Comparative nitrogen requirements of canola, *Juncea* canola and wheat

WRITTEN BY

Chris Allitt, Graham Brodie, Robert Norton and Gregory Dunn University of Melbourne

***Juncea* canola is a cross between a mustard (*Brassica juncea*) and conventional canola (*Brassica napus*). Canola is often used in rotation with wheat, so it is useful to know if *Juncea* canola has a different nitrogen requirement to wheat or normal canola.**

Aim

To determine the optimum nitrogen requirements for growth and development of *Juncea* canola compared with canola and wheat.

Method

Juncea canola, canola and wheat were grown in a glasshouse pot trial. The trial was carried out in a glasshouse in order to maintain better control over the growing environment of the plants and to maintain an optimal water status for the plants throughout the trial period.

The soil in the pots was a low-fertility, light, sandy soil. These experimental conditions were established to more completely isolate the nitrogen response of the plants from other confounding environmental influences.

KEY POINTS

- **There is little data relating yield responses of *Juncea* canola to nitrogen fertiliser.**
- **Canola increased dry matter (DM) production for every unit of applied nitrogen; however wheat and *Juncea* canola had a response to applied nitrogen up to a rate of 60 kilograms per hectare, but no response occurred above this rate.**

The experiment was a randomised block design with four replicates of six nitrogen treatments (equivalent to 0, 20, 40, 60, 80, and 100 kilograms of nitrogen per hectare). Urea was used as the fertiliser in this trial. The urea was dissolved in water and applied to each pot at the appropriate dose level at the time of sowing. The pots were kept moist throughout the trial period; however watering was controlled to avoid water passing through the pot and leaching nitrogen from the soil. Pots were harvested at late flowering. Dry mass and nitrogen uptake were measured.

Results

Key results for the trial are shown in Figures 1 and 2.

Observations and comments

Canola was the most responsive to applied nitrogen. It increased dry matter (DM) production for almost every additional unit of nitrogen applied. Both wheat and *Juncea* canola had a response to applied nitrogen up to a rate of 60kg/ha but no response occurred above this rate (see Figure 1).

Canola and wheat had a larger nitrogen uptake than *Juncea* canola (see Figure 2). The uptake in wheat and *Juncea* canola plateaued after applying nitrogen at 40kg/ha; however the nitrogen uptake in canola continued to increase linearly as nitrogen application increased.

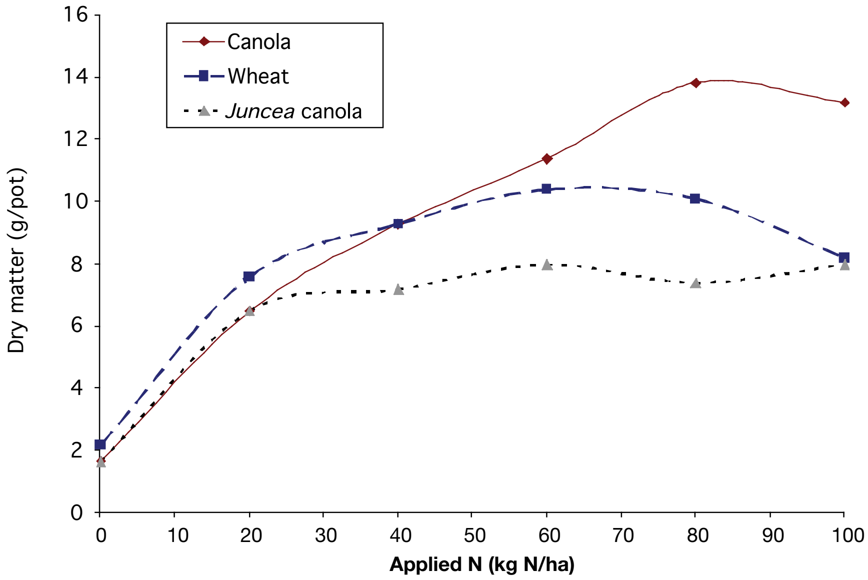

FIGURE 1 Effect of applied nitrogen on mean total dry matter per pot

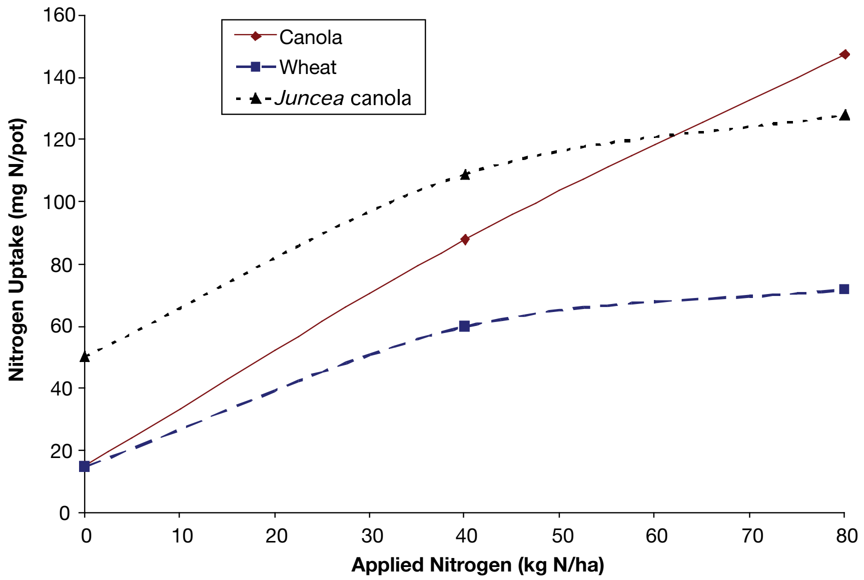

FIGURE 2 Mean nitrogen uptake

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Relative rooting depth and behaviour of *Juncea* canola, canola and barley

WRITTEN BY

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***Juncea* canola is a cross between a mustard (*Brassica juncea*) and conventional canola (*Brassica napus*). There is limited information about the root growth habits of *Juncea* canola.**

Location: Goschen, south west of Swan Hill, Victoria

Soil:

Type: Sandy loam with red clay subsoil

pH (H_2O): Ranging from 7.8 in the top layers to 9.5 with increasing depth

Sowing information:

Sowing date: 23 April 2009

Fertiliser: 50kg MAP

Row spacing: 25cm

Plot size: 1 x 10m

Replicates: 3

Aim

To observe the rooting behaviour of *Juncea* canola, compared with conventional canola and barley in strongly duplex soils.

Method

Root growth of *Juncea* canola was compared with conventional canola and barley. The trial was arranged in a randomised block design with three replicates. Above-ground dry mass and 140 centimetres deep (4cm diameter) soil cores were taken at bolting stage (second node for the barley). Root mass in the soil cores was determined by carefully washing the soil away from the roots and drying the roots.

Results

There was no significant difference in above-ground biomass between the three species (see Table 1). The root mass data is shown in Figure 1.

Observation and comments

There was no significant difference in above-ground biomass between the species, neither was there any significant difference in root biomass between the species below 10cm. However, *Juncea* canola had significantly less root biomass in the top 10cm of soil compared with conventional canola and barley. This may reduce its ability to utilise surface moisture during the growing season, however this did not affect the above-ground biomass.

TABLE 1 Mean above-ground sample dry weight

Species	Above-ground dry mass (g/sample)
Juncea	90.7
Canola	87.7
Barley	99.2
LSD ($P < 0.05$)	28.4

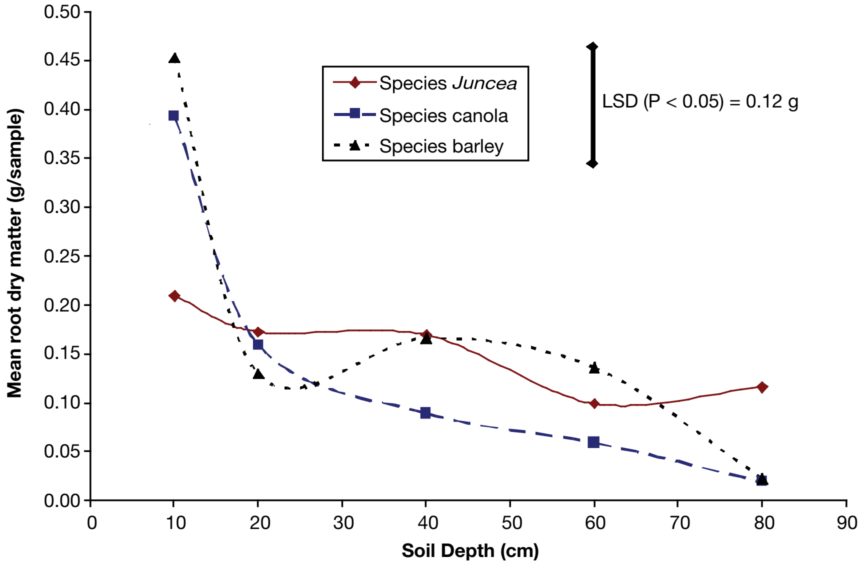

FIGURE 1 Mean dry root mass as a function of depth

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Herbicide resistance — the picture so far

WRITTEN BY

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Random surveys of weed populations across southern Australia have identified considerable levels of herbicide resistance in annual ryegrass (see Table 1).

KEY POINTS

- **Herbicide resistance is common in annual ryegrass across most cropping regions of southern Australia.**
- **Resistance to trifluralin and Select® is increasing.**
- **Herbicide resistance is also present in wild oats and brome grass.**
- **Glyphosate resistance occurs where there is intensive use and where few or no other weed control options are available.**
- **Some alternatives to glyphosate will control glyphosate-resistant annual ryegrass on fence lines.**

There are variations across regions, with trifluralin resistance being high in parts of South Australia, but lower elsewhere.

These regional differences reflect differences in cropping practices and herbicide use patterns. Of particular concern is the increase in annual ryegrass resistance to Select®, which is becoming apparent in some areas of South Australia. This trend will remove an important control tactic for ryegrass in canola and pulse crops.

Surveys of herbicide resistance in wild oats consistently indicate lower levels of resistance compared with annual ryegrass (see Table 2). Group A resistance is highest in south-east New South Wales and then western Victoria. No Group B resistance could be detected, but 14% of populations in SA were resistant to Mataven®. This is despite the relatively rare use of Mataven in the area. We have previously observed that Topik® and/or Wildcat® in wild oats can select for cross-resistance to Mataven. Likewise, about 10% of southern NSW populations were Mataven resistant.

TABLE 1 Percentage of paddocks with herbicide-resistant annual ryegrass in cropping regions of southern Australia

Region	Year	Trifluralin	Hoegrass	Glean	Achieve	Axial	Select
		Populations resistant (%)					
SA — mid-north	1998	9	38	22	nt	nt	19
SA — mid-north	2003	49	76	75	51	40	36
SA — mid-north	2008	40	76	73	64	59	40
SA — Mallee	2007	19	6	67	2	2	2
SA — south-east	2007	39	60	69	50	53	41
Victoria —western	2005	5	35	57	28	30	12
Victoria — northern	2006	2	40	43	nt	34	11
NSW — south-east	2008	6	81	70	nt	nt	21

TABLE 2 Percentage of paddocks with herbicide-resistant wild oats in southern Australia

Herbicide	Year	Hoegrass	Verdict	Wildcat	Topik	Axial	Atlantis	Mataven
Victoria — western	2005	17						
Victoria —northern	2006	8				2		
SA — mid-north	2008		4	11	13	8	0	14
NSW — south-east	2008	38					0	10

Brome grass resistance

Recent surveys have also looked for resistance in brome grass. Brome grass with resistance to Group A herbicides is becoming quite common in western Victoria. Resistance to Group B herbicides has also been detected (see Table 3). No resistance has been found in SA Mallee, south-east NSW or northern Victoria.

Glyphosate resistance in annual ryegrass

There are now 103 confirmed sites with glyphosate-resistant annual ryegrass in Australia. These come from four States and a variety of situations (see Table 4). An increasing number of SA sites are from fence lines and other uncropped parts of the farm. Glyphosate-resistant annual ryegrass occurs when populations are treated intensively with glyphosate, where no other herbicides are applied and there is little or no tillage.

TABLE 3 Percentage of paddocks with herbicide-resistant brome grass in southern Australia

Herbicide	Year	Verdict	Atlantis	Midas	Metribuzin
Victoria — western	2005	33	0		
Victoria — northern	2006	0	0		
SA — Mallee	2007	0	0	0	0
SA — mid-north	2008	2	2		
NSW — south-east	2008	0			

TABLE 4 Situations containing glyphosate-resistant annual ryegrass

Situation		Number of sites	States
Broadacre cropping	Chemical fallow	28	NSW
	No-till winter grains	19	Victoria, SA, WA
Horticulture	Tree crops	4	NSW
	Vine crops	15	SA, WA
Other	Driveway	1	NSW
	Fence line/firebreak	25	NSW, SA, Victoria, WA
	Irrigation channel	8	NSW
	Airstrip	1	SA
	Railway	1	WA
	Roadside	1	SA

Source: Preston, C. (2009) Australian Glyphosate Resistance Register. Australian Glyphosate Sustainability Working Group. Online. Available from www.glyphosateresistance.org.au

Relying solely on glyphosate for weed control is the greatest risk factor in developing glyphosate-resistant weeds. Management of glyphosate-resistant annual ryegrass on crop margins is necessary in order to stop resistance moving into the cropped area.

A trial was carried out to look at the ability of glyphosate mixtures and alternative herbicides to control a glyphosate-resistant population of annual ryegrass on a fence line (see Figure 1).

Glyphosate, even at high rates, provided little control of the resistant ryegrass. Some mixtures with glyphosate were more effective. Mixtures with Spray.Seed® were effective, as was Alliance® and two applications of Spray.Seed 14 days apart.

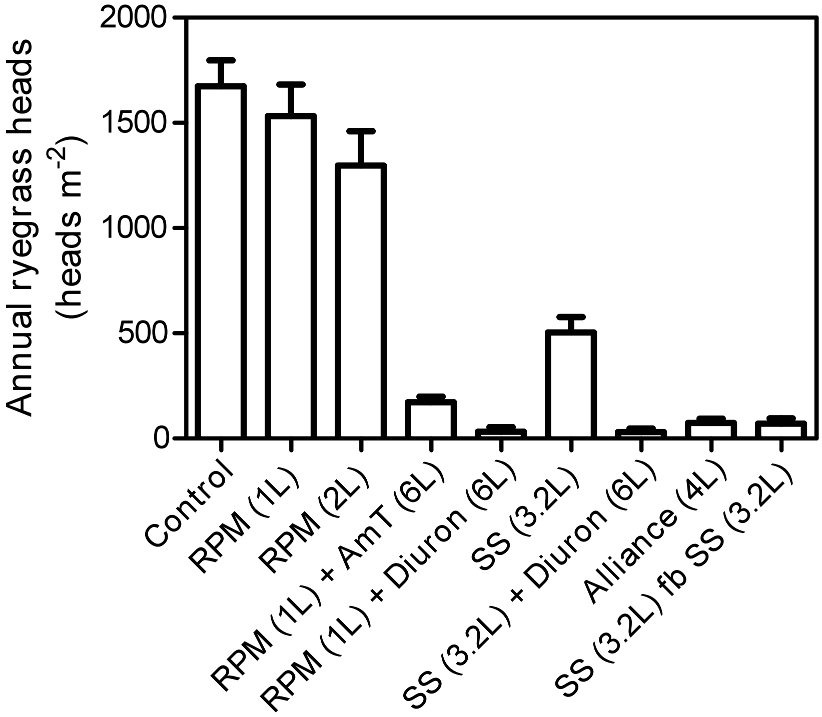

FIGURE 1 The efficacy of different mixes and rates of herbicides on glyphosate-resistant ryegrass

RPM = Roundup PowerMax, SS = Spray.Seed, AmT = Amitrole T, fb = followed by after 14 days.

Sponsors

Grains Research and Development Corporation (GRDC) Projects UA00098 and UA00104

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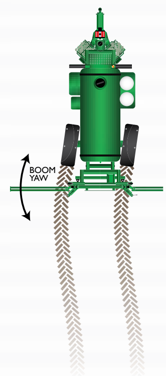

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On-farm grain storage — strategies for success

WRITTEN BY
Peter Botta PCB Consulting

On-farm storage has been increasing during the past 10 years for a variety of reasons. These include harvest buffer, feed storage for livestock and marketing purposes. The key to getting successful is to know the target outcome for the grain and to match the storage system to that end. For example, it is pointless storing grain long term in a system that is intended for short-term storage. The other major consideration is increasing levels of resistance to the contact treatments used in unsealed storage is making insect control more difficult. Investing in gas-tight sealed storage or having at least a proportion of storage as gas-tight sealed storage enables successful fumigation to kill insects .

KEY POINTS

- **Grain growers often store grain to improve marketing options, but successful storage commitment and careful planning.**
- **Grain insects and control, end-user requirements, maintaining quality and contracts are among the many issues to consider.**
- **The preservation of phosphine as an insect control tool, through correct use in gas-tight sealed storages, is critical to maintaining grain quality during long-term storage.**
- **Grain can be fumigated effectively with phosphine in a gas-tight sealed silo, providing quick, inexpensive and long-lasting insect control, providing greater marketing flexibility through residue-free, high-quality grain.**

Growers will typically use and have a variety of storages at their disposal. While each should work well for their intended purpose, it is worth considering the pros and cons of each; particularly in regard to the ease of insect and quality control for the expected period of storage.

Plan for success

Having a plan is essential to ensure successful grain storage. Know where your grain is, determine suitable protection periods for specific storages, record treatments, determine quality specifications and know when to check grain.

Often a storage site will increase in size over time and planning for expansion is essential (for example, to ensure access to power for future aeration). Also ensure any storage facility is easy to access and use.

When considering new storages plan for the end goal.

Thinking about storage periods

For short-term storage growers can use 'ground dumping' and silo bags. Clearly, grain stored on the ground should be moved or used as quickly as possible (within six weeks). Silo bags offer better protection from the elements and are particularly good for managing harvest pressure.

For medium-term storage growers can use unsealed silos, sheds, silo bags and gas-tight sealed silos. The longer the storage period required, the greater the potential for infestation.

It is difficult to control insects in sheds (even when grain is treated) and options for killing insects if grain becomes infested are limited. Silo bags are typically not treated and require nil insect levels when loaded.

Although we presume there are no insects in grain when being loaded into storage, we generally treat the grain using protectants, or fumigate in gas-tight sealed storage.

When using protectants always read and follow label directions, calibrate, mix and apply chemicals correctly and always wear the recommended safety gear.

Unsealed storage, when managed well, can yield clean grain — but always treat grain in unsealed storages with a protectant. Aeration is increasingly common and also can help manage insects and quality in unsealed storages.

Increasingly growers are storing grain for up to 12 months. To do this the storage system needs to be able to kill insects effectively and maintain grain quality. Gas-tight sealed and aerated storage is the best way to do this. Fumigating the grain kills any insects present and the aeration maintains grain quality.

In a gas-tight sealed silo grain can be fumigated effectively providing quick, inexpensive and long-lasting insect control. Market flexibility is greatly enhanced because grain is stored residue-free.

When considering new storage, consider gas-tight sealed storage as an option.

Like any piece of equipment on the farm gas-tight sealed silos need to be well maintained to work efficiently. Check seals before each filling and replace if worn or damaged. Always pressure test the silo to ensure it is sealed.

Keep it clean

Whatever the system there are always basic principles to follow, the most important is to have excellent grain hygiene — prevention is better than cure.

Clean up any grain spills immediately wherever they may be, but particularly around the storage area. To help this process, spray out or remove any weeds around the storage area. Silos mounted on a slab are easier to clean and keep clean.

Clean up all grain spills around the farm and storage area, ensure all harvesting and storage equipment is clean and treated with a structural treatment.

Inert dusts (for example, Dryacide®, Absorba-Cide®, Cut 'N Dry™ and Perma-Guard®) can be used to treat the header, storages and handling equipment for residual control. Always read and follow label directions.

Keep it safe

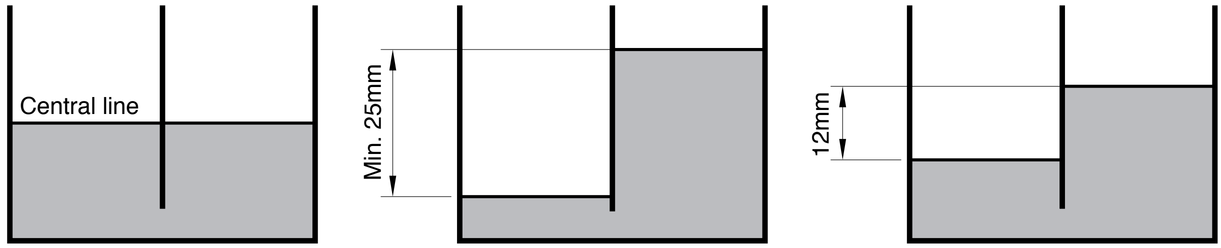
Always use a mixture of an organophosphate (for example, Fenitrithion®, Actellic® or Reldan®) with Methoprene (for example, IGR® and Diacon®,) either by mixing them together or bought as a 'twin pack' such as Reldan Plus®, to protect grain during storage.

Resistance in the lesser grain borer to Methoprene is increasing, making it difficult to control the borer in unsealed storages.

Regularly monitor grain to detect any problems that may arise. Inspect storages fortnightly during summer and monthly during winter. Early insect detection prevents increasing numbers and potential reinfestation of other sites.

Insect infestations are not evenly distributed throughout a silo. Insects seek out the most favourable places, such as the grain peak and around hatches, where moisture can get in. If insects are found, or damage is detected it is important to treat the infestation.

Any grain with holes in it indicates that primary pests, such as the lesser grain borer or the grain weevil have infested the grain.



(a) Fill up to the central line with recommended oil

(b) Pressurise the silo until a minimum of 25mm difference shows in the oil levels

(c) Remove pressure; oil levels fall to a 12mm difference in the oil levels over five minutes or more

FIGURE 1 Testing the pressure relief valve

Correct insect identification is important to determine a suitable control tactic.

In unsealed storages, Dichlorvos (for example DDVP500®) is used to treat existing insect infestations. Unfortunately the lesser grain borer is commonly resistant to Dichlorvos, however it is effective on the other insect pests.

In sealed gas-tight storage, phosphine will control all pests when used at correct label rates and fumigation periods.

Making phosphine last

Phosphine resistance is a serious threat to the grain industry. While resistance is right in our face, it really is a symptom of a larger problem — phosphine use in structures that are not gas-tight, or use at off-label rates and insufficient periods.

Ensuring phosphine use only in gas-tight structures at label rates and for recommended fumigation periods will enable the industry to prolong the use of this important insect-control tool.

The first step for growers is to ensure existing and new storages are gas-tight. Gas tightness is determined by a standard pressure test (see Figure 1).

After the silo has been tested and has met the pressure test it is important to follow label directions when using phosphine.

Correct dose rates and exposure periods are essential. The exposure period is determined by temperature:

- Recommended minimum exposure period:
  - Seven days when temperature is less than 25 degrees Celcius.
  - 10 days at 15–25°C.
  - Insects are hard to kill at <15°C.
- Ventilation period:
  - 24 hours with fans,
  - Up to five days without fans.
- Withholding period:
  - Two days after the ventilation period (human or stockfeed)

Maintaining quality

High moisture and temperature can affect grain in many ways — insect activity increases, spoilage can occur due to moulds and fungi and seed viability can be affected. Always aim to store grain at a moisture content of 12 per cent and at 25°C or less.

Harvest temperatures are often 30°C or higher and during summer temperatures in silos can exceed 40°C. This makes keeping grain cool a challenge.

When harvesting, target cool grain to be stored on-farm. This may mean harvesting when moisture can be high, a moisture meter can be used to ensure moisture limits are not exceeded. Installing an aeration system will further assist in cooling grain.

Keep the market in mind

Above all, work with grain end users to ensure any delivered grain meets receival expectations.

A system that allows easy grain storage while maintaining quality will ensure growers can deliver grain that meets market expectations.

For more information on managing phosphine resistance in stored grain pests and the current status of insect resistance in Australia to registered grain treatments go to www.dpi.qld.gov.au/26_4801.htm.

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Syngenta territory sales manager, Craig Sharam, Wodonga, Victoria, with IK Caldwell agronomists, Wayne Marchment and Leigh Hepner, Moama, and John Douglas, "Thornton", Barham.

Barham grower bucks cropping trend

A RUN OF DRY seasons capped off by an aphid plague last season has been the reality for most farmers in the marginal cropping country south-west NSW.

But one Barham district grower has successfully managed to avoid insect damage and is gearing up for a malt barley harvest of 1.8 to 2.3 tonnes a hectare.

John and Kathryn Douglas crop 2400 hectares on their 4000 ha mixed soil country at "Thornton" and "The Springs".

With an average annual rainfall of just 325 millimetres – and only half of that last year – maximising yield potential wherever possible is paramount.

In recent years, John has shied away from pulses and wheat in favour of barley and sows by the calendar, which often means dry-sowing.

"I used to sow 50:50 barley and wheat but with the successive spring failures we seem to be moving more towards barley," he says.

"With barley being a shorter-season crop, we've got a better chance of getting the crop through to grain fill."

Last year, he elected to sow 1550 ha of Buloke and Schooner barley and 870 ha of Ventura and Frame wheat.

The barley was dry-sown in mid-May at 70 kg/ha using seed that that been treated with 1.3 L of DIVIDEND® and 1.2 L of EMERGE™ per tonne of seed.

DIVIDEND is the only seed treatment that protects emerging crops from Rhizoctonia, Pythium, smuts, bunts and seed-borne Net Blotch, while EMERGE protects emerging crops against aphids and thus the spread of Barley Yellow Dwarf Virus.

Besides its insecticidal properties, EMERGE is known to trigger the biosynthesis of certain plant proteins, thereby improving plant vigour.

Benefits include faster emergence, enhanced root development, increased biomass and higher yields, even in situations where there are no obvious symptoms of insect attack.

"If we can get a plant established with a stronger root system when it's younger, it's got to be better for it if we run into a hard finish," John says.

"I also want to stop spraying crops with insecticides, where possible.

"In the past, this seemed good agronomic practice, but I have since learned we are also killing good bugs at the same time."

The barley was planted on 30-centimetre row spacings using a Janke direct drill with disc opening coulter, narrow and knife point.

This method ensured minimal soil disturbance and uniform seed placement.

"The disc opener also cuts through any summer weed escapes, such as melons and hog weed," John says.

At planting, it received 40 kg/ha of MAP fertiliser with Impact fungicide and 1.5 L/ha of a pre-emergent herbicide.

Agronomist, Wayne Marchment of IK Caldwell, Moama, says John's decision to use DIVIDEND and EMERGE means the crop should achieve malting grade when harvested.

"Germination in many crops around here was hit-and-miss whereas John's crops had really good emergence," he says.

"Aphid numbers were significantly lower through the mid-tillering and early node stages in July and August, which is when we would have expected the protection of EMERGE to have run out.

"We've seen the same sort of results using EMERGE in trials on other properties."

Wayne says many of his clients' crops have been affected by aphids this year.

"Many growers will put reduced yield and quality down to a tight finish whenin fact aphids will be to blame in those crops that suffered.

"You simply cannot afford to ignore aphids anymore."

Syngenta territory sales manager for north-east Victoria and southern NSW, Craig Sharam, says growers have worked hard to tighten their crop rotations and adopt strategies and innovations to improve management and boost yields.

"Given the pressure we've had from aphids and some of the emergence issues we've had due to the season in the more marginal areas, we're definitely going to have more adoption of DIVIDEND and EMERGE next year," he says.

"This area has probably been the hardest hit by continual dry conditions yet it'll be the area with the most uptake of this seed treatment combination."

For more information please contact your local Territory Sales Manager, call the Syngenta Advice Line on 1800 067 108 or visit www.syngenta.com.au

syngenta

Better canola — crop architecture and seed quality 2008–2009 results

WRITTEN BY

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In the medium-rainfall zone of central and southern New South Wales there is increasing interest in manipulating row spacing and plant population (crop architecture) for canola. This is being driven by a number of factors including stubble retention and moisture conservation, the option of inter-row sowing, the desire to sow into high stubble loads and the shift from open-pollinated varieties to more vigorous hybrids. Low plant populations and/or wider row spacing are being considered as a strategy to reduce the risk of poor yields during dry seasons. Low plant population (low sowing rates) is also seen as a cost saving, especially with more expensive hybrid seed.

KEY POINTS

- **Widening row spacing reduced established plants per area for a given sowing rate.**
- **At a yield of 1.5 tonnes per hectare there was no yield difference between 19 and 42 plants per square metre or between 18 centimetre and 30cm row spacing during 2008.**
- **At a yield of 0.44t/ha, the low plant population (28 plants/m^2) yielded highest during 2009.**
- **In the Victorian *Better Oilseeds* trial, farmer-saved hybrid canola seed reduced crop uniformity (variable plant height), delayed maturity and increased blackleg infection.**

The *Better Oilseeds* project, funded by the Grains Research and Development Corporation (GRDC) and the Australian Oilseeds Federation (AOF) aimed to better understand the interactions between row spacing and plant population in open-pollinated and hybrids by carrying out a replicated trial at Junee over three years (2007–2009). At the same site during 2009, a variety trial included a comparison of company-produced seed with farmer-saved seed of a representative hybrid and open-pollinated variety. A more detailed study was undertaken in Victoria, also during 2009.

Aim

To evaluate the effect of row spacing (18 centimetres, 22cm and 30cm) and target plant population (20, 40 and 60 plants per square metre) on yield and oil content of a representative Clearfield® and Triazine Tolerant (TT) variety.

Method

Two representative varieties of the appropriate maturity were used; Bravo TT and the Clearfield® hybrid 45Y77. Sowing rates were calculated based on seed weights, germination percentage, estimated establishment percentage and target plant population.

Results

Establishment

Overall establishment was poorer during 2008 compared with 2007 (see Table 1). Poorer seedbed moisture at the time of sowing is the likely reason.

Expected establishment losses did not eventuate during 2009, resulting in plant populations higher than the targets. The trend of reduced establishment with wider row spacing was observed in every year (for a given sowing rate — see Figures 1 and 2).

Yield and oil

The site mean yield of 1.53 tonnes per hectare during 2008 is considered average to slightly below average for Junee. During the 2008 trial there was no statistical difference in yield between a target of 20 and 60 plants/m^2 (see Table 2), although the achieved plant populations were lower than anticipated at 19 and 42 plants/m^2 respectively.

TABLE 1 Average establishment for three plant population targets and three row spacings at Junee during 2007, 2008 and 2009

	Achieved plant population (plants/m²)		
Target plant population (plants/m²)	2007	2008	2009
20	21	19	28
40	38	31	53
60	52	42	75
Row spacing (cm)			
18	44	33	60
22	38	34	51
30	30	25	46

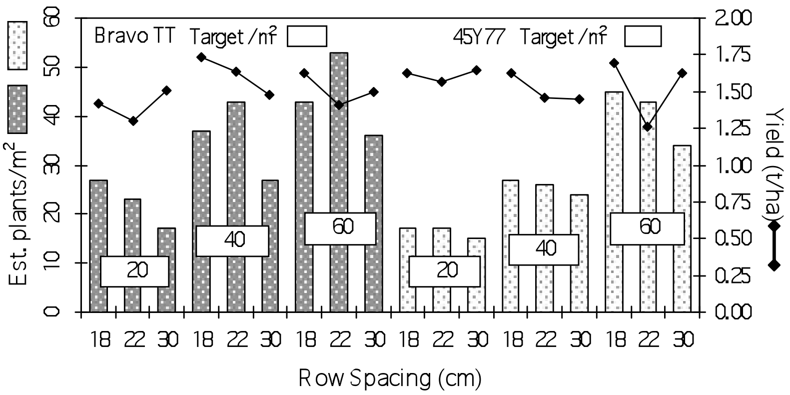

FIGURE 1 Effect of row spacing and target plant population on plant establishment and yield at Junee *Better Canola* site during 2008 (sown 5 May 2008)

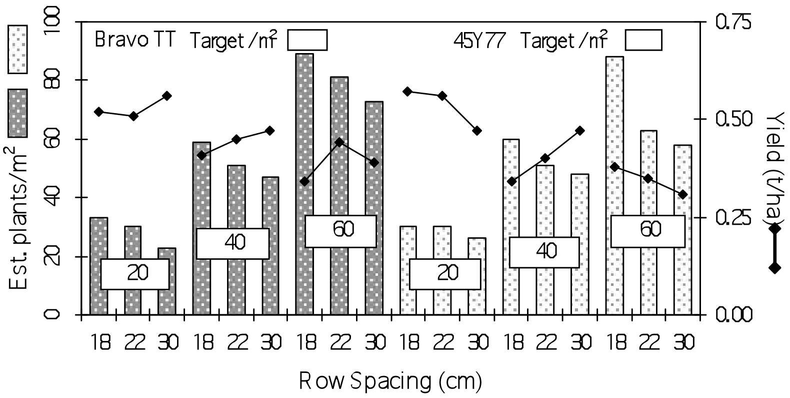

FIGURE 2 Effect of row spacing and target plant population on plant establishment and yield at Junee *Better Canola* site during 2009 (sown 5 May 2009)

TABLE 2 Effect of target plant population and row spacing on yield and oil content at Junee during 2008

	Treatment	Yield (t/ha)	Oil (%)*
Target plant population (plants/m²)	20	1.51	34.9
	40	1.57	35.1
	60	1.52	35.3
	LSD (0.05)	NSD	NSD
Row spacing (cm)	18	1.62	34.9
	22	1.44	35.1
	30	1.54	35.3
	LSD (0.05)	0.14	NSD

*@ 6% moisture content LSD — least significant difference NSD — no significant difference.

TABLE 3 Effect of target plant population and row spacing on yield and oil content at Junee during 2009

	Treatment	Yield (t/ha)	Oil (%)*
Target plant population (plants/m²)	20	0.53	na
	40	0.42	na
	60	0.37	na
	LSD (0.05)	0.06	na
Row spacing (cm)	18	0.43	na
	22	0.45	na
	30	0.44	na
	LSD (0.05)	NSD	na

*@ 6% moisture content LSD — least significant difference NSD — no significant difference
na — not available at 18 January 2010.

Oil contents were generally disappointing and a reflection of a very tough finish. Overall the oil contents were seven percentage oil points under the standard of 42 per cent. Plant population had no effect on oil content.

There was no significant difference in yield between 18cm and 30cm row spacings during 2008, yet a row spacing of 22cm resulted in a significantly lower yield than 18cm. The lower yield on the 22cm row spacing cannot be explained. Row spacing had no effect on oil content.

During 2009 row spacing had no effect on yield but the low plant population of 20 plants/m² (actual achieved 28 plants/m²) was significantly higher yielding than 40 and 60 plants/m² (actual population achieved was 53 and 75 plant/m²), but the yields were poor at 0.44t/ha (see Table 3).

Seed source of hybrids and open-pollinated varieties

Farmer-saved seed of open-pollinated varieties has been common practice in some areas, despite past research indicating an average yield penalty of about 12%. Despite a trend in the trials at Junee and Dunkeld for lower yields with farmer-saved seed, the results were too variable to have full confidence. However, in the Dunkeld trial blackleg infection levels increased, plant height distribution was greater and maturity was delayed in hybrid farmer-saved seed compared with company seed.

Comments and observations

At yield levels of 1.5t/ha achieved during 2008, there was no difference in yield or oil content between plant populations of 19 and 42 plants/m^2 or between 18cm and 30cm row spacings. At higher yield potential (2.0–3.0 t/ha) the outcome may well be different.

In all years, increasing row spacing from 18cm to 30cm reduced the established plant density for a given sowing rate.

The *Better Oilseeds* project unfortunately did not strike a year conducive to yields of 2.0–3.0t/ha. Further work is needed on row spacing and plant population at yield potentials of 2.0–3.0t/ha.

Acknowledgements

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New assessment tool targets better blackleg management

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Blackleg, caused by the pathogen *Leptosphaeria maculans*, is the most damaging disease of canola and *Juncea* canola in Australia. The disease is difficult to control and many growers accept yield loss from blackleg as a normal part of canola production.

Blackleg is challenging to control as the pathogen:

- Survives on stubble resulting in higher levels of spore release in intensive canola production regions.
- Spreads via windborne and rain-splashed spores resulting in inoculum being spread extensively and quickly.
- Grows systemically within the plant resulting in limited efficacy of foliar applied fungicides.
- Reproduces sexually resulting in diverse pathogen populations that can overcome resistance genes within a few years.
- Individual blackleg isolates that are virulent against an individual canola cultivar will increase in frequency quickly if that particular cultivar is grown for a number of years in a row, resulting in resistance being overcome. In this scenario other canola cultivars that have different resistance genes will maintain their resistance.

KEY POINTS

- **Recommendations to Australian canola growers for blackleg control are likely to change over the next few years with improved understanding of the disease.**
- **As strains of the blackleg pathogen overcome resistant canola cultivars, existing management practices may be insufficient to control high levels of the disease.**
- **A new risk assessment tool will help growers identify the risks of their own situation to determine their own specific blackleg management program.**

Blackleg pathogen and canola resistance

When individual canola cultivars (with specific resistance sources) are grown on a large scale and over a number of years, the blackleg isolates that are virulent towards that particular resistance gene dramatically increase in frequency, resulting in increased disease levels.

When a cultivar based on a different source of resistance is sown in areas where another source of resistance has been extensively sown, this cultivar is likely to have fewer blackleg symptoms, as most blackleg isolates are virulent towards the previously-grown source of resistance.

Newly-deployed novel sources of resistance remain effective for a number of years before virulent blackleg isolates increase in frequency to a level where significant disease results.

Resistance sources that have become ineffective may regain some resistance after a number of years, as blackleg isolates virulent to that particular resistance source decrease to a lower frequency.

Current grower management approaches include:

1. Sowing canola cultivars with high levels of blackleg resistance.
2. Avoiding canola stubble (especially from the previous season's crop).
3. Applying seed dressing or fertiliser-amended fungicide.

However, when host resistance is overcome, the above practices can still be insufficient to avoid high levels of blackleg disease.

Since blackleg severity varies depending on regional climate and intensity of canola production, blanket recommendations to growers from different regions can result in inappropriate management in many situations.

New management tools

Based on an understanding of the interaction between the blackleg pathogen and resistance genes within canola cultivars, researchers have developed new tools for blackleg management. Recommendations to growers will reflect the specificity of blackleg pathogen/canola resistance gene interactions and account for disease development at the regional, property and even paddock level.

Growers need to be able to identify the risks of their own situation to determine their own specific blackleg management program. The recommended approach includes:

1. ***Balanced Assessment of Risk of Blackleg (BARB):*** A paddock risk assessor tool for blackleg is being developed and will be made available to industry in the near future (see Table 1.). The risk assessor tool, known as the BARB (Balanced Assessment of Risk of Blackleg) will enable growers to determine the risk of blackleg development in their paddocks by assessing all known factors that can influence blackleg severity and ultimately determine the overall risk of individual paddocks. Growers can then alter individual factors to reduce risk; for example, sow cultivars with a different source of resistance, use a fungicide product or change paddock selection. When growers have determined the blackleg risk score for a paddock, they can determine how management practices influence blackleg severity.
2. ***Monitoring pathogen populations and canola cultivars:*** Future recommendations for blackleg management will become more region-specific with a focus on monitoring disease. Monitoring blackleg severity will enable growers to be informed of any changes in the current disease status of their region. Our understanding of the interactions between specific isolates of the blackleg pathogen and canola cultivars at the genetic level is improving. We are monitoring populations of L. maculans using molecular markers that identify genes that express virulence towards a number of resistance genes in commercial canola cultivars. This allows us to estimate the frequency of virulence of the blackleg pathogen population, and therefore canola cultivars at risk of having their resistance overcome in any given region.

In parallel with pathogen monitoring, the monitoring of resistance of canola cultivars, both commercial and advanced breeding lines, will continue. This has involved monitoring the level of blackleg occurring in canola national variety trials (NVTs) across southern Australia. While this activity has been underway for a number of years, only now are we identifying the genes for blackleg resistance in many canola cultivars. The identification of resistance genes in individual canola cultivars combined with knowledge of the prevailing blackleg pathogen population will further determine the blackleg risk in a particular region. In addition, any observed 'breakdown' of resistance can be quickly identified and alternate canola cultivars offering different genes for resistance can be recommended.

TABLE 1. The Balanced Assessment of Risk of Blackleg (BARB) with potential factors and weightings (scores) to be completed for each individual paddock before sowing canola

Blackleg severity risk factor	Individual factor score									Paddock score
	9	8	7	6	5	4	3	2	1	
1. Annual rainfall including irrigation (mm)	>600	600	550	500	450	400	350	300	250	
2. Total rainfall received March – May before sowing (mm)				>100	91-100	81-90	71-80	61-70	<60	
3. Month sown				June – Aug	May 15-31	May 1-15	April 15-30			
4. Regional canola intensity (%)	>20	20	15			10		5		
5. Cultivar blackleg rating	VS	S-VS	S	MS-S	MS	MR-MS	MR	R-MR	R	
6. Fungicide seed/ fertiliser dressing				No		Yes				
7. Canola stubble conservation burning				Inter-row sowing		Min till		Raking/ burning		
8. Distance (m) to one-year-old stubble	0	100	200	300	400	500	>500			
9. Distance (m) to two-year-old stubble					0	100	250	500	>500	
10. Years of same cultivar sown on farm	>3			3			2	1	0	
11. Distance (m) to one-year-old stubble of same cultivar	0	100	200	300	400	500	>500			
12. Distance (m) to two-year-old stubble of same cultivar			0	100	200	300	400	500	>500	
									TOTAL	

This table is a prototype; the blackleg severity risk factors and their score will be modified prior to release to industry.

The blackleg management package

The blackleg management package that growers will receive will include:

1. National Blackleg Ratings — published each year with reduced resistance warnings placed next to cultivars that have a lower level of blackleg resistance.
2. Canola cultivars grouped according to the resistance genes they harbour, allowing growers to rotate canola cultivars and resistance types.
3. The paddock risk assessor or BARB will allow growers to assess their blackleg risk and identify and implement any management practices that may reduce potential losses due to blackleg in canola crops.
4. Results of surveys of region-specific blackleg severity — including five-year averages and previous years' severity.
5. Knowledge of effectiveness of specific resistance genes based on both the frequency of virulent isolates and blackleg severity scores for individual cultivars across all major canola producing regions.

Although BARB is a prototype, it can be used to highlight individual risk factors for each planned 2010 canola paddock. At this stage, total paddock scores that indicate high risk of yield loss from blackleg have not been determined. However, weightings that are considered high risk are shaded.

Obviously growers cannot control all factors affecting disease. The idea behind the BARB is to highlight all known influences over blackleg so each grower can determine their own level of risk and be informed on how their management strategies can influence their risk of severe blackleg infection.

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Phosphorus strategies require rethink in high phosphorus soils

WRITTEN BY

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The broad objective of this project was to encourage growers to question their fertiliser strategies given the observed increase in soil phosphorus levels and changed sowing systems.

More specifically the aims were to:

- Investigate if existing phosphorus response information can be applied when using the knife point press wheel sowing system in high phosphorus soils.
- Quantify the economics of phosphorus management on high phosphorus soils.

KEY POINTS

- **Recent trial results in Lockhart, New South Wales suggest that additional phosphorus applications on soils with existing levels above 35ppm (Colwell P) are likely to be uneconomic when sowing with a knife point press wheel system.**
- **A reliable rule of thumb for high phosphorus soils would be to apply five kilograms per hectare of phosphorus when using a knife point press wheel sowing system when sowing during the main sowing window or earlier.**
- **Significant cost savings could be achieved by minimising applied phosphorus in seasons that produce yields less than 3.0 tonnes per hectare.**

The adoption of the knife point press wheel sowing system has primarily been grower driven with traditional 'trial and error' outcomes refining the practice. Research information relating to nutrient interactions when using the new sowing system, specific to the Lockhart, New South Wales area is limited.

The application of phosphorus in the Lockhart district at rates greater than removal during the past 15 to 20 years and more so in the past seven drought-affected years, has resulted in measured soil available phosphorus being at levels much higher than previously experienced. These soils are now consistently in the high phosphorus range (greater than 40ppm Colwell P).

Recent grower and advisor experience indicates that on-the-ground phosphorus responses are different to those expected with the new sowing system and the high available phosphorus soils, possibly highlighted by the variable rainfall patterns of the recent past. A possible answer lies in the ability of the system to allow for earlier sowing and crop establishment providing better phosphorus utilisation. The rate of phosphorus required to achieve the target yield may allow application rates to be reduced, however the level of refinement and consistency of the result is unknown.

Phosphorus decisions have now become more risky for growers in the Lockhart district due to the sustained drought conditions placing businesses under greater financial pressure and the rapid increase in phosphorus price. The economic impact of getting phosphorus decisions wrong on the high available phosphorus soils in the district is not well understood, so consequently phosphorus is often oversupplied to avoid any possible deficiency but this may not be the most economic approach.

Research

This project was a joint initiative between the Lockhart Ag Bureau, a grower group and Rural Management Strategies Pty Limited — independent farm management consultants.

Four sites were selected with Colwell P levels higher than 35ppm and paddock-scale trials were established during the 2009 winter crop season to measure the response to applied phosphorus in wheat.

A randomised block trial design using three replicates of four treatments was used to allow for statistical analysis of the results. Four phosphorus rates were selected — nil phosphorus per hectare, 5 kilograms per hectare, 10kg/ha and 20kg/ha and trials were sown using knife point press wheel equipment. Trials were harvested using GPS yield monitoring equipment with the raw yield data being cleaned before statistical analysis.

Outcomes

Yields from the three trials harvested did not show any consistent response to applied phosphorus. No consistent negative yield or quality effect was observed from applied phosphorus. One trial was not harvested due drought conditions.

In three of the four trials it was most economic not to apply any phosphorus. One trial showed an economic response to 5kg/ha and 10kg/ha of applied phosphorus. However, on average across all trials a nil phosphorus approach was the most economic strategy.

The results supported the existing information that soils with Colwell P levels higher than 35ppm are unlikely to be responsive to applied phosphorus.

These results need to be considered in perspective with the yield range of 0–2.74 tonnes per hectare and a single year data set for complex issues such as phosphorus management.

Implications

A reliable rule of thumb for high phosphorus soils would be to apply 5kg/ha of phosphorus when using a knife point press wheel sowing system when sowing in the main sowing window or earlier.

If consecutive higher-yielding crops occur, this may need to be increased to 10kg/ha of phosphorus.

The trial results suggest that the risk of getting phosphorus management wrong from a yield and quality perspective at yields less than 3.0t/ha on soils with a Colwell P level higher than 35ppm is low when using this sowing system. However, the economic return from applied phosphorus on these soil types at yields less than 3.0t/ha is most likely negative.

Therefore, significant cost savings could be achieved by minimising applied phosphorus in seasons that produce yields less than 3.0t/ha. This would also reduce business risk by minimising the cash outlay on fertiliser and potential for a cash loss situation if the crop under performs or fails.

However, additional research is required to answer questions posed by this research such as:

- How far can residual soil phosphorus be 'run-down'?
- How quickly will it run-down?
- What happens if the season allows for more than 3.0t/ha yield?
- Does the same hold true for crops other than wheat?
- What are the long-term implications of phosphorus application rate changes?

Grains Research and Development Corporation (GRDC) funding for this project is continuing for the 2010 winter crop season to continue monitoring of the sites to attempt to address the issues outlined above.

The research to date also highlighted the benefit of experience gained with using Precision Agriculture (PA) techniques to carry out paddock-scale on-farm trials. Many growers now possess PA hardware but lack the experience in applying scientific rigour to on-farm trials to obtain reliable results. Focusing on a project that demonstrates the techniques is a valuable education tool that allows growers to have the confidence to carry out reliable trials on their own farm. This provides them with the ability to assess and fine tune new techniques or varieties to reduce risk in the adoption process.

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North east Victoria National Variety Trials 2009

Trials conducted by Agrisearch and Industry and Investment NSW, Deniliquin
Data collated by Geoff Stratford (DPI Horsham) and Dale Grey (DPI Cobram)

The Katamatite faba bean site had data too variable to publish and the Yarrawonga oat site was abandoned.

TABLE 1 Long-term predicted wheat yield (main season) for 2000–2009 in north east Victoria, expressed as a percentage of the yield of Janz. The numbers in brackets indicate the number of site years in that area

North east	Yield
Janz (t/ha)	3.62
Beaufort	115(6)
Espada	109(11)
Waagan	109(11)
Magenta	108(7)
Pugsley	108(27)
GBA Ruby	108(23)
Young	107(19)
Gladius	107(14)
Lincoln	106(9)
Gascoigne	106(6)
Preston	105(6)
Axe	105(14)
Correll	105(14)
Derrimut	105(14)
Carinya	105(10)
Sentinel	104(16)
Bolac	104(11)
Merinda	103(11)
Bullet	104(9)
Guardian	104(8)
Ventura	102(19)
Catalina	102(11)
Orion	102(6)
Yitpi	101(28)
Wyalkatchem	101(19)
Peake	101(14)
Hornet	101(8)
Janz	100(39)
Barham	100(29)
EGA Wentworth	100(8)

TABLE 1 Long-term predicted wheat yield (main season) for 2000–2009 in north east Victoria, expressed as a percentage of the yield of Janz. The numbers in brackets indicate the number of site years in that area (cont.)

North east	Yield
Janz (t/ha)	3.62
Bowie	99(34)
Annuello	99(28)
Dakota	99(9)
Frame	98(28)
Clearfield Jnz	98(3)
Kellalac	98(3)
EGA Bounty	97(6)
Crusader	96(9)
EGA Wedgetail	96(8)
Chara	93(38)
EGA Wills	92(9)
Rosella	91(42)

TABLE 2 Long-term predicted wheat yield (long season) for 2000–2009 in north east Victoria, expressed as a percentage of the yield of Kellalac. The numbers in brackets indicate the number of site years in that area

North east	Yield
Kellalac (t/ha)	3.18
Beaufort (feed)	125(4)
Bolac	115(7)
Sentinel	111(6)
EGA Gregory	110(6)
Mackellar (feed)	109(4)
Endure	107(3)
EGA Eaglehawk	106(6)
Rudd (feed)	105(4)
Chara	104(9)
Barham (biscuit)	104(3)
Frelon (feed)	103(3)
EGA Wedgetail	102(10)
Kellalac	100(10)
Diamondbird	99(8)
Tennant (feed)	99(6)
Naparoo (feed)	98(3)
Amarok (feed)	96(5)
Rosella	96(3)

TABLE 3 Yield and quality of wheat varieties during 2009 at Dookie (main season), expressed as a percentage of the yield of GBA Ruby

Dookie	Yield	Protein	Screenings
GBA Ruby (t/ha)	2.65	%	%
Beaufort	112	13.3	4.2
Waagan	109	12.7	0.2
Young	109	13.0	1.3
Wyalkatchem	108	12.8	0.2
Bullet	103	12.0	3.4
Correll	103	13.1	1.6
Gladius	103	14.4	0.4
Peake	102	12.6	0.9
Espada	100	14.2	0.9
GBA Ruby	100	13.1	0.4
Magenta	99	13.8	1.1
Catalina	97	12.6	1.6
Kennedy	97	13.4	0.3
Derrimut	95	12.4	0.9
Gascoigne	95	13.6	0.8
Janz	95	12.8	1.1
Yitpi	95	14.5	0.5
Annuello	94	12.7	2.7
Axe	94	12.6	0.7
Lincoln	94	12.9	0.8
Ventura	94	13.5	1.1
Diamondbird	92	13.9	1.8
Preston	92	13.9	4.8
Bolac	91	13.6	10.2
Barham	90	13.0	1.0
Merinda	90	12.4	2.4
Carinya	89	13.1	0.7
EGA Gregory	89	13.4	1.1
Clearfield Jnz	88	13.3	0.9
Bowie	86	13.4	0.7
Orion	86	12.1	1.6
Sentinel	84	14.2	1.2
Chara	83	13.9	2.0
Dakota	83	14.1	4.4
Livingston	83	13.2	1.0
Pugsley	83	14.8	2.3
EGA Wills	81	15.3	0.4
Frame	81	14.0	0.8
Yenda	80	13.6	8.4
Crusader	78	13.7	0.7
Rosella	72	13.8	3.4
EGA Bounty	69	13.9	0.8
Site mean (t/ha)	2.43		
CV (%)	6.53		
LSD (%)	11		
Sown	7 May 2009		

TABLE 4 Yield and quality of wheat varieties during 2009 at Wunghnu (main season), expressed as a percentage of the yield of GBA Ruby

Wunghnu	Yield	Protein	Screenings
GBA Ruby (t/ha)	1.22	%	%
Beaufort	164	15.7	0.8
Axe	138	14.1	1.4
Yenda	136	16.2	0.2
Rosella	133	15	1.3
Espada	130	16.2	0.8
Gascoigne	130	15.1	0.7
Gladius	130	13.8	5.7
Hornet	126	15.5	12.0
Preston	126	16.6	2.3
Young	124	14	2.5
Bolac	117	15.3	0.8
Orion	116	13.8	0.6
Sentinel	114	15.1	1.2
Catalina	111	17.4	0.6
Derrimut	109	15.2	0.2
Correll	107	14.9	1.0
Barham	106	14.5	0.8
Kennedy	106	16.8	2.3
Bullet	105	17.2	1.0
Bowie	103	15.7	0.9
Annuello	102	*	*
Merinda	102	15.7	0.1
GBA Ruby	100	15.1	7.9
Peake	100	15.9	0.5
Lincoln	98	15.3	1.0
Waagan	98	14.1	0.9
EGA Gregory	97	14.8	1.2
Dakota	95	16.8	0.6
Janz	93	16.9	0.3
Livingston	89	15.5	0.9
Magenta	89	14.7	1.3
Yitpi	83	16.5	0.9
Clearfield Jnz	77	17	5.3
Diamondbird	77	15.7	1.4
EGA Wills	75	16.7	0.3
Pugsley	74	16.1	0.7
Ventura	71	16.5	1.9

TABLE 4 Yield and quality of wheat varieties during 2009 at Wunghnu (main season), expressed as a percentage of the yield of GBA Ruby (cont.)

Wunghnu	Yield	Protein	Screenings
GBA Ruby (t/ha)	1.22	%	%
Frame	70	14.2	0.5
Wyalkatchem	70	15.6	1.2
EGA Bounty	61	13.7	0.9
Chara	59	14.8	0.1
Crusader	58	15.2	1.0
Site mean (t/ha)	1.22		
CV (%)	9.25		
LSD (%)	16		
Sown	5 May 2009		

TABLE 5 Yield and quality of wheat varieties during 2009 at Yarrawonga (main season), expressed as a percentage of the yield of GBA Ruby

Yarrawonga	Yield	Protein	Screenings
GBA Ruby (t/ha)	3.32	%	%
Bullet	125	12.8	3.2
Waagan	125	12.8	1.0
Axe	121	12.6	0.3
Young	116	12.8	2.1
Barham	112	11.8	0.6
Derrimut	112	12.4	0.8
Peake	111	12.4	1.1
Wyalkatchem	106	12.6	0.5
Correll	105	13.3	0.8
Janz	103	12.4	1.3
Bolac	100	13.6	3.2
Catalina	100	11.9	0.8
GBA Ruby	100	13.3	1.3
Gladius	100	12.8	0.7
Hornet	99	12.5	2.5
Carinya	98	13.3	1.7
Espada	98	13.3	0.4
Clearfield Jnz	97	11.9	0.7
Dakota	97	12.1	0.6
Magenta	97	13.5	0.6
Gascoigne	96	13.4	1.8
Livingston	94	12.8	2.1
Kennedy	93	13.3	1.3
Bowie	92	12.6	0.7
Merinda	90	12.6	3.2
Preston	90	13.6	3.3
Beaufort	89	15.0	0.6
EGA Gregory	87	13.0	1.2
Orion	86	13.2	0.4
Ventura	86	13.9	1.3
Diamondbird	84	13.6	2.4
Pugsley	84	14.8	1.6
Yitpi	83	14.0	0.4
Crusader	80	14.3	3.2
Lincoln	80	12.6	5.4
Sentinel	80	13.3	1.6
Chara	77	14.3	1.4
Yenda	77	13.8	1.5
Frame	75	14.4	0.7
EGA Wills	64	14.3	1.3
EGA Bounty	61	13.9	3.1
Rosella	58	14.1	1.6

TABLE 5 Yield and quality of wheat varieties during 2009 at Yarrawonga (main season), expressed as a percentage of the yield of GBA Ruby (cont.)

Yarrawonga	Yield	Protein	Screenings
GBA Ruby (t/ha)	3.32	%	%
Site mean (t/ha)	3.15		
CV (%)	5.29		
LSD (%)	10		
Sown	1 May 2009		

TABLE 6 Yield and quality of long-season wheat varieties during 2009 at Rutherglen, expressed as a percentage of the yield of Kellalac

Rutherglen	Yield	Protein	Screenings
Kellalac (t/ha)	4.1	%	%
Beaufort	138	8.3	0.5
Preston	137	8.5	0.3
Endure	125	10	0.2
Bolac	122	8.9	1.4
EGA Gregory	122	9.8	0.2
Sentinel	120	10	0.1
Lincoln	119	10.6	0.1
Barham	117	9.9	0.1
EGA Wedgetail	117	9.6	0.3
Yenda	117	8.6	1.2
Diamondbird	115	9.5	0.5
Naparoo	115	9.2	1.6
Sunzell	113	9.8	0.4
Derrimut	112	9	0.1
Espada	110	11	0.1
EGA Bounty	109	10.8	0.4
Gascoigne	109	10.3	0.1
Kennedy	107	10.4	0.1
Chara	103	9.6	0.7
Kellalac	100	8.9	0.4
Amarok	92	10.3	1.6
Frelon	90	10.7	6.5
Site mean (t/ha)	4.57		
CV (%)	4.64		
LSD (%)	8		
Sown	6 May 2009		

TABLE 7 Long-term predicted triticale yield for 2000–2009 in north east Victoria expressed as a percentage of the yield of Tahara. The numbers in brackets indicate the number of site years in that area

North east	Yield
Tahara (t/ha)	3.09
Bogong	118(6)
Canobolas	116(6)
Hawkeye	112(8)
Jaywick	111(8)
Tobruk	111(8)
Rufus	102(4)
Kosciuszko	101(15)
Tickit	101(13)
Tahara	100(19)
Credit	100(14)
Speedee	95(4)

TABLE 8 Yield of triticale varieties during 2009 at Rutherglen, expressed as a percentage of the yield of Tahara

Rutherglen	Yield	Protein	Screenings	Test weight
Tahara (t/ha)	2.73	%	%	kg/hL
Hawkeye	131	7.9	1.2	69
Jaywick	120	8.1	4.1	67
Rufus	119	9.2	2.0	63
Canobolas	117	8.1	3.9	68
Bogong	112	9.6	1.0	67
Tobruk	108	8.4	4.5	62
Tahara	100	8.8	2.0	65
Crackerjack	96	8.9	2.6	64
Speedee	89	8.8	3.1	60
Site mean (t/ha)	2.97			
CV (%)	8.03			
LSD (t/ha)	13			
Sown	4 June 2009			

TABLE 9 Yield of triticale varieties during 2009 at Yarrawonga, expressed as a percentage of the yield of Tahara.

Yarrawonga	Yield	Protein	Screenings	Test weight
Tahara (t/ha)	1.12	%	%	kg/hL
Canobolas	194	15.3	2.3	61
Jaywick	138	15.2	8.4	57
Speedee	135	14.9	5.4	57
Tobruk	134	17.1	19.6	58
Hawkeye	128	16.1	21.5	55
Rufus	118	16.2	11.2	55
Tahara	100	17.3	13.7	54
Bogong	89	16.2	16.5	56
Crackerjack	86	16.7	24.6	56
Site mean (t/ha)	1.38			
CV (%)	10.8			
LSD (t/ha)	18			
Sown	11 June 2009			

TABLE 10 Long-term predicted barley yield for 2000–2009 in north east Victoria expressed as a percentage of the yield of Gairdner. The numbers in brackets indicate the number of site years in that area

North east	Yield
Gairdner (t/ha)	4.04
Malt	
Commander	105(9)
Buloke	102(9)
Gairdner	100(15)
Baudin	98(10)
Vlamingh	98(3)
Flagship	95(8)
Sloop	94(11)
Schooner	91(15)
Franklin	90(15)
Feed	
Fleet	107(4)
Hindmarsh	106(5)
Lockyer	106(3)
Capstan	103(9)
Yarra	102(12)
Keel	100(15)
Tantangara	100(6)
Barque	99(11)
Cowabbie	99(3)
Hannan	99(3)
Finniss (hulless)	88(4)

TABLE 11 Yield and quality of barley varieties in the 2009 Katamatite trial, expressed as a percentage of the yield of Gairdner.

Katamatite	Yield	Protein	Plumpness
Gairdner (t/ha)	2.24	%	%
Malt			
Buloke	113	12.6	70.3
Flagship	106	12.1	75.1
Vlamingh	101	13.3	65.5
Gairdner	100	12.0	47.1
Baudin	93	13.1	71.0
Schooner	93	13.9	65.5
Commander	89	12.7	59.0
Franklin	79	14.0	6.3
Feed			
Keel	129	11.3	88.9
Fleet	120	11.8	85.3
Hindmarsh	119	12.6	86.5
Yarra	101	12.1	76.9
Capstan	100	12.6	49.2
Lockyer	100	12.7	63.1
Roe	100	12.8	85.5
Hannan	98	13.1	75.6
Oxford	79	12.1	12.9
Finniss (hulless)	68	*	*
Site mean (t/ha)	2.12		
CV (%)	8.64		
LSD (%)	14		
Sown	17 June 2009		

TABLE 12 Long-term predicted oat yield for 2000–2009 in north east Victoria, expressed as a percentage of the yield of Echidna. The numbers in brackets indicate the number of site years in that area

North east	Yield
Echidna (t/ha)	2.32
Possum	102(12)
Potoroo	102(12)
Mitika	100(12)
Echidna	100(10)
Quoll	99(10)
Kojonup	96(5)
Yallara	95(9)
Euro	92(12)
Mortlock	83(11)

TABEL 13 Yield of oat varieties in the 2009 Dookie trial, expressed as a percentage of the yield of Mitika

Dookie	Yield	Screenings	Test weight	Protein
Mitika (t/ha)	2.92	%	kg/hl	%
Quoll	117	11.2	40	11.9
Potoroo	109	6.6	44	10.1
Echidna	104	4.7	47	10.9
Euro	102	5.8	45	10.5
Yallara	100	4.1	48	10.4
Mitika	100	3.9	52	11.2
Possum	92	3.9	47	11.7
Site mean (t/ha)	3.02			
CV (%)	6.97			
LSD (%)	11			
Sown	7 May 2009			

TABLE 14 Long-term predicted conventional canola yield for 2000–2009 in north east Victoria expressed as a percentage of the yield of Garnet. The numbers in brackets indicate the number of site years in that area.

North east	Yield
Garnet t/ha	1.9
Hyola 50	101(3)
AV Garnet	100(3)
Monola 130CC	83(4)
AV Sapphire	79(15)

TABLE 15 Yield of mid-season conventional canola varieties in the 2009 Wunghnu trial expressed as a percentage of AV Garnet

Wunghnu	Yield
AV Garnet (t/ha)	0.69
Hyola 50	122
Victory 3001	104
AV Garnet	100
Monola 130CC	96
Hyola 76	94
Hyola 433	78
Site mean (t/ha)	0.68
CV (%)	11.7
LSD (%)	18
Sown	2nd June 2009

TABLE 16 Yield and quality of mid-season IMI-tolerant canola varieties at the 2009 Yarrawonga trial expressed as a percentage of Pioneer 45Y77

Yarrawonga	Yield	Oil
Yield Pioneer 45Y77 (t/ha)	1.96	%
Pioneer 46Y83	113	*
Pioneer 45Y82	108	*
Pioneer 46Y78	104	38.6
Pioneer 45Y77	100	36.6
Hyola 571CL	91	37.2
Pioneer 44C79	89	39.0
Site mean (t/ha)	2.0	
CV (%)	10.1	
LSD (%)	16	
Sown	30 April 2009	

TABLE 17 Long-term predicted yield of mid-season triazine tolerant (TT) varieties for 2000–2009 in north east Victoria expressed as a percentage of the yield of Bravo TT. The numbers in brackets indicate the number of site years in that area

North east	Yield
Bravo TT (t/ha)	1.22
ATR Cobbler	102(4)
BravoTT	100(9)
Rottnest TTC	97(4)
ThunderTT	96(6)
Tawriffic TT	96(4)
ATR409	95(5)
CB Argyle	93(4)
ATR Marlin	92(5)
ATR Barra	92(3)
Tornado TT	90(10)
Flinders TTC	90(3)

TABLE 18 Yield and quality of mid-season triazine tolerant (TT) canola varieties during 2009 at Yarrawonga expressed as a percentage of Bravo TT

Yarrawonga	Yield	Oil
Bravo TT (t/ha)	1.71	%
CB Jardee HT	115	35.9
CB Tanami	112	37.4
CB Tumby HT	108	*
Hurricane TT	107	40.6
CB Scaddan	103	36.2
Monola 76TT	103	39.3
CB Telfer	101	39.9
BravoTT	100	36.5
ATR Cobbler	99	39.7
Monola 77TT	98	38.4
Rottnest TTC	96	36.6
ATR409	88	37.7
Tawriffic TT	86	39.9
CB Argyle	78	39.8
ATR Marlin	75	37.4
Lightning TT	75	*
Site mean (t/ha)	1.65	
CV (%)	6.88	
LSD (%)	11	
Sown	30 April 2009	

TABLE 19 Yield and quality of herbicide-tolerant canola varieties during 2009 at Shepparton, including Round Up Ready varieties, expressed as a percentage of the yield of Hyola 502 RR

Shepparton	Yield	Oil
Hyola 502 RR (t/ha)	1.0	%
Triazine tolerant (TT)		
CB Jardee HT	117	34.9
ATR Cobbler	110	37.4
CB Telfer	106	36.9
Tawriffic TT	106	38.6
Hurricane TT	104	38.4
BravoTT	102	34.4
ATR409	101	37.1
CB Tumby HT	101	35.2
Monola 76TT	101	37.6
CB Tanami	100	35.1
CB Scaddan	99	34.9
Rottnest TTC	96	35.8
ATR Marlin	94	37.8
Monola 77TT	94	38.2
Hyola 751TT	70	32.5
Lightning TT	66	34.5
CB Argyle	64	37.8
Roundup Ready (RR)		
GT Scorpion	132	35.3
Hyola 601RR	121	36.5
GT61	117	36.2
Pioneer 46Y20	113	37.4
GT Cougar	104	33.0
Hyola 502RR	100	35.0
CB Eclipse	98	*
GT Mustang	91	36.3
Clearfield (CL)		
Pioneer 46Y83	140	35.7
Pioneer 45Y82	139	35.4
Pioneer 44C79	106	37.1
Pioneer 46Y78	103	35.3
Pioneer 45Y77	83	34.0
Hyola 571CL	72	35.2
Site mean (t/ha)	1.03	
CV (%)	12.8	
LSD (%)	21	
Sown	4 May 2009	

TABLE 20 Long-term predicted faba bean yield for 2000–2009 in north east regions expressed as a percentage of the yield of Fiesta. The numbers in brackets indicate the number of site years in that area

North east	Yield
Fiesta (t/ha)	2.99
Farah	101(6)
Fiesta	100(11)
Fiord	98(11)
Cairo	98(5)
Nura	97(11)
Doza	92(3)
Manafest	85(9)

TABLE 21 Long-term predicted lupin yield for 2000–2009 in north east Victoria expressed as a percentage of the yield of Mandelup. The numbers in brackets indicate the number of site years in that area

North east	Yield
Mandelup (t/ha)	2.49
Mandelup	100(7)
Belara	97(5)
Quilinock	97(5)
Wonga	94(7)
Moonah	93(7)
Tanjil	93(4)
Jindalee	92(7)
Danja	88(6)

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The National Variety Testing (NVT) program was established in 2005 by the Grains Research and Development Corporation (GRDC) and is managed by the Australian Crop Accreditation System Limited (ACAS). It is a national program of comparative crop variety testing with standardised trial management, data generation, collection and dissemination. This is managed through an internet accessed database that ensures a common approach and uniformity across the system.

NVT Online is the delivery system for the data. It is an easy-to-use searchable database. Visit: www.nvtonline.com.au.

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