CLEARFIELD® Tolerant Juncea Canola Crop tolerance evaluation

By David Moody

Research Manager, Birchip Cropping Group, Birchip.

Take Home Messages

- DPI Horsham/Viterra are currently breeding Clearfield® tolerant juncea canola varieties.
- The Clearfield® tolerant varieties express a high level of tolerance to recommended rates of the imidazolinone herbicides.
- A new Clearfield® tolerant variety, Oasis CL will be commercially available in 2008.

Methods

These trials were conducted by BCG for the Department of Primary Industries as part of a pre-release evaluation (crop tolerance testing) of potential new canola quality *Brassica juncea* varieties (J05Z-08920 and J05Z-08960) for tolerance to the appropriate CLEARFIELD® (imidazolinone) herbicide products. Comparator varieties were Dune (intolerant juncea canola) and Pioneer 44C73 (Clearfield *B. napus* canola).

Trials were sown at Birchip (1st June 2007) and Longerenong (8th June 2007) with a seeding rate of 5 kg/ha, MAP applied at 60 kg/ha and 50 kg/ha of nitrogen predrilled as urea. A split-plot design was used with varieties as main plots and herbicide treatments as sub-plots, with 3 replicates. TriflurX (1.5 L/ha) and Endosulfan (500 mL/ha) were applied at the Birchip site immediately post-sowing and incorporated using rolling harrows.

Intervix herbicide was applied at the 4 leaf stage at 3 rates (0, 750 mL/ha and 1.5 L/ha) using a hand boom at Birchip and a 3 m boomspray at Longerenong. Crop injury assessments were conducted 10 days post application and 21 days post application. Flowering dates were recorded and grain yield harvested at the Longerenong site.

Results

At both Longerenong (Table 1) and Birchip (Table 2) the Clearfield® Juncea canola lines JO5Z-08920 and JO5Z-08960 displayed a high level of tolerance to both the 1X (750 mL/ha) and 2X (1.5 L/ha) rates of the group B herbicide Intervix® (imazamox/imazapyr) compared with the intolerant control variety Dune. The Clearfield® tolerant canola variety Pioneer®44C73, used as a tolerant check, was also highly tolerant of both the 1X and 2X rates.

For the "imi" tolerant (Clearfield®) varieties, there was no effect on the flowering dates at either site through the application of either the 1-times or 2-times rate of Intervix®. However, plant death occurred for both rates of Intervix for the intolerant check variety Dune.

Grain yields were also harvested at the Longerenong site. Virtually no yield was recorded for the variety Dune, even at the nil rate of Intervix®; this result is very difficult to interpret given the visual observations that the level of biomass at the nil herbicide treatment was similar to the other varieties at maturity. Yields of the two new

2007 CANOLA & JUNCEA CANOLA TRIALS

Clearfield® tolerant juncea canola breeding lines were not significantly different to the tolerant *B. napus* variety Pioneer®44C73. Interestingly, there was a significant yield response to the application of Intervix® to the tolerant varieties of both *B. juncea* and *B. napus*. Whilst this may be in response to improved weed control in these plots, visual inspection indicated that the level of weeds (predominately Lamium spp.) within the plots was unlikely to cause such yield losses.

Table 1:

Percentage plants expressing symptoms of herbicide damage following the application of single (1x) and double (2x) rate of Intervix®, Julian day for 50% flowering and grain yield (kg/ha) for B. juncea and B. napus varieties at Longerenong.

Species	Variety	Intervix® Rate	% plants expressing symptoms		Mean Julian day* at 50%	Grain yield (kg/ha)
			10 DAA	21D AA		
B. juncea	Dune	0	0	0	261	60
	Dune	1X	18	80	DNF	2
	Dune	2X	35	100	DNF	0
	Oasis CL	0	0	0	260	206
	Oasis CL	1X	0	0	260	519
	Oasis CL	2X	0	0	259	571
	JO5Z-08960	0	0	0	255	230
	JO5Z-08960	1X	1	0	255	522
	JO5Z-08960	2X	1	0	255	440
B. napus	Pioneer44C73	0	0	0	256	285
	Pioneer44C73	1X	1	0	255	394
	Pioneer44C73	2X	1	0	255	452

Table 2:

Percentage plants expressing symptoms of herbicide damage following the application of 1X and 2X rate of Intervix, and the mean Julian day for 50% flowering for *B. juncea* and *B. napus* varieties at Birchip. Julian day is the day of the year.

Species	Variety	Intervix Rate	% plants expressing symptoms		Mean Julian day* at 50% flowering
			10DAA	14DAA	
B. juncea	Dune	0	0	1	249
	Dune	1X	65	46	DNF
	Dune	2X	80	76	DNF
	JO5Z-08920	0	0	4	244
	JO5Z-08920	1X	3	4	244
	JO5Z-08920	2X	0	5	244
	JO5Z-08960	0	0	1	242
	JO5Z-08960	1X	1	0	242
	JO5Z-08960	2X	0	0	242
B. napus	Pioneer®44C73	0	0	11	249

	Pioneer®44C73	1X	0	13	249
	Pioneer®44C73	2X	1	11	249

Commercial practice

Clearfield® tolerant Juncea canola varieties will provide an option for Mallee growers to include an alternative *Brassica* species in their crop rotations. Both Clearfield® Juncea canola lines evaluated will undergo further commercial seed production and further yield and crop tolerance testing in 2008. If their performance is satisfactory they will be commercially available in 2009.

Alternative Oilseeds trial

By David Moody

Research Manager, Birchip Cropping Group

TAKE HOME MESSAGES

- Juncea canola varieties, with the advantage of lower production costs, are being bred for the lower rainfall districts to provide a Brassica break crop option. Further breeding is required to improve the yield potential of these varieties.
- Identity preservation schemes, involving the contracted production for a particular market, are required for the production of specialty oils. Growers need to carefully consider the price premiums (above canola) and the agronomic performance of these varieties. Unfortunately, currently there is very limited independent evaluation of this material.

Introduction

Considerable interest exists in the diversification of crop rotations through the use of *Brassica* species. Biofumigation of major cereal root diseases by canola break crops has been reported to provide up to a 20 per cent yield benefit for wheat after a canola crop (Angus et al., 2001) compared to wheat grown after wheat. At present, there are four main alternatives to traditional (*B. napus*) canola, viz:

1. Canola quality *B. juncea* "juncea canola".
2. Specialty canola in which *B. napus* canola has been bred for high oleic acid and relatively low linolenic acid levels resulting in canola oil with exceptional stability on frying.
3. Condiment and industrial quality oilseeds, including both high glucosinolate *B. juncea* (condiment mustards) and high erucic acid *B. napus* (rapeseed). However, high erucic acid rapeseed is no longer grown in Australia.
4. Forage brassicas, principally *B. napus* varieties but potentially other *Brassica species.*

B. juncea has both yellow and brown seed; both types are reputedly well suited to Australian conditions, with a reputation for:

- Good level of blackleg resistance
- Suited to later sowing than canola
- Much more drought and heat resistant than canola (stress tolerant)
- Yield better in lower rainfall areas
- Excellent seedling vigour
- Better ground cover and weed competition than canola
- Good lodging resistance
- Good soil bio-fumigation effects due to the high level of glucosinolates in the condiment mustard types.

2007 CANOLA & JUNCEA CANOLA TRIALS

The first juncea canola variety "Dune" was released in 2007, but there is very limited farmer experience with this variety in terms of agronomic performance and grain marketing. Breeding work for the juncea canola is continuing at DPI-Horsham, with two new, CLEARFIELD™ types being evaluated by BCG this year for herbicide tolerance. MUSCON™ is the trademark for condiment mustards bred from *B. juncea* and includes both brown and yellow seeded forms, reputedly well suited to Australian conditions.

HEMOLA™ is the trademark for specialty types of rapeseed (*B. napus*) whose oil comprises a high level (around 50%) of erucic acid compared to Canola, bred for low erucic acid (<2%). This oil profile is of increasing interest for a wide range of specialty non-food products, including bio-diesel. HEMOLA™ varieties have very similar agronomic characteristics to canola, but represent an alternative marketing option.

Forage Brassicas represent a Brassica grazing option; varieties of forage Brassica have been evaluated in other BCG projects and did not form part of this investigation. Trials were conducted by the BCG to evaluate a range of these alternative oilseed options.

Methods

A trial was sown at Manangatang on 18 May 2007 using a conventional seeder with 50mm points. 60 kg/ha SupremeZ (S) was used as a basal fertiliser for all treatments at both sites. TriflurX (1.2 L/ha) and endosulfan (500mls/ha) was applied immediately post sowing and incorporated by rolling harrows. Plots were 25 m in length and 2.5 m from centre to centre with 0.175 m row spacing.

Seed of some alternative oilseed varieties was obtained from DPI, Horsham, NuSeed and Australian Agricultural Crop Technologies (AACT) for evaluation (Table 1).

Table 1:

Origins and descriptions of varieties included in evaluation trials

Species	Variety	Description	Breeder	Marketer
B. napus	Hyola50	Early – mid, hybrid canola	Pacific Seeds	
B. napus	AV Jade	Early-Mid, conventional canola	Vic. DPI	Nuseed
B. napus	BravoTT	Early – Mid, TT canola		
B. napus	TT Monola NMT310	Specialty canola	Nuseed	Nuseed crop Network
B. napus	Monola NMC116	Specialty canola	Nuseed	Nuseed crop Network
B. juncea	Dune	Juncea canola	Vic. DPI/Viterra	Pacific Seeds
B. juncea	JC06019	Juncea canola	Vic. DPI/Viterra	Pacific Seeds
B. juncea	Var.MY05	Condiment mustard	AACT	
B. juncea	Var.M973	Condiment mustard	AACT	
B. napus	Var.HE805	Rapeseed	AACT	
B. napus	Var.MB11	Rapeseed	AACT	

Plant establishment counts were conducted eight weeks after sowing, and harvest yields recorded by direct heading.

2007 CANOLA & JUNCEA CANOLA TRIALS

Results

Plant establishment was variable due to the presence of header rows and some poor seed quality (Table 2), particularly Var.HE805 and yield results for this variety should be viewed with caution.

As described in the BCG Trial and Demonstration Overview in this manual, rainfall was very low after May, with only 35 mm during July, August, September and October. Consequently, yields were low for all varieties (Table 2) although significant differences in yields were recorded. The conventional canola variety AV-Jade was the highest yielding, whilst the yields of the newly released juncea canola variety Dune and the condiment mustards were disappointing. Yields of the industrial quality rapeseed varieties Var.MB11 was similar to the conventional canola variety ^{AV}Jade.

Whilst direct heading was used, it is unlikely that any variety was disadvantaged by this technique as shattering and lodging were minimal.

Table 2:

Plant establishment and grain yield at Manangatang. NB: Yield results for this variety should be viewed with caution.

Variety	Establishment (plants per m^2)	Grain Yield (t/ha)
Hyola50	85	0.172
AV-Jade	75	0.294
Bravo	78	0.157
TT Monola NMT310	72	0.240
Monola NMC116	64	0.236
Dune	72	0.101
JC06019	62	0.191
Var.MY05	58	0.078
Var.M973	91	0.180
Var.HE805*	10	0.164
Var.MB11	78	0.269
LSD (5%)	23.3	0.096

*low germination percentage led to poor plant establishment

Commercial practice

Juncea Canola and condiment mustard varieties need to be evaluated in a farming systems context to determine the true value of *B. juncea*'s greater earlier vigour, reduced shattering and reputed greater tolerance of heat and drought stress. The results presented from the trial at Manangatang provided no evidence to suggest the currently available varieties have yield potentials that are superior to conventional canola varieties in low rainfall, low yielding environments.

Varieties of Muscon, Monola and Hemola must be grown using Identity Preservation Schemes, which involves the contracted production of these varieties for a particular enduser. Price premiums above conventional canola need to be negotiated on a case by case basis and growers need to be aware that for many of these varieties there is very limited independent agronomic evaluation has occurred.

References

Angus, J.F., Kirkegaard, J.A. and Peoples, M.B. (2001). Rotation, Sequence and Phase: Research on Crop Pasture Systems. In: Proceedings of the Australian Agronomy Conference, Australian Society of Agronomy, Hobart.