

SOUTH AUSTRALIAN RESEARCH & DEVELOPMENT INSTITUTE
PIRSA

Beet Western Yellows Virus (synonym: Turnip Yellows Virus) and its vector Green Peach Aphid in canola

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Epidemic southern cropping region 2014

- Reports of failing canola crops – started mid June
- Initially in South Australian lower North and Mallee regions
- Entire paddocks with purple/yellow leaves at rosette stage
- Confused with herbicide damage and or sulfur deficiency
- GPA reported widespread in high numbers (>5 per leaf on every plant)
- GPA sprayed out before entomologists and pathologists visited crops –difficult to identify losses from direct feeding damage
- 100% infection by BWYV identified in plants submitted to VIC DEPI Horsham

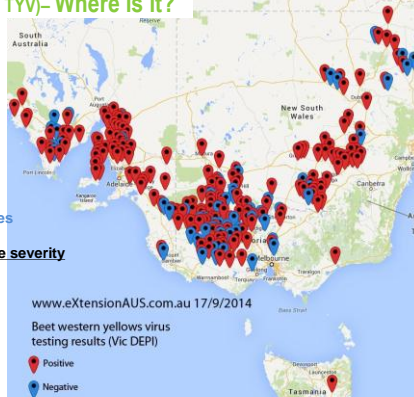
Epidemic southern cropping region 2014

- Field day organised at Riverton (SA) by private agronomists June 30th
- Early industry estimates of >66,000 ha infected potential 50% yield loss
- Up to 10,000 ha in lower north infected at the vulnerable rosette stage
- Extensive industry and media interest
- >600 canola crops, >100 weeds, >80 pulse crops tested in 2-3 month period (tested in VIC DEPI and NSW DPI, some blotting in SARDI Pulse Pathology)



Riverton June 30

BWYV (synonym TYV)– Where is it?



Mid Sept - 618 crops tested
290 crops from SA

57% crops infected
86.6% in SA
30.8% in eastern states

Map does not indicate severity

5-10,000 ha in SA severely affected

Rest grew 'normally'

www.eXtensionAUS.com.au 17/9/2014

Beet western yellows virus testing results (Vic DEPI)

Legend: Positive (Red dot), Negative (Blue dot)

http://www.extensionaus.com.au/spread-of-beet-western-yellows-virus/

BWYV (synonym TYV)– infection in SA 2014

Results to Sept 2014	Number of canola BWYV tests in 2014 (%)	
	Positive	Negative
SA District		
Lower North	58 (93.5%)	4 (6.5%)
Mid North	10 (100%)	0
Upper North	17 (94.4%)	1 (5.6%)
Mallee SA	22 (95.6%)	1 (4.4%)
Yorke Peninsula	56 (96.6%)	2 (4.4%)
Mid & Upper EP	36 (81.1%)	8 (18.9%)
Lower Eyre Peninsula	36 (66.7%)	18 (33.3%)
South East	16 (76.2%)*	5 (23.8%)
Total	251 (86.6%)	39 (13.4%)

*actual percentage may be lower in South East due to symptomatic sampling

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BWYV (synonym TYV)–Infection in weeds in SA 2014

Results to Sept 2014	Number of canola BWYV tests in 2014 (%)	
	No. of Positive samples	Average infection rate
Weeds		
Long fruited turnip, wild turnip, turnip	17/17	83.6%
Marshmallow	5/22	4.2%
Indianhedge Mustard, Mustard	3/13	7.2%
Sowthistle	1/3	37%*
Yellow Burr weed	2/2	100%*
Milk Thistle	1/2	50%*
Salvation Jane	1/1	100%*
Oxtongue	1/1	100%*

Many other weeds were tested and found uninfected; including bedstraw, charlock, dandelion, geranium, London rocket, medic, soursob, sowthistle, short fruited turnip, capeweed, vetch

* Small sample number distorts average percentage

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Impact of BWYV (synonym TYV) on yield in SA 2014? (estimates from agronomists)

Yield loss ranged from 75% loss to negligible

- 10-15% crops yielded 500-600 kg; early virus infestation
 - Lower North, Mallee, Lock
- 50-60% crops yielded ~ 1 t/ha; infestation after rosette stage
 - Lower & Mid North, fewer crops in this category on EP
- 20-25% crops yielded ~ 2 t/ha; no virus
 - Lower and Mid North, more in this category on EP

Interactions with -

- Diamondback moth (did aphid sprays reduce beneficial insects?)
- frost, waterlogging and drought

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BWYV agronomic influences

Varieties - visual assessment and laboratory virus tests

NVT trial – Roseworthy SA sampled 6 August



FT variety	Mean Virus test	Visual %LAD
ATR Stingray	30 a	3.3 b
T18093	66.67 b	31.7 cde
Hyola 559TT	80 bc	35 abcd
Hyola 650TT	80 bc	48.3 cde
NL0809	83.33 bcd	55 cde
Hyola 750TT	91.67 bcde	45 bcde
Monola 314TT	91.67 bcde	33.3 abcd
NT0251	91.67 bcde	55 cde
T18096	93.3 de	63.3 de
ATR Bonito	93.33 de	58.3 de
CB1301TT	93.33 de	36.7 abcd
NL0805	93.33 de	18.3 abc
NL0851	93.33 de	8.3 ab
NL0852	93.33 de	31.7 abcd
ATR Wahoo	95 de	45 bcde
CB1302TT	95 de	26.7 abcd
ATR Gem	96.67 de	75 ef
NL0853	98.33 de	55 cde
NT0252	100 e	100 f
LSD	16.25	38.1

IMI variety	Mean Virus test	Visual %LAD
PHW-1402	13.33 a	53.3 ab
PHW-1401	26.67 a	28.33 a
Hyola 577CL	50 b	100c
Archer	71.67 c	31.7 a
Pioneer 44Y87 (CL)	76.67 cd	86.7 bc
Fiber	78.33 cd	100c
PHW-1305	78.33 cd	100c
Pioneer 45Y88 (CL)	85 cd	76.7 bc
Pioneer 45Y86 (CL)	90 cd	91 bc
Pioneer 5132 (CL)	91.67 cd	98.3c
Hyola 575CL	93.33 d	93.3 bc
H5HC133 (CL)	95 d	80 bc
Hyola 474CL	96.67 d	100c
LSD	20.22	43.48

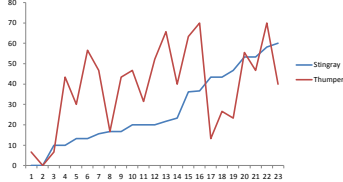
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BWYV Stingray vs Thumper

Virus laboratory test 23 SABL0D trials sampled in spring
(Marcroft, Sprague, Khangura, Bambach)

- Stingray ranged 0- 60% infection (>30% in 9 sites)
- Thumper ranged 0-70% infection (>30% in 15 sites)
- Thumper < Stingray in 6 sites

% BWYV Stingray & Thumper in 23 SABL0D trials spring 2014



Is this variability due to lateness of sampling?

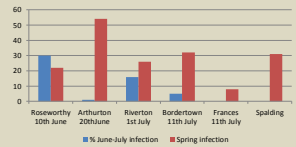
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BWYV SABL0D trials

Virus laboratory test 6 SA SABL0D trials sampled in winter

Winter = 100 petioles across trial
No symptoms in winter sampling
Mummified aphids at Roseworthy
Already 30% infected
Spring = Stingray & Thumper
Arthurton higher rate than Roseworthy (and other sites) but less symptoms

% BWYV infection in SA SABL0D trials

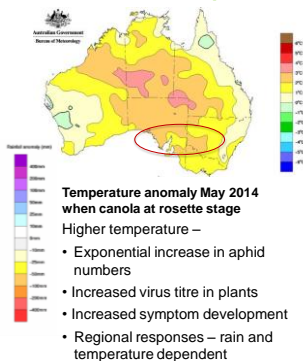
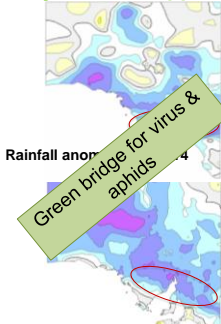


Little difference between state averages in spring sampling.
Is winter sampling a better indicator of epidemic risk?
Are both winter and spring sampling informative?

	Average infection per state (spring sampling)
NSW	24
SA	35
Vic	37
WA	32

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Why did this happen – autumn rain and temperature



Rainfall anomaly Apr 2014
<http://www.bom.gov.au/climate/maps/>

Messages for industry

2015 season no greater risk than any other season

- Seasonal conditions appear to be the driver for BWYV outbreak

Control of green bridge and weeds prior to sowing

- SARDI monitoring 6 sites in mid north of SA for weeds and GPA leading up to and 4 weeks after sowing
- Virus tests immediately before sowing

If high risk use crop management strategies

- seed dressings, standing stubble, higher sowing rates
- GRDC/SAGIT survey still being analysed
- 156 completed questionnaires (goal 300-400)
- 141 harvest replies (still coming in)

SA	96
Vic	57
NSW	3

Monitor for aphids in seedling crop and spray if necessary

- Insecticide resistance in green peach aphid

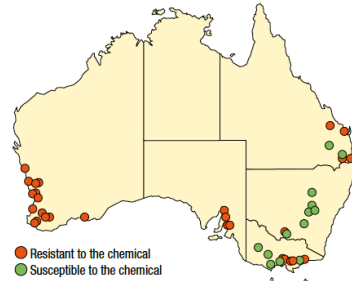
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The Vector: Green Peach Aphid (*Myzus persicae*)

- Transmitted persistent fashion at 97% efficiency by GPA
- Lower efficiency by cabbage aphid (14%)
- Rothamsted study (UK) found 20- 72% of GPA carried BWYV varying with each season (Stevens et al 2008)
- GPA is highly polyphagous i.e. feeds on wide host range
- GPA can transmit over 100 different virus species



Resistance to pyrethroids – 2012/2013



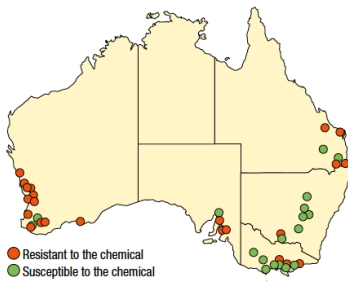
Courtesy Paul Umina cesar (2015)

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Resistance to carbamates – 2012/2013



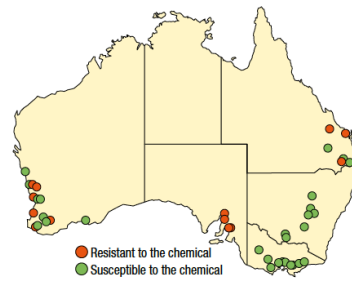
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Resistance to organophosphates – 2012/2013



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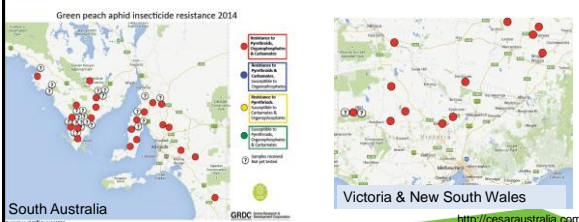
www.cesaraustralia.com



GPA insecticide resistance 28 Aug 2014 Paul Umina cesar

Foliar insecticides applied but ineffective –

- GPA resistant to synthetic pyrethroids, organophosphates and carbamates
- Transform (sulfoxaflor) applied too late
 - virus infection and feeding damage from aphids already occurred



Insecticide resistance summary

Insecticide Group	Example product names	Known resistance	Implications for GPA control
SP's (3A)	Astound, Dominex, Fastac etc	Widespread	SP's not recommended (including as an anti-feed)
Carbamates (1A)	Pirimicarb Eg. Pirimor®, Aphidex etc	Becoming widespread	Carbamates likely to be ineffective in many situations. Ensure sprays applied under ideal conditions
OP's (1B)	Dimethoate, Chlorpyrifos, Lorsban etc	Common	Consider small strip field test to assess efficacy
Sulfoxaflor (4C)	Transform™	None	If OP & Carbamate R suspected, Transform is 'best-bet' option

Courtesy Paul Umina cesar (2015)

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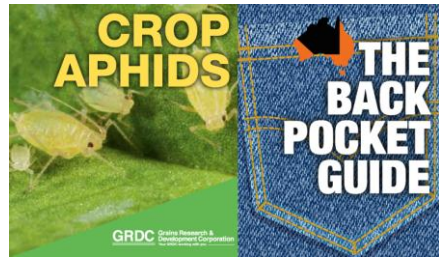
GPA insecticide use – future years?

Potential for overuse of the limited number of insecticides
 Risk of GPA developing additional insecticide resistance to:

- Neonicotinoid seed dressings –
 - Gaucho® (imidacloprid), Cruiser Opti® (thiamethoxam)
- Foliar spray Transform® (Sulfoxaflor)
- Insecticides implicated in colony collapse disorder of bees
- EU plans to restrict use of neonicotinoids; Australia to follow?
- Need for judicious use of insecticides and IPM



www.grdc.com.au/CropAphidsBackPocketGuide



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<http://ipmguidelinesforgrains.com.au/ipm-information/resistance-management-strategies/>

AUGUST 2014
RESISTANCE MANAGEMENT STRATEGY FOR THE GREEN PEACH APHID IN AUSTRALIAN GRAINS
 GRDC
 Grains Research & Development Corporation

KEY POINTS

- Green peach aphid (GPA) are a widespread and damaging pest of cereals and a range of other crops causing damage by feeding and transmitting viruses.
- Five chemical subgroups are registered to control GPA in grain crops: carbamates (Group 1A), synthetic pyrethroids (Group 3A), organophosphates (Group 1B), neonicotinoids (Group 4A), and sulfoxylates (Group 4C). Fluralaner (Group 4D) is also registered for suppression of GPA.
- High levels of resistance to carbamates and pyrethroids are now widespread across Australia. Moderate levels of resistance to organophosphates have been observed in many populations, and there is evidence that resistance to neonicotinoids is emerging.



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www.grdc.com.au/GRDC-TnT-ReducingAphidVirus
<http://cesaraustralia.com/latest-news/>
http://www.sardi.sa.gov.au/pestsdiseases/publications/crop_watch

Tips and Tactics
 Reducing aphid and virus risk
 GRDC
 Grains Research & Development Corporation
 FEBRUARY 2015

Early management decisions are key to reducing aphid and virus risk in 2015

KEY POINTS

- Destroy green-bridge over summer and autumn prior to sowing.
- Do not use cereals that have seedling resistance volunteers, otherwise, aphids will move directly from the weeds to the emerging seedlings.
- Monitor green peach aphid (GPA) populations on weeds, volunteers and seedling cereals crops.
- Use seed treated with a neonicotinoid insecticide and ensure proper application and coverage of seed dressing for efficacy against GPA.
- Ensure correct identification of GPA before applying insecticides to protect seedling cereals.

Current situation

There was significant rain over much of the southern cropping zone and parts of Western Australia during January 2015. In many areas, this rainfall has produced a green-bridge (between-cereals host for pests and diseases) that includes volunteer cereals, wild radish, wild turnip and marestail. These weeds and volunteers can host large populations of insects, including aphids, as well as viruses, and need to be destroyed prior to sowing. Widespread resistance of green peach aphid (GPA) to insecticides prevented application for an outbreak of *Black seedling problem virus* (BSPV) in 2014. BSPV is not seedborne and is transmitted into cereals crops by aphids carrying the virus. Several other species transmit BSPV, but GPA is the principal vector and the most common species on juvenile cereals plants.

Although further rainfall and mild temperatures during summer and early autumn are necessary for an increase in GPA populations and associated virus risk, early weed control will reduce the risk. Growers should continue to pay attention to weather conditions (rainfall and mild temperatures) leading into the sowing season because this will provide a good indication of the risk of GPA and BSPV.

Background

In 2014, aphid crops across the Lower South, Mid North and East Pastoral in South Australia, western Victoria and some parts of New South Wales were severely affected by the BSPV leading to significant yield losses. The severity of the BSPV outbreak was most likely due to a combination of the following factors:
 - summer rainfall, which resulted in a green-bridge of weed hosts for aphids and BSPV.

RDI

Acknowledgements

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 Many other agronomists

Brenda Courtts, virologist DAFWA

Murray Sharman, virologist QDAFF

Katherine Hollaway & eXtension Aus (Vic DEPI)

Anyone else that we forgot



Photo: Eudunda (SA) Aug 21st
 same paddock in aerial photo July 8th

