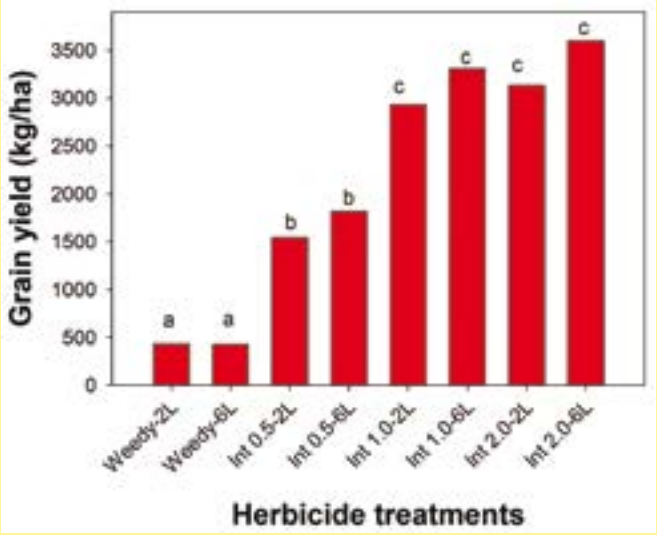
FIGURE 3: Effect of Intervix application time (2 and 6-leaf sorghum growth stage) and dose (0, 0.5, 1.0 and 2.0 L per hectare) on sorghum grain yield (kg/ha)



at a lower dose of Intervix (0.5 L per hectare), especially if the spray is done at an early stage of the crop (e.g. 2-leaf stage).

Late application of Intervix (at the 6-leaf stage) could kill the late cohorts of shattercane.

Survival of shattercane in IMI-tolerant sorghum paddocks could result in gene flow of herbicide-resistant traits from sorghum to shattercane as the chances of outcrossing are high. Shattercane and sorghum are sexually compatible, which can result in hybridisation.

A study in the US observed hybridisation (pollen transfer through wind) up to 200 metres from the edge of the sorghum field. If shattercane gains the herbicide-tolerant trait from IMI-tolerant sorghum, it will produce herbicide-resistant populations.

This means IMI-tolerant sorghum systems must be integrated with stewardship guidelines to reduce the risk of outcrossing and survival of weed-crop hybrids.

These guidelines must be implemented with the aim of preventing shattercane resistance resulting from outcrossing as well as from selecting spontaneous mutation in the paddock. Seed producers of IMI-tolerant sorghum are required to follow strict guidelines which ensure that fields used for seed production are free from shattercane.

Growers should follow the recommended dose of IMI herbicides. Growers are required to purchase certified seeds each year and seed companies should ensure that seeds are free from shattercane. In Queensland, some legal issues are already pending concerning shattercane contamination in sorghum seeds.

Growers may also be required to sign a stewardship agreement and complete stewardship training before using this technology.

Rotating crops and paddocks should be encouraged while using IMI-tolerant sorghum. This practice may reduce the risk of development of resistant weeds.

This research also suggests that research is required on issues concerning outcrossing for herbicide-resistant traits and fine-tuning of this technology.

1. Queensland Alliance for Agriculture and Food Innovation (QAAFI), The University of Queensland, Gatton, Queensland 4343.

Australian grain-fed beef exports on the rise with focus on China

GRAIN-FED production is set to play a larger role in Australia's beef sector, with the opportunity to triple the nation's exports of grain-fed beef to China by 2030, according to new industry research.

In its report, *Opportunities for growth in Australian grain-fed beef,* agribusiness banking specialist Rabobank says while the backbone of the Australian beef industry will remain a grass-based production system, grain feeding is forecast to play an increased role in the country's overall beef production over the coming 10 years.

Continued growth in beef consumption in Asian countries, particularly China – along with Australia's strong market access and competitive supply chain – will provide the opportunity for the nation's total grain-fed beef exports to increase 65 per cent to more than 500,000 tonnes by 2030, according to the research.

Exports of Australian grain-fed beef to China alone could triple in the same period – from the current 50,000 tonnes to close to 200,000 tonnes.

"Rabobank believes there will be strong growth in the global demand for grain-fed beef, fuelled principally by China," the report said.

Report author, Rabobank senior animal proteins analyst Angus Gidley-Baird, acknowledges Australia's vast areas of pastured land – and limited and volatile feed-grain production – suit a grass-based beef production system. But at a time where China is the centre of global beef demand, there is an opportunity to capitalise on the growing need for grain-fed beef for part of the Australian industry, he says.

Angus Gidley-Baird.

"Since the opening of the Chinese market more widely to Australian beef imports in 2013 – and with a growing appetite for beef among Chinese consumers – there has been an increasing demand for grain-fed beef," he said.

"Chinese beef consumption will continue to grow over the next decade and, with limited growth in local Chinese beef production, imports will play a much larger role in meeting this demand. At the same time, consumers in Asian markets, including China, have a strong affinity with highly-marbled grain-fed beef as it suits their palate and cuisine, fuelling a demand for grain-fed beef imports that has the potential to grow at a faster rate than overall beef imports.

"Given projections in Chinese income growth, per capita consumption of beef and food service trends – it is reasonable to expect Chinese grain-fed beef imports to grow to represent 20 per cent of China's total beef imports by 2030 (from an estimated six per cent today)."

But the report says, while increasing Australia's focus on grain-fed beef production is an opportunity worth pursuing, it comes with risks and challenges.

Enough room for everyone

While Australia is in a strong position to capture a sizeable portion of the growing global demand for grain-fed beef, particularly in China, the report says, it will not be on its own.

Other major grain-fed beef exporters – primarily the US, Canada and also likely South American countries in the future – are also expected to increase their export volumes.

But the good news is, says Angus, with the Chinese market forecast to require close to 500,000 tonnes of grain-fed beef exports by 2030, "there will be enough room for everyone".

"Rabobank believes that the other suppliers of high-quality grain-fed beef would not fill more than 300,000 tonnes of this increased Chinese demand," he said.

"Given the potential size of the Chinese grain-fed beef market and, provided Australia is competitive on price, the opportunities for Australia will likely outstrip the production growth of grain-fed beef in Australia."

Competitive position

Although Australia's grain-fed system is faced with higher feeding and processing costs than the US and Brazil, the reports says costs of cattle, reduced freight costs and free trade agreements "balance out the equation" when it comes to being competitive in export markets.

As such, Rabobank believes Australian grain-fed beef – with its own particular characteristics – can be competitive in the global market for grain-fed beef.

If Australia is to compete successfully with the US and Brazil, the report says, the local industry will need to increase the number of genetically-suitable cattle and the number of cattle that spend a longer time on feed.

"The real value of grain feeding cattle destined for a higher-end Asian export market is in the ability to more consistently deliver a high degree of marbling," Angus said. "Australia lags the US in terms of higher marbled beef production. Generally speaking, Australia's grain-fed beef production is less focussed on marbling, with less time spent being grain fed and lower marbling scores."

Maximising chances

Maximising the chances of growing grain-fed beef exports to meet increased global demand will require adjustments to the Australian beef system, the report says.

"Producers, backgrounders, feedlots and processors will all need to work together – a challenge in the current system which is heavily influenced by the availability of grass," Angus said.

"Producers and backgrounders will need to deliver consistent volumes of high-quality feedlot-performing animals. And choosing cattle genetics that perform under a feedlot environment and produce the desired quality traits will be essential.

"Feedlots will need to manage feed-grain supplies and encourage crop farmers to focus on feed-grain production while processors will need to play an active role in incentivising and providing market information to encourage the supply of appropriate animals for the system."

External challenges

There are also a number of challenges outside the sector itself which need to be considered and managed, the report says.

These include social and environment issues (such as concerns about animal welfare and environmental impacts of feedlot production), the use of Australia's valuable grain supply for animal production and an increasingly volatile global trade outlook. ■

ASK AN EXPERT –

WHAT'S THE BEST WAY TO MANAGE ANNUAL RYEGRASS IN CHICKPEA CROPS?

With Bhagirath Chauhan, weeds researcher, QAAFI

ANNUAL ryegrass is becoming increasingly prevalent in the northern cropping region, and many populations already have a high level of resistance to the major Group B and Group A herbicides registered for use in chickpea crops.

To keep this important crop as a viable option, growers are looking for ways to add non-chemical in-crop options to an integrated weed control program to prevent a yield-limiting blow-out in ryegrass populations.

The principles of crop competition are fairly well known but making the necessary changes to planting gear can be daunting, so it is important to know that any changes will achieve the desired effect.

To assist growers to better implement crop competition in chickpeas, A/Professor Bhagirath Chauhan, principal research fellow and weed team leader, QAAFI, UQ looked at the effect of narrow rows, variety and early weed control to assess which is the most powerful suppressant of annual ryegrass.

"In a weed-free environment, it has been shown that narrow-sown chickpeas will produce higher yield, so we wanted to see if narrow sowing also suppresses weed growth and seed set," says Bhagirath. "We also wanted to understand whether a more-prostrate variety like PBA Seamer would suppress more weeds than the more-erect PBA HatTrick. The third aspect we considered was the effect of weed infestation at different growth stages of the crop."

The results were pretty conclusive: PBA Seamer sown at 25 cm and kept weed-free for at least the first three weeks after planting is a winning combination for ryegrass control.

QAAFI weeds researcher Baghirath Chauhan has completed several studies to investigate ways to make pulse crops, including chickpeas and mungbeans, more competitive against weeds.

What is the best way to reduce ryegrass growth and seed set?

Short answer: Narrowing the row spacing and ensuring good early weed control are the most effective tactics in chickpeas.

Longer answer: Plant architecture made some difference, but only in very weedy conditions. Narrowing row spacing from 75 cm to 25 cm reduced weed biomass by 16 per cent and reduced seed set by 26 per cent.

Keeping the crop weed-free for at least three weeks had the biggest effect, driving down weed biomass at the end of the season by 52 per cent and weed seed set by 48 per cent. This shows that, once established, chickpea can hold its own against weeds that emerge later in the season.

Can more competitive crops also produce higher grain yield?

Short answer: Yes. If you can't do narrower rows then put an emphasis on early weed control.

Longer answer: Averaged across both cultivars and all weed infestation periods, sowing chickpeas on 25 cm row spacing (same seeding rate) produced 20 per cent more grain than sowing on 75 cm row spacing. This is most likely due to the crop plants being more evenly spaced and able to better exploit the available soil and light resources.

This research was conducted across two growing seasons and demonstrated that controlling annual ryegrass for the first

Averaged across both cultivars and all weed infestation periods, sowing chickpeas on 25 cm row spacing (same seeding rate) produced 20 per cent more grain than sowing on 75 cm row spacing, and reduces annual ryegrass seed production.

three weeks after planting increased crop yield by a whopping 200 per cent compared to the season-long weedy scenario. Annual ryegrass that emerges 6 weeks or more after planting does not impact on chickpea yield, but if allowed to set seed, can contribute to the weed seed bank present at seeding the following year.

Is annual ryegrass a serious weed in chickpea?

Short answer: Yes, annual ryegrass is a yield limiting weed and is adapting to farming systems further north than its traditional range.

Longer answer: Averaged over row spacing and cultivar, the penalty attributable to annual ryegrass was 1.2 tonnes per hectare less grain yield between the weed-free plots (1.8 tonnes per hectare) and the season-long weedy plots (0.6 tonnes per hectare). Without any competition, season-long weedy plots produced more than 129 annual ryegrass seed spikes per square metre.

By planting PBA Seamer at 25 cm row spacing and keeping the crop weed-free for three weeks, the number of annual ryegrass spikes is reduced to just eight per square metre.

How can I achieve this early weed control?

Short answer: Start the year ahead in the paddocks you plan to grow chickpeas and do everything possible to reduce the ryegrass seed bank using effective herbicides, weed seed burial, competitive cereals and harvest weed seed control tactics or hay-making. Back this up with registered pre-emergents for chickpea and as many non-herbicide tactics in-crop as possible.

Longer answer: Annual ryegrass is a master at evolving herbicide resistance. In southern regions it has evolved resistance to the registered in-crop herbicides for chickpeas. This will also occur in the northern region if steps are not taken to preserve the efficacy of Group A post-emergent chemistry across the crop sequence.

An over-reliance on pre-emergent herbicide use will also select for herbicide resistance, just as it has for post-emergent herbicides. To minimise this risk, it is important to use a diverse range of weed management tactics in-crop, such as crop competition, inter-row cultivation or chipping, to remove survivor weeds before they set seed.

Where possible, rotate registered pre-emergent herbicide modes of action groups J, D and K between years and consider mixing pre-emergent modes of action groups where permitted, always at full label rates for all active components of the mix.

ALWAYS READ AND FOLLOW LABEL INSTRUCTIONS. ■

HOW TO ASK A WEEDSMART QUESTION

Ask your questions about the competitive crops on the WeedSmart Innovations Facebook page WeedSmartAU, Twitter *@WeedSmartAU* or the WeedSmart website *www.weedsmart.org.au/category/ask-an-expert/*

'WeedSmart' is an industry-led initiative that aims to enhance on-farm practices and promote the long term, sustainable use of herbicides in Australian agriculture.

Research delivers a heads-up on barley head loss

RESEARCH has generated findings and genetic material that could help produce future barley varieties that are less susceptible to 'head loss' – an issue that significantly reduces barley crop yields in some areas and seasons.

The work has also highlighted the importance of growers comparing the risk for different varieties and ensuring barley crops at critical growth stages have adequate access to potassium and copper, as crops deficient in these nutrients were found to be much more prone to the issue.

Barley crops in areas such as Western Australia's south coastal districts and South Australia's Lower Eyre and Yorke Peninsulas are especially susceptible to head loss. This is caused by straw under the head breaking and results in yield losses of five to nine per cent in typical seasons in these areas.

Collaborative project

The research findings are from a project with Grains Research and Development Corporation (GRDC) investment, led by Chengdao Li, director of the Western Barley Genetics Alliance. This collaborative project involved work by the Department of Primary Industries and Regional Development WA, Murdoch University and the University of Adelaide.

Chengdao said the laboratory work and field trials at Esperance, Katanning and Geraldton had revealed information and developed advanced breeding lines, new germplasm and molecular markers which had the potential to be used in breeding programs.

"Our research suggests barley varieties will be less susceptible to head loss if the barley 'peduncle' – the straw beneath the barley head – is bred to have greater flexibility and strength," he said.

"A significant finding from this project is the relationship between straw strength and straw flexibility, and some varieties are significantly more flexible and are less prone to breakage.

"We identified quantitative trait loci (QTL) associated with straw strength on three chromosomes and these could be used as selection targets by barley breeders."

Seasonal impact on straw strength

Chengdao said seasonal conditions were shown to have a significant effect on straw strength, with some varieties demonstrating a significant variation in straw strength in different years of the trials.

He said the head loss risk of barley varieties varied significantly and several high yielding, new varieties and advanced breeding lines had an even greater head loss risk than current susceptible varieties.

Potassium levels also have an impact

"The research also demonstrated that varieties respond differently to low levels of potassium, suggesting that genetically improving potassium use efficiency in barley varieties will not only enhance yields and reduce the need for fertiliser, but also improve straw strength and reduce head loss," he said.

Chengdao said the project showed that the same variety sown at the same trial could have head loss levels up to two to three times greater if copper and potassium were deficient during the stem elongation and head formation stage of the crop.

"This shows the importance of providing adequate levels of these nutrients, particularly during this growth stage," he said.

"For example, up to 30 per cent of soils in WA's cropping regions are deficient in potassium and this can be exacerbated on sandy soils in the south coastal region where nutrients are prone to leaching."

Varietal head loss risk information is available in sowing guides such as the Barley Sowing Guide for WA, available at *http://bit.ly/2MYdYnV* ■

Professor Chengdao Li inspects barley at a field trial of the genetic, environmental and management factors that reduce barley head loss. (PHOTO: DPIRD)

Barley head loss in the field. (PHOTO: DPIRD)

Spring into action with fallow residuals

WHILE frost on winter crops is often growers' main concern in August and September, this is also the time when some summer weeds start germinating if conditions are favourable. A spring rainfall event, followed by a week or two of warmer weather, can quickly kick off the season for summer weeds.

Mark Congreve, consultant with Independent Consultants Australia Network, says fleabane, sowthistle and feathertop Rhodes can all start germinating as early as August in northern regions when temperatures are suitable.

"Establishment at this time of year may result in plants that are large and very difficult to control with knockdowns if control is left until after the busy harvest period," he says. "Once this happens the only options for control are a robust double-knock herbicide strategy, or tillage."

The full canopy cover in a dense winter crop generally prevents most germinations within the crop, but these weeds can establish in open crops, in missed rows or wide guess rows, around crop edges or in winter fallows.

Apply pre-ems before the spring storms

Mark suggests that pre-emergent herbicides applied in late winter or early spring fallow, before the first spring storms, can play an important role in managing these early germinations of 'summer' weeds, by helping create weed-free winter-spring fallows until it is time to sow a summer crop.

"This is easiest when a paddock has been ear-marked for a specific summer crop," he says. "Rotation planning is really important – where you know what you will be planting, there are normally one or more options with acceptable plant-back periods for most crop choices. Where you are unsure about what crop will be planted into the paddock, then decisions are more difficult."

To 'keep the options open' growers are restricted to using products with shorter plant-back periods, and therefore less residual control. If using a product with potentially damaging residual activity on subsequent crops, growers are reliant on further rainfall to breakdown the herbicide in the soil prior to summer crop planting.

"In some situations, it may be possible to plant the summer crop any time after the residual is applied in spring," says Mark. "A good example of this is using Dual Gold for feathertop Rhodes grass control in paddocks going to sorghum."

For other combinations of residual herbicides and summer crops a plant-back period may be required. Mark said it is very important to use the label information to determine the level of risk involved in applying a particular product and judge whether it is safe to plant the summer crop or not.

"Where plant-back periods exist, the breakdown of these herbicides needs a combination of time and soil moisture over the warmer months, so it is important to look at how the rain has fallen, as well as the totals," he says. "Having the soil surface wet for a few weeks from regular rainfall events during these warmer months will support more microbial breakdown of the herbicide than one storm event that delivered the same quantity of rainfall, followed by weeks of dry weather."

A knockdown may be needed

Ideally, a well-timed spring residual herbicide will keep the fallow clean until the summer crop planting window opens. Assuming the appropriate plant-backs have been met, an effective knock-down herbicide may be needed to remove weeds germinating on the planting rain, should the spring residual herbicide be running out.

The decision around the choice of additional pre-emergent applied at planting will depend upon the length of residual expected from the spring application, the known weed pressure in the field, the availability of inter-row cultivation or post-emergent in-crop herbicide options and the predicted rainfall outlook.

Growers and agronomists interested in learning more about the benefits and risks of pre-emergent herbicides can access a free online course at www.diversityera.com, presented by Mark and Dr Chris Preston.

For more information about pre-emergent herbicide to control summer weeds visit the WeedSmart website: *www.weedsmart.org.au* ■

Mark Congreve, consultant with Independent Consultants Australia Network, says summer growing weeds that establish in late winter and early spring may result in plants that are large and very difficult to control with knockdowns if control is left until after the busy harvest period.

Pre-emergent herbicides applied in late winter or early spring fallow, before the first spring storms, can play an important role in managing these early germinations of 'summer' weeds, helping to create a weed-free winter-spring fallow until it is time to sow a summer crop. (PHOTO: Ben Fleet)

(ADVERTORIAL)

Sunchaser, a variety full of great attributes

Australian Grain Technologies (AGT) released a new high-performing APH quality wheat variety on the 18th of September at the annual Plant Breeding Institute Field Day held in Narrabri. Sunchaser offers lower screenings and improved yields, with trial results proving it can outperform its major competitors in key attributes.

AGT's marketing manager Douglas Lush says the new variety, called Sunchaser and tested as SUN843E, offers growers in NSW and Queensland a 'package deal' with its unique combination of features.

"Our team are excited to release this variety as a lower risk alternative to Suntop, with excellent grain size, reduced levels of screenings, improved yields, a longer coleoptile and increased disease resistance," Mr Lush said.

"Over the last three years of testing, Sunchaser has produced grain with lower screenings levels than Suntop and Reliant while proving very similar to Spitfire," he said.

"In fact, the screenings levels of Sunchaser have consistently been 2 per cent lower than Suntop, from low to high screenings risk situations.

"Elevated screenings can contribute to downgrades at point of sale, so this feature in Sunchaser has the potential to improve grower's profitability compared to variety's such as Suntop, amongst others.

"Trial data also shows that Sunchaser displays a yield improvement over Suntop, while performing competitively with Reliant."

AGT wheat breeder Meiqin Lu, based The University of Sydney's Plant Breeding Institute at Narrabri, says that one of her main breeding objectives was to improve Suntop's grain size and disease resistance while retaining its very wide adaptation, yield and agronomic suitability.

"We believe that we have achieved this goal with Sunchaser," she said.

AGT's Narrabri breeding team officially launch their new variety, Sunchaser.

"Another key attribute of Sunchaser is its coleoptile length. Three years of testing has shown that Sunchaser has a longer coleoptile than Suntop, Spitfire and Reliant.

"In a region where moisture seeking planting is a regular occurrence, the longer coleoptile of Sunchaser should be valued by growers.

"We are also pleased to report that Sunchaser offers an improved disease resistance package in comparison to Suntop, with greater resistance to stem rust, leaf rust, yellow leaf spot and crown rot.

"Sunchaser is suited to the main season planting window and matures slightly quicker than Suntop and Reliant, and a little slower than Spitfire

Sunchaser has an APH quality classification for NSW and Queensland.

Commercial seed will be available for the 2020 season through AGT Affiliates or local retailers.

For more information contact:
Douglas Lush, Marketing Manager – northern NSW & QLD
M: 0407 177 029
E: douglas.lush@agtbreeding.com.au

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