

TURNIP YELLOWS VIRUS EPIDEMICS IN 2018

IT'S TIME TO GET ONE STEP AHEAD OF THE GREEN PEACH APHID



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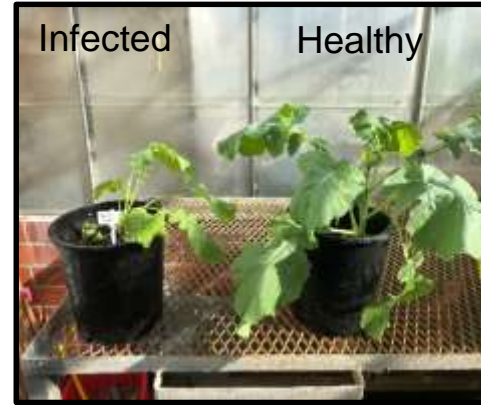
Turnip yellows virus epidemics in 2018

It's time to get one step ahead of the
green peach aphid



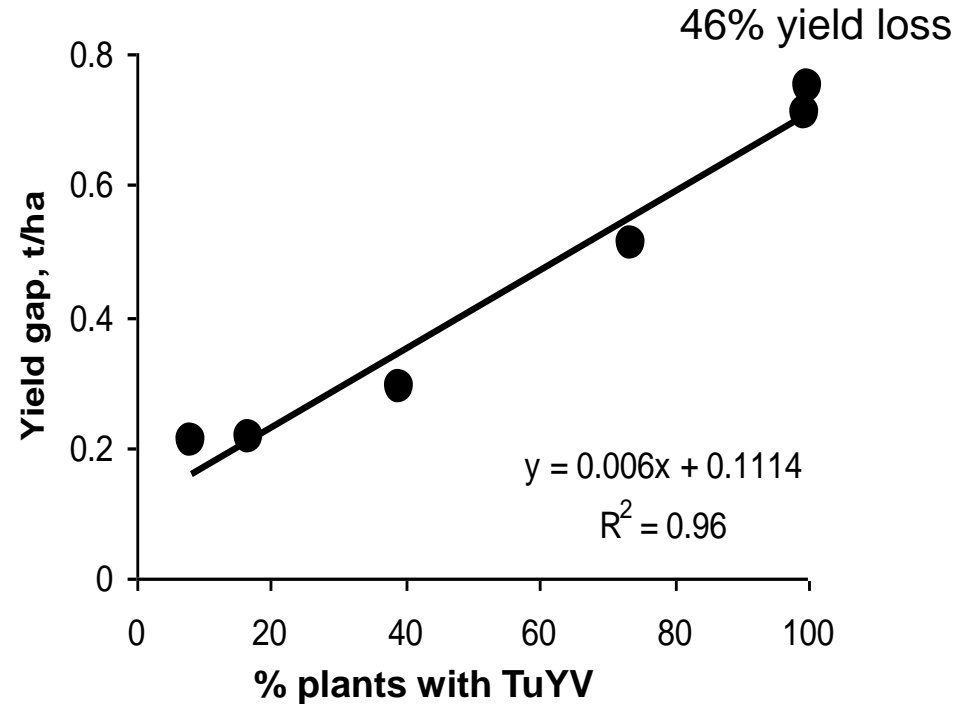
Turnip yellows virus (TuYV)

- Infects canola and pulses
 - Externally sourced
 - Persistently transmitted by green peach aphid (GPA)
 - Vector manipulated to enhance spread
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- ↑ Summer and early autumn rainfall events
 - ↑ Green-bridge
 - ↑ Reservoir
 - ↑ Epidemic risk

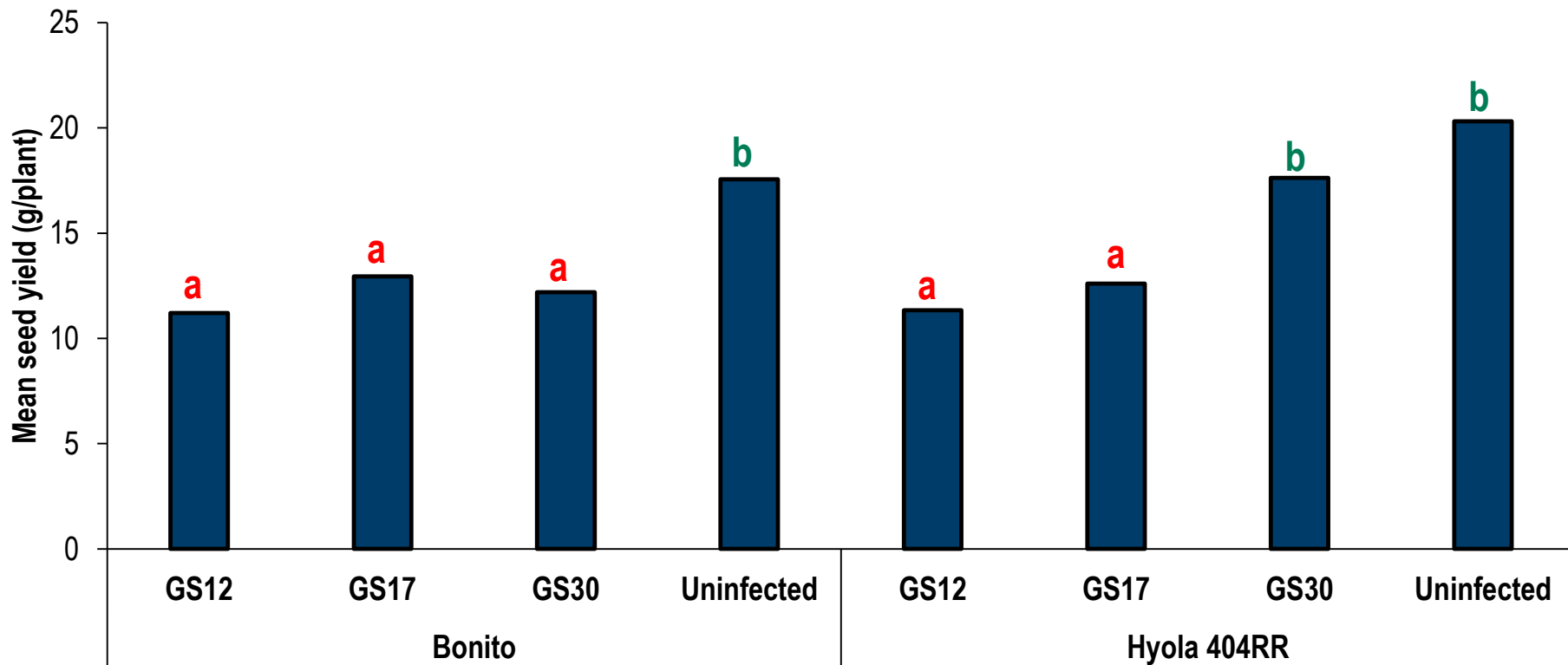


Potential impact on seed yield and quality

- 25-50% yield loss
- 2-3% decrease in oil content
- 40% increase in erucic acid
- 10% increase in glucosinolates



Effect of growth stage on yield loss



From three repeat glasshouse experiments

Commercial cultivars highly susceptible

Variety	Susceptibility
43Y23	S
44Y25	S
45Y27	S
Mako	S
Bonito	S
Gem	S
GT53	S
404RR	S
525RT	S
559TT	S
Stingray	PR
T4510	S
Thumper	S
Wahoo	S

- Partial resistance identified in Stingray
- Decreases virus concentration
- Mechanism identified in Europe >18 years ago
- Durable resistant varieties bred in Europe
- +12% yield advantage in high disease years
- Exploring other resistance in *B. rapa* and *B. oleracea*

Severe TuYV epidemics in 2018

- Esperance port zone
- Green bridge followed by dry period
- Early infestation of GPA in young canola crops



Severe TuYV epidemics in 2018

- TuYV infected 70-100% plants before flowering in all crops tested
- Sulfoxaflor applications too late
- Enormous reservoir for viral infections in pulses



Epidemics more frequent and severe in the future?

CULTURAL

- Area sown to canola higher
- Highly susceptible varieties
- Earlier sowing exposing plants to autumn aphid flights for longer

CHEMICAL

- Variable efficacy of neonicotinoid seed dressings
- Deregistration due to impact on beneficials
- Resistance

CLIMATIC

- Increasing summer rainfall events
- Warmer autumns
- Increased CO₂ – increase in virus titre and symptom severity

Management - IDM approach

PRE-SOWING

- Remove external hosts
- Avoid sowing during peak aphid flights
- Neonicotinoid seed treatment
- High sowing density – early canopy cover
- Vigorous varieties
- Stubble retention

Imidacloprid (600g/L)	Thiamethoxam (210g/L) + Lambda-cyhalothrin (37.5g/L)	Clothianidin (360g/L) + Imidacloprid (240g/L)
400 mL/100kg	500-1000 mL/100kg	500 mL/100kg



Management - IDM approach

POST-SOWING

- Systemic insecticide application – currently only sulfoxaflor (e.g. Transform)
-

GPA insecticide resistance

- Highly adaptable insect
- Most resistant insect in the world
- In Australia:
 - Target site resistance to synthetic pyrethroids and carbamates
 - Metabolic resistance to organophosphates, neonicotinoids
- Current chemistries should be used proactively and non-prophylactically



Requirement for earlier TuYV detection

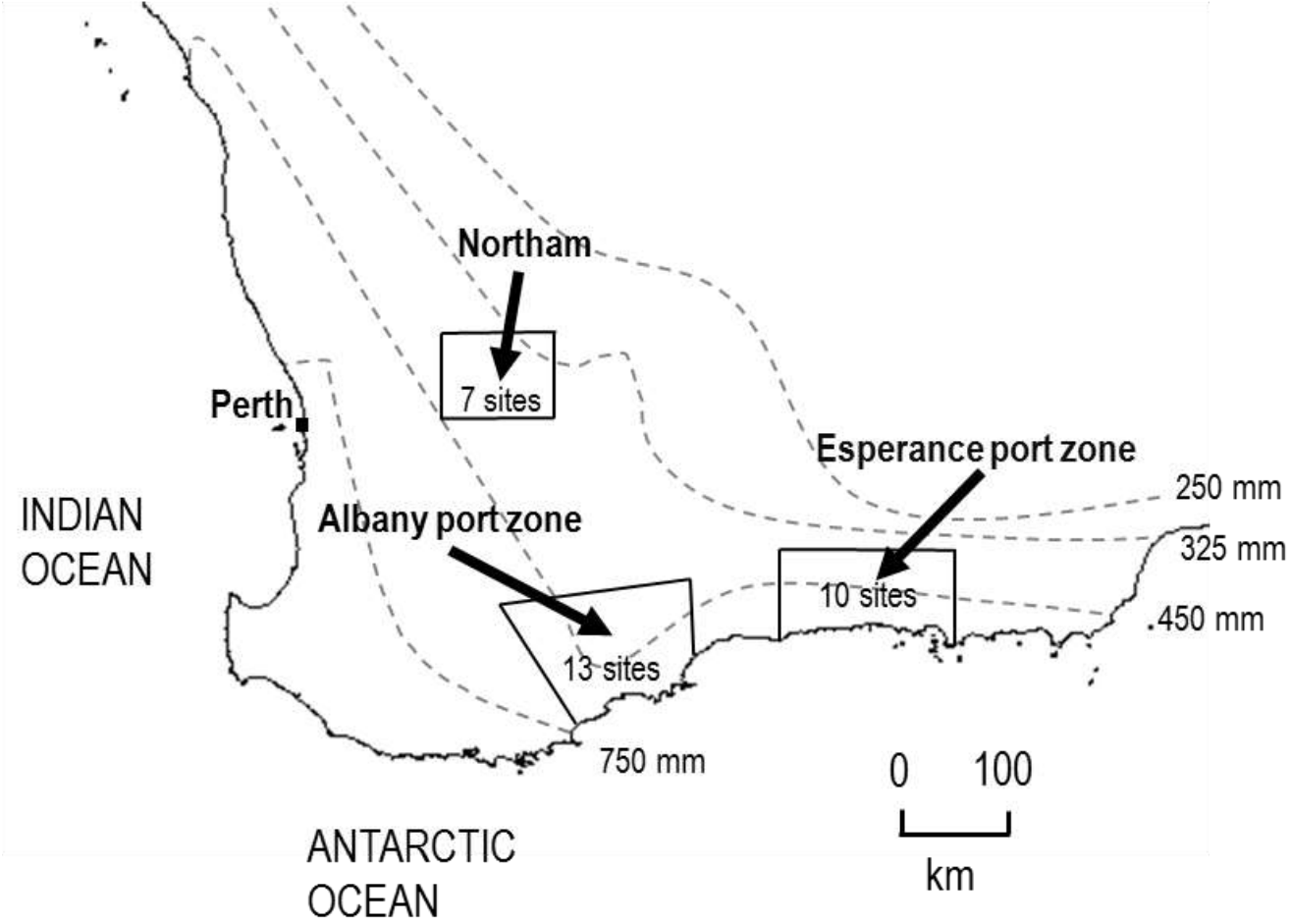
- Traditionally test leaves in symptomatic crop using serology, often too late.
- Developed LAMP to detect 1 virus-carrying aphid in 100 non-carriers, and in aphids on traps
- Can detect GPA separately

But would it...

1. Work under field conditions?
2. Provide earlier detection?
3. Be useful for management?



In-field validation 2017/2018



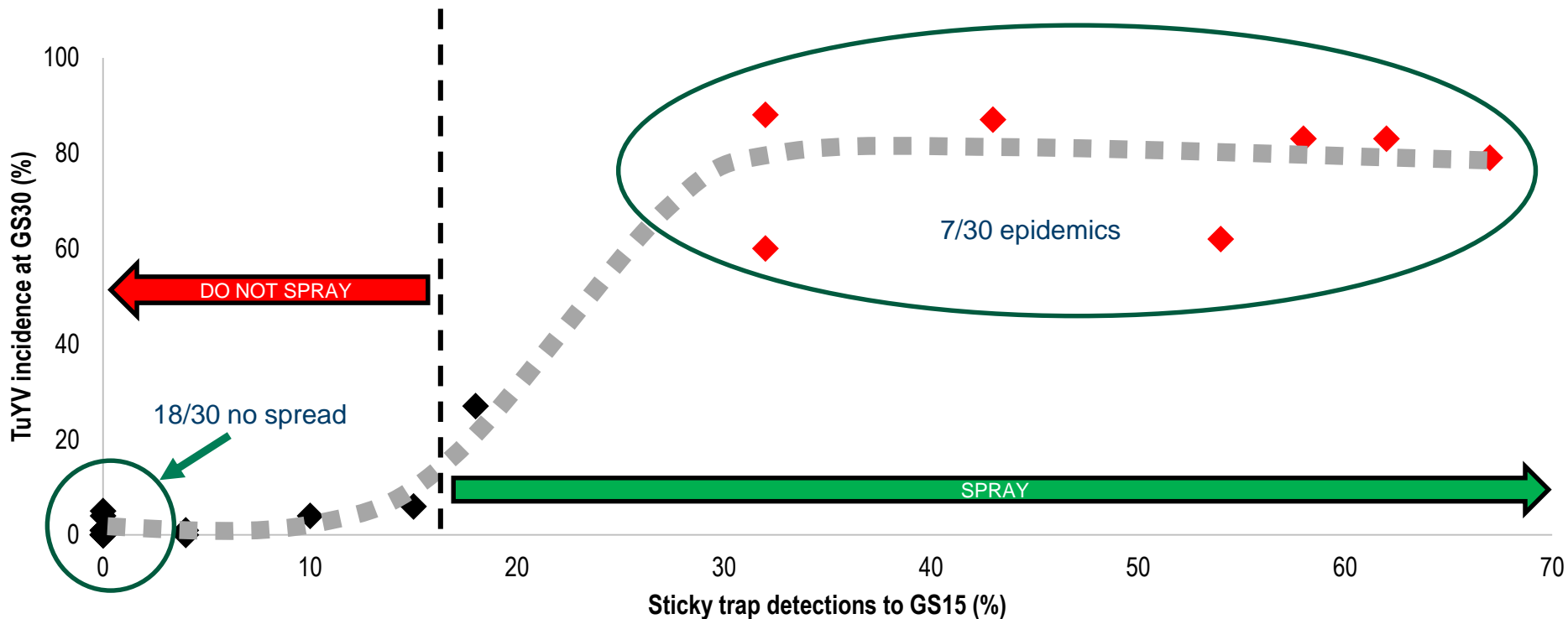




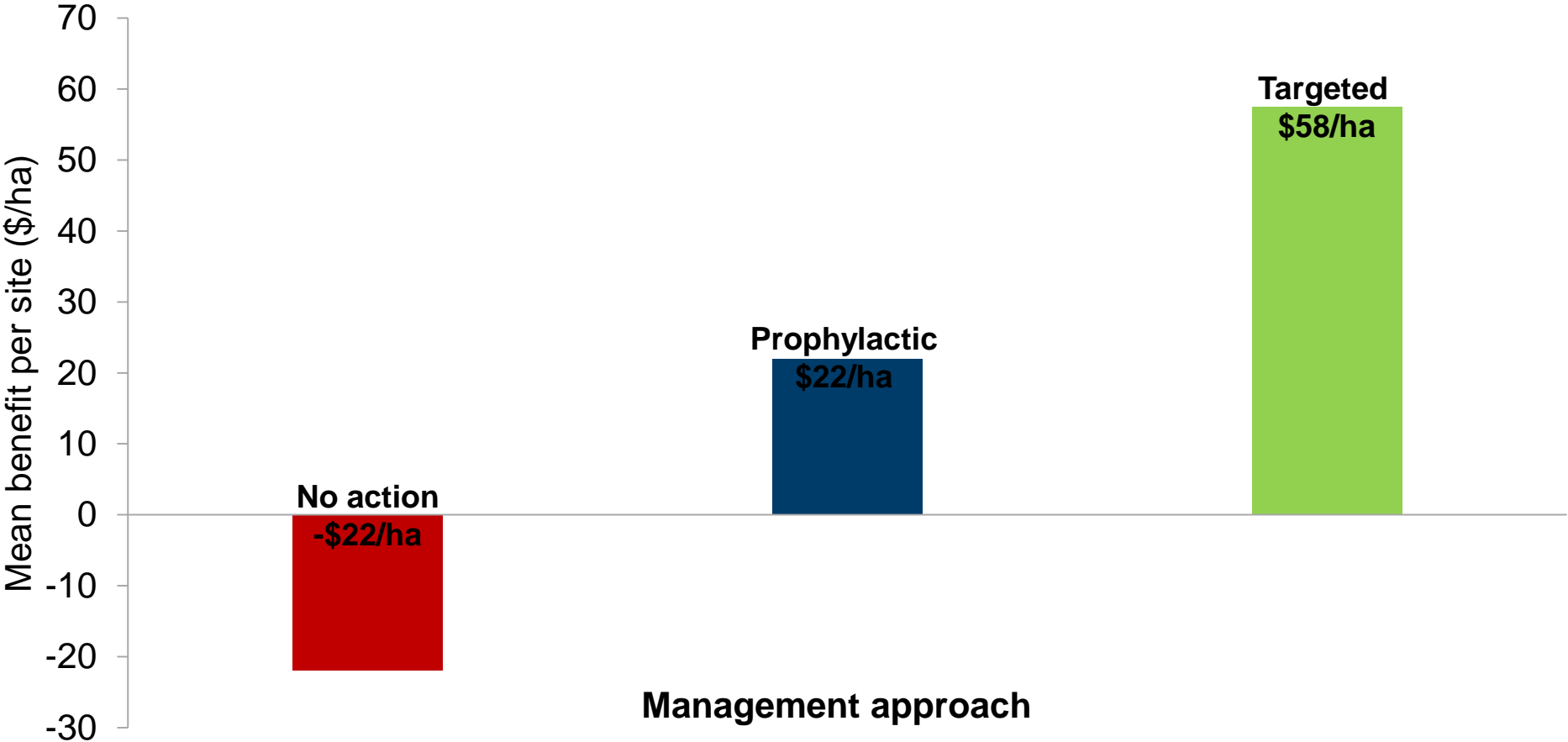


TuYV-LAMP protocol - Early warning system

1. Reliable under field conditions
2. Provided TuYV detection before it spread through the crop
3. Early enough to inform a targeted insecticide application decision



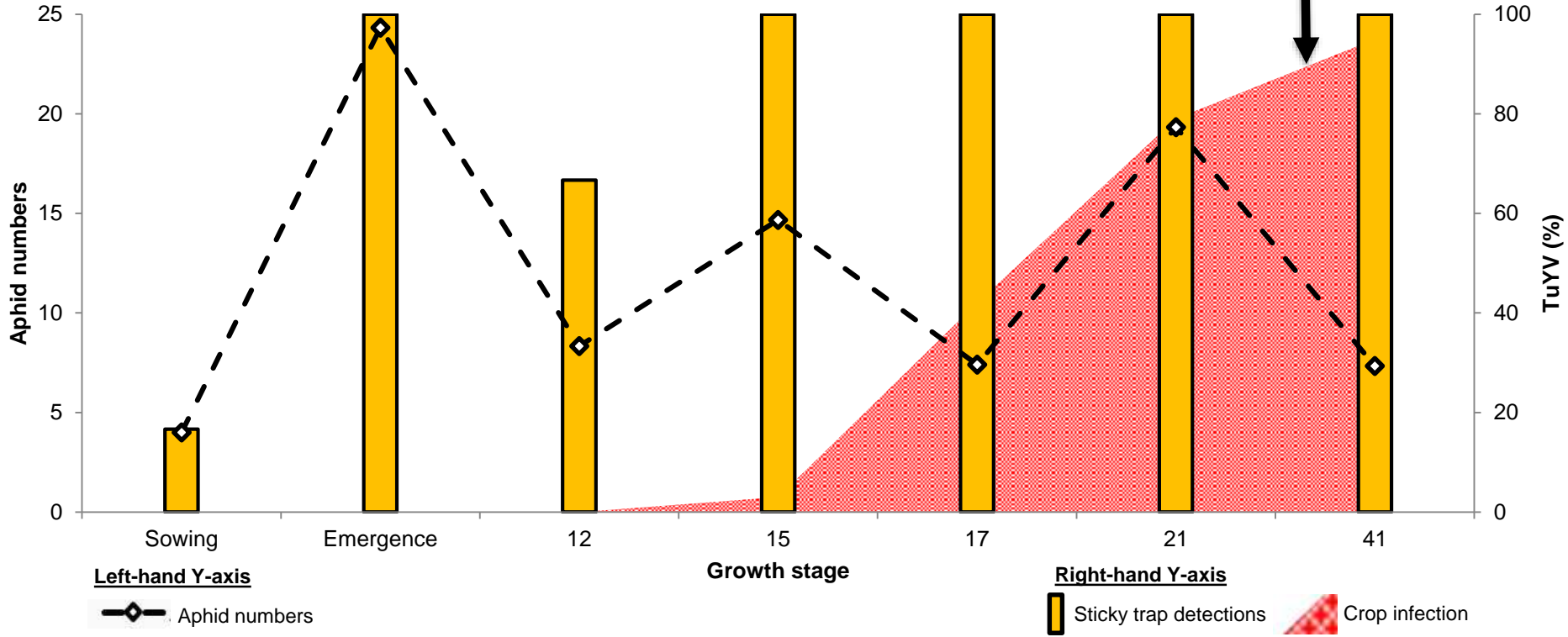
Early warning system – potential benefits



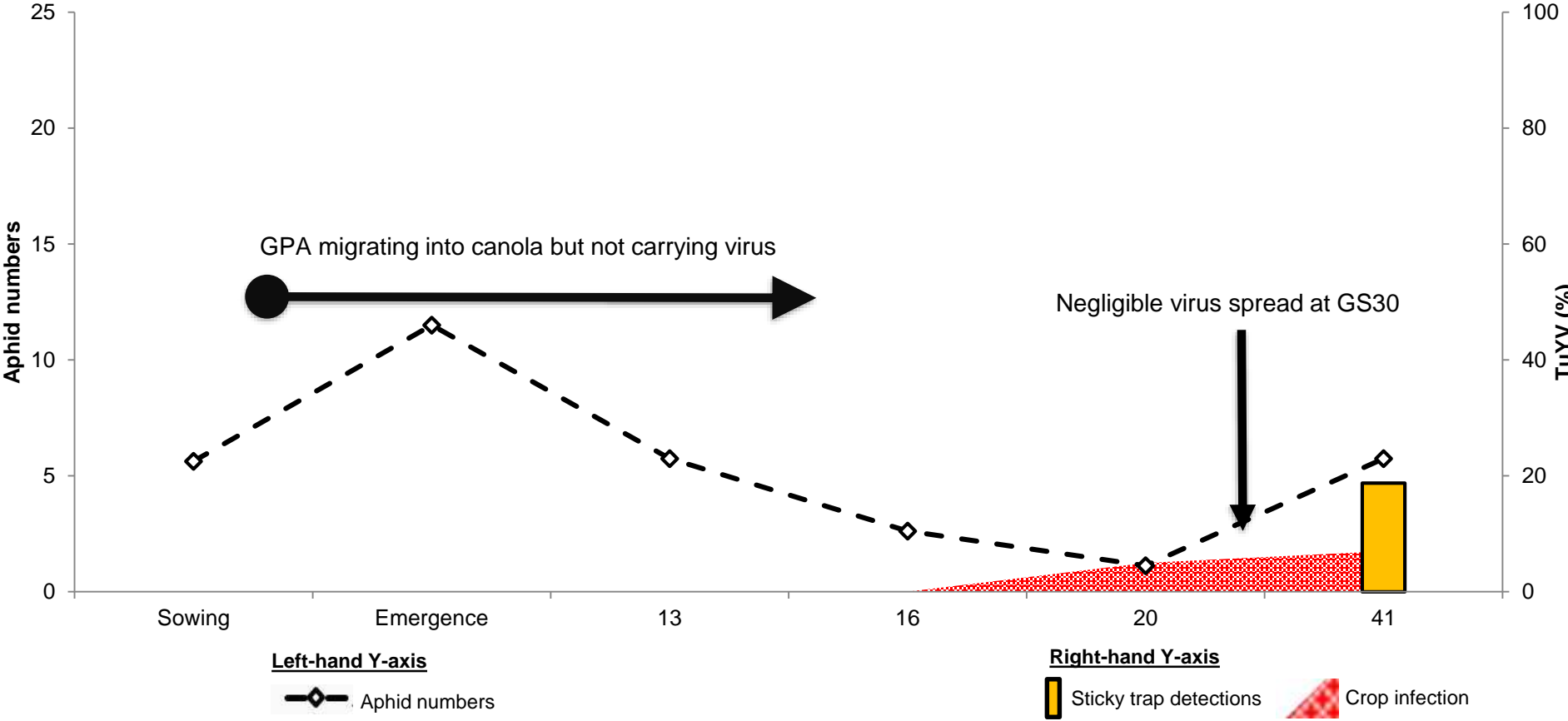
Coomalbidgup 2018

Virus-carrying GPA migrating into canola →

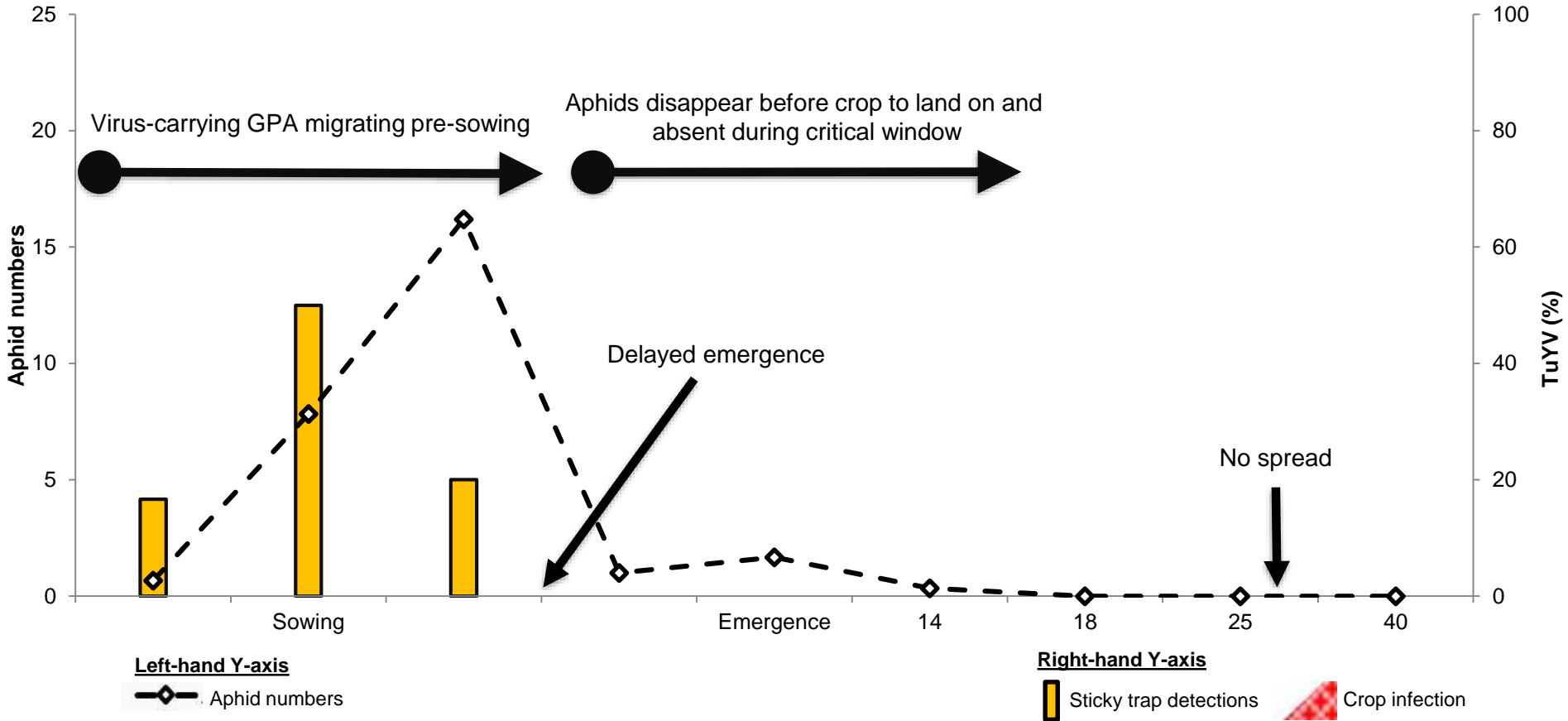
Severe epidemic ↓



Coomalbidgup 2017



Woogenellup 2018



Early warning system

- Surveillance in some locations and extended through usual channels
- For advisors and growers in high risk areas
 1. Get free sticky traps from DPIRD
 2. Attach two or three to the fence line after sowing
 3. Collect and send back to DPIRD for testing
 4. Repeat every two to four weeks (until GS15)
 5. Advise on management decision
 6. Follow-up testing at GS30 to validate
- Will be improved by grower engagement and increased automation

Future research

- Improve aphid flight predictions— targeted deployment
- Continual surveillance
- Continual assessment of new commercial varieties
- Better understanding of seed dressing effectiveness
- Best use of currently registered systemic insecticides
- Role of newly registered insecticides
- Incorporating durable quantitative resistance into high yielding varieties
- Exploring 'next-generation' control
 - CRISPR/cas9
 - RNAi
 - Biodegradable insect repellents

Thank you

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Important disclaimer

The Chief Executive Officer of the Department of Primary Industries and Regional Development and the State of Western Australia accept no liability whatsoever by reason of negligence or otherwise arising from the use or release of this information or any part of it.

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