, an associate professor of cell biology in UCR's College of Natural and Agricultural Sciences.

Chen and his colleagues have been studying a group of photoreceptors called phytochromes that are sensitive to red and far-red light, and are conserved in plants, fungi, and bacteria. The research was done in Arabidopsis thaliana, a small flowering plant that is widely used by biologists as a model species because it is easy to grow and study.

Phytochromes control plant growth and development by changing the amount or stability of another group of proteins called transcription factors whose job is to turn genes on and off. To find out how the photoreceptor regulates the amount of transcription factors, Chen's team turned their attention to the structure of the phytochrome, which has two functional areas called domains.

While it is known that one domain (called the N-terminal module) senses light, the function of the other domain (called the C-terminal module) had remained unknown. Most scientists did not believe the C-terminal module played a role in signaling changes in gene expression in plants, but Chen disagreed.

"We know that in bacteria, which use a similar protein to sense light, the N-terminal module senses light and the C-terminal module regulates the stability of transcription factors. However, the current model in plants is that the photoreceptor uses the N-terminal module both to sense and respond to environmental light cues," said Chen, who is also a member of UCR's Institute for Integrated Genome Biology (IIGB).

Chen's group showed that the C-terminal module does in fact regulate gene expression, though it uses a very different method to bacteria.

Chen said the findings have implications in agriculture, where farmers are increasingly looking to grow more food on less land. For example, when crops are planted at high density, they compete for light, often growing taller at the expense of yield.

"Now that we understand how light is causing changes in growth and development, we can engineer plants to be blind to their neighbours, so we can plant them more densely without seeing a decrease in yield. We can take crops that grow well in one part of the world and engineer them to grow in other latitudes and climates," Chen said.

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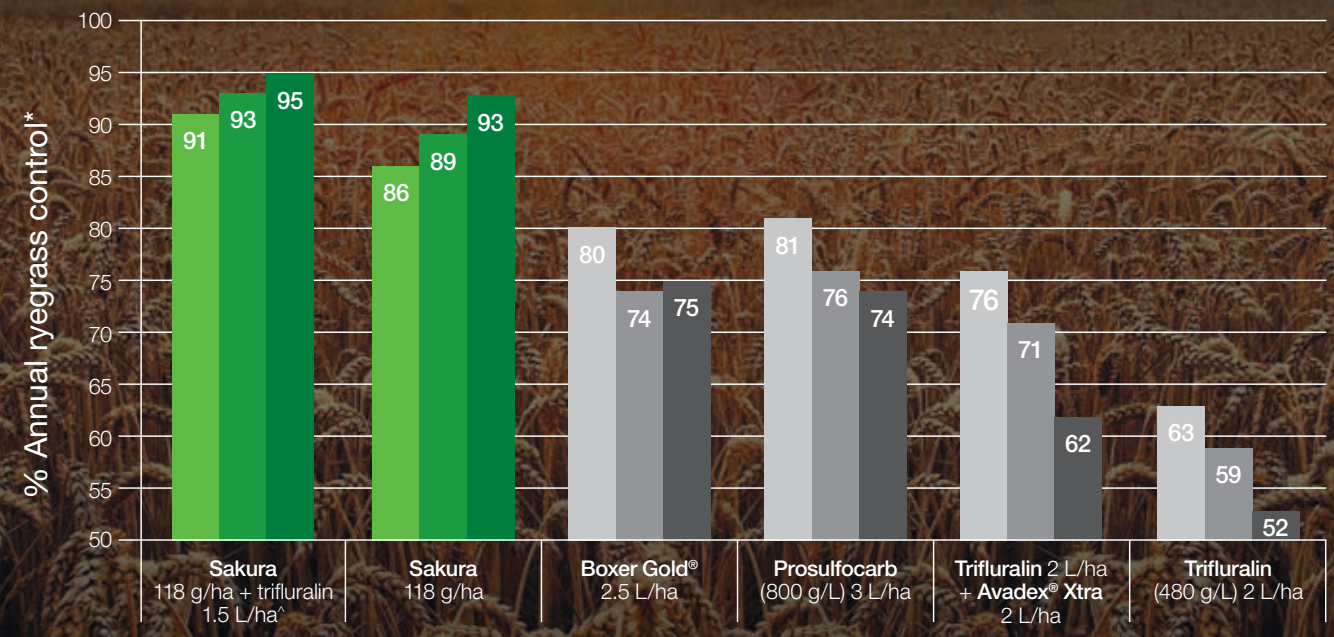

Early (4-6 wks) Mid (7-13 wks) Final (17-19 wks)

Trial IDs: WE05, WE06, WE07, Liebe Group Nugadong 16, VD12, VD13, NA11. All trials conducted in 2016#.

*Some trials, weed counts and others are control ratings. ^Trifluralin (480 g/L) applied at 2 L/ha in trials VD12, VD13 and NA11. #Final assessments only for WE05, WE06, WE07, Liebe Group Nugadong trial sites.

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