



Industry &  
Investment



# INSECTICIDE RESISTANCE IN SHEEP BLOWFLY... now and then

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# CONTROL FAILURE

..... WHEN THINGS DON'T GO AS PLANNED

**Occurs when a pesticide application does not control a pest as well as expected and may occur because of-**

- unrealistic expectations of the producer
- failure to apply the product correctly (dose/head and as per label directions)
- failure to provide adequate prevention from re-infestation post-treatment
- **insecticide resistance**

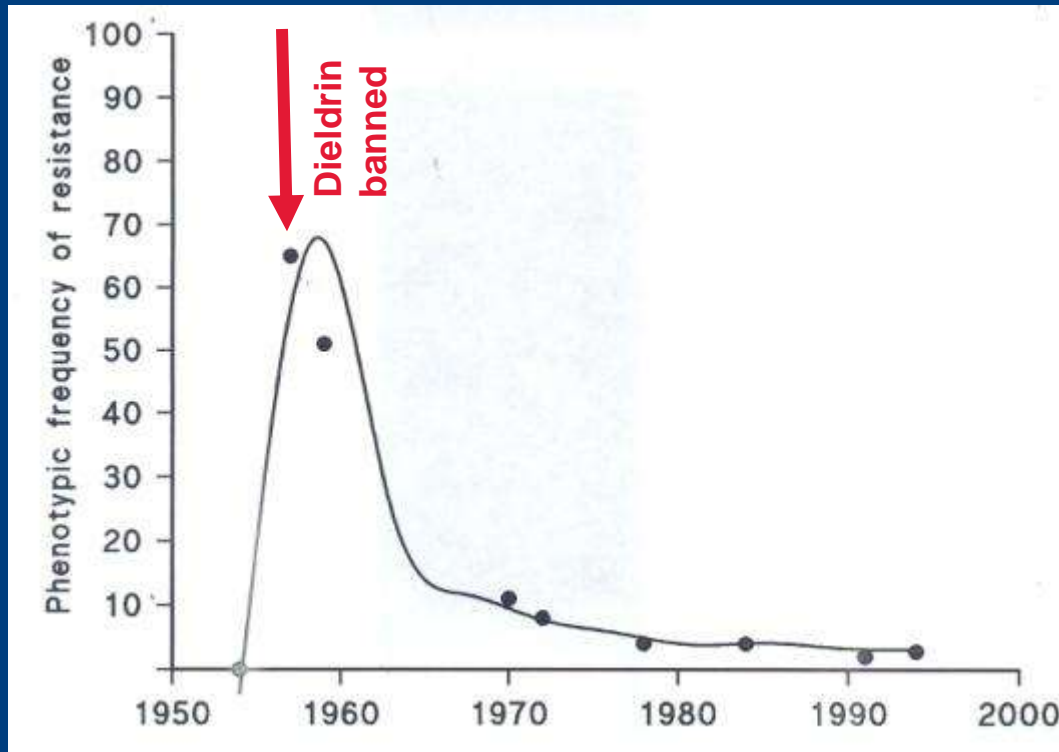
# RESISTANCE – risk factors

- Persistent and diminishing residues (time and space)
- Over reliance on a single chemical class (or different classes with shared MOA)
- High variability in susceptibility within target population
- Large proportion of population exposed to treatment (nowhere to escape to!)
- Multiple life-stages exposed to treatment
- Low damage tolerance (frequent treatments used)
- No natural control agents or loss of natural control agents
- Multiple applications of single chemical class to same population
- Multiple generations per year
- Poor application (uneven coverage)

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# Eg. Organochlorine (dieldrin) resistance



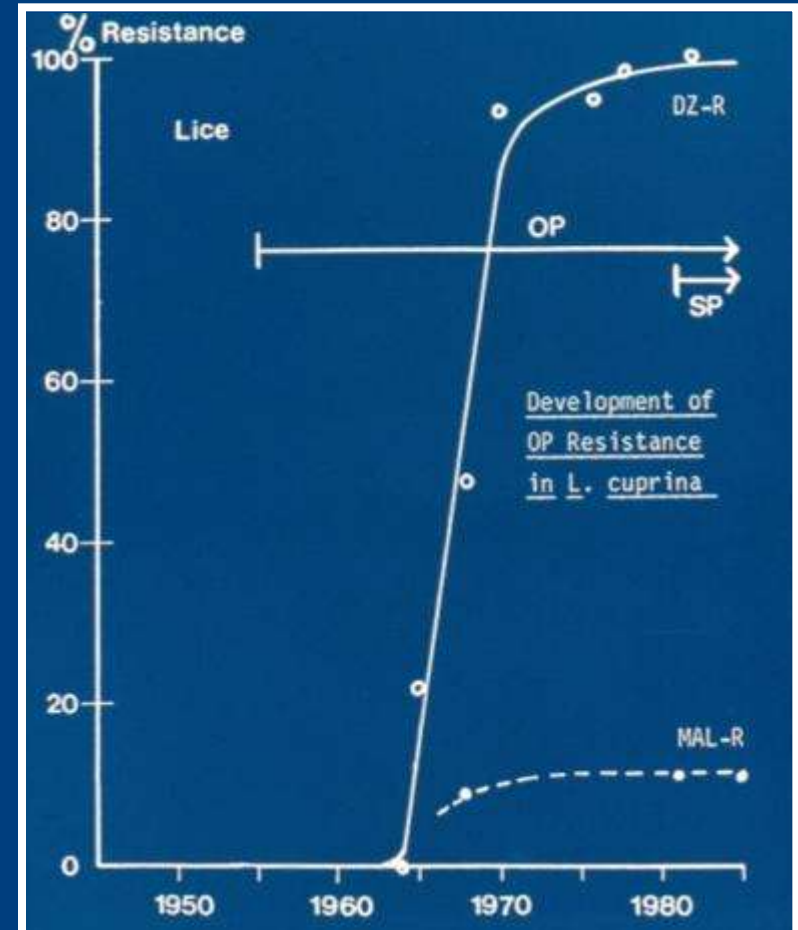
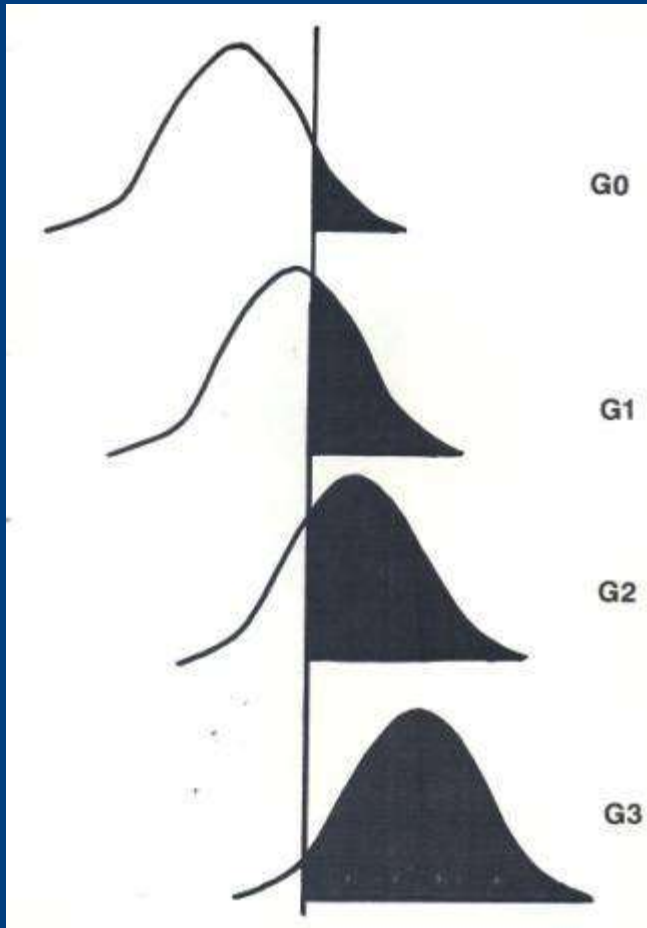
## Take home message #1:

*Once there are resistant individuals in a population they are likely to persist at low frequency as long as that population exists.*

# RESISTANCE – risk factors

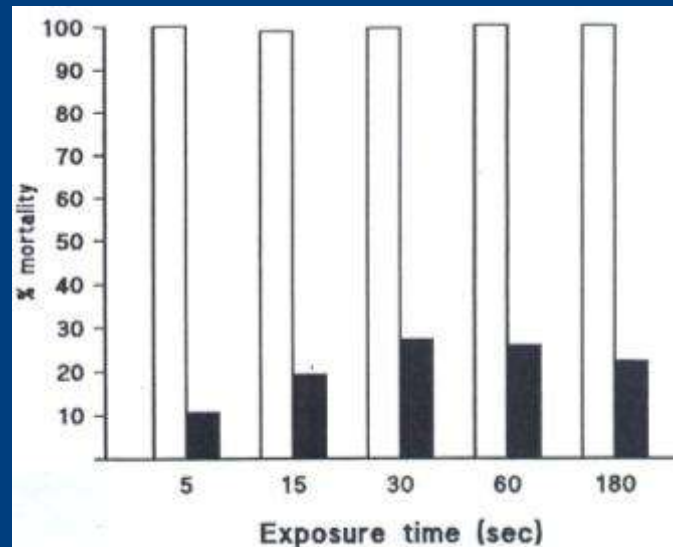
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# Eg. Organophosphate (diazinon) resistance.





# RESISTANCE – practical effects





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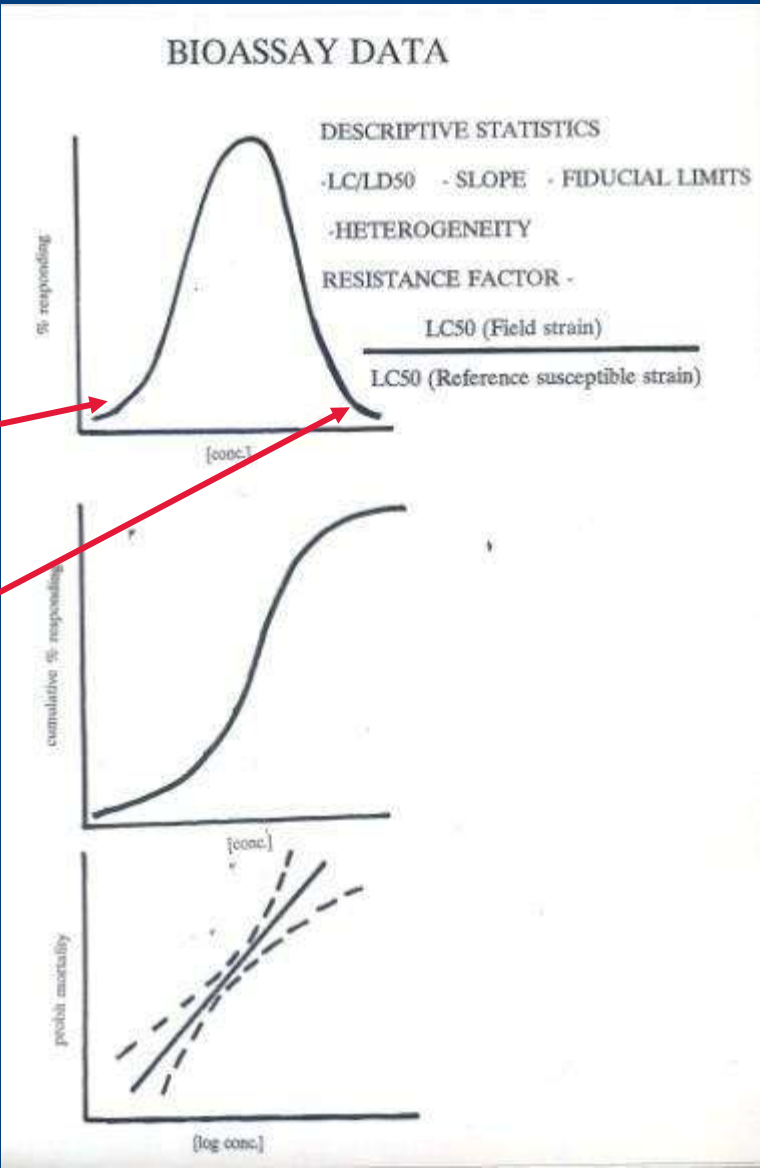
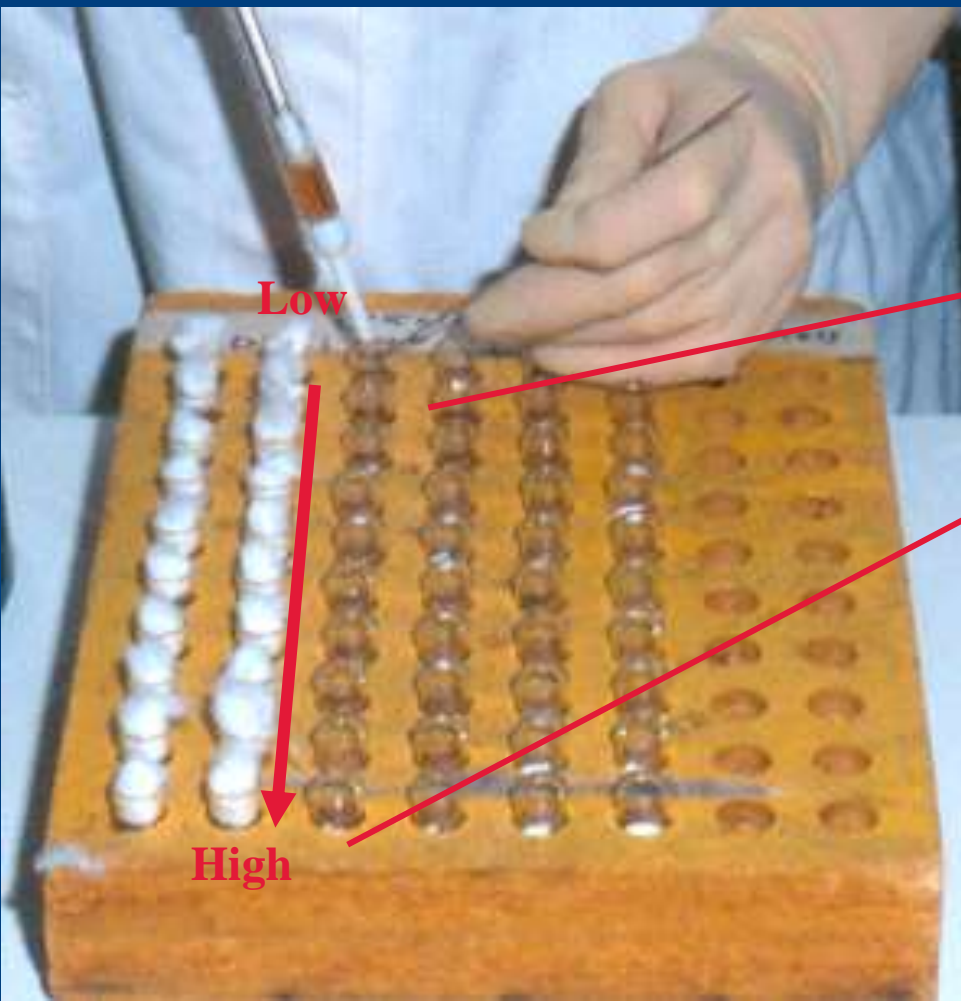


**Flystrike protection period  
reduced from 16 weeks to only  
2 – 4 weeks!**

# RESISTANCE – risk factors

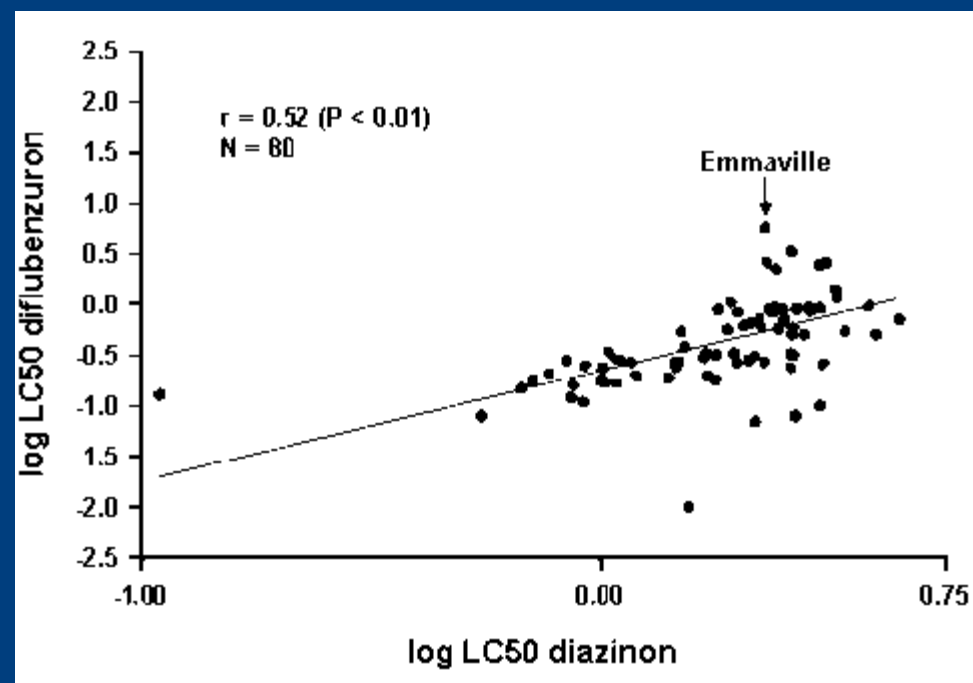
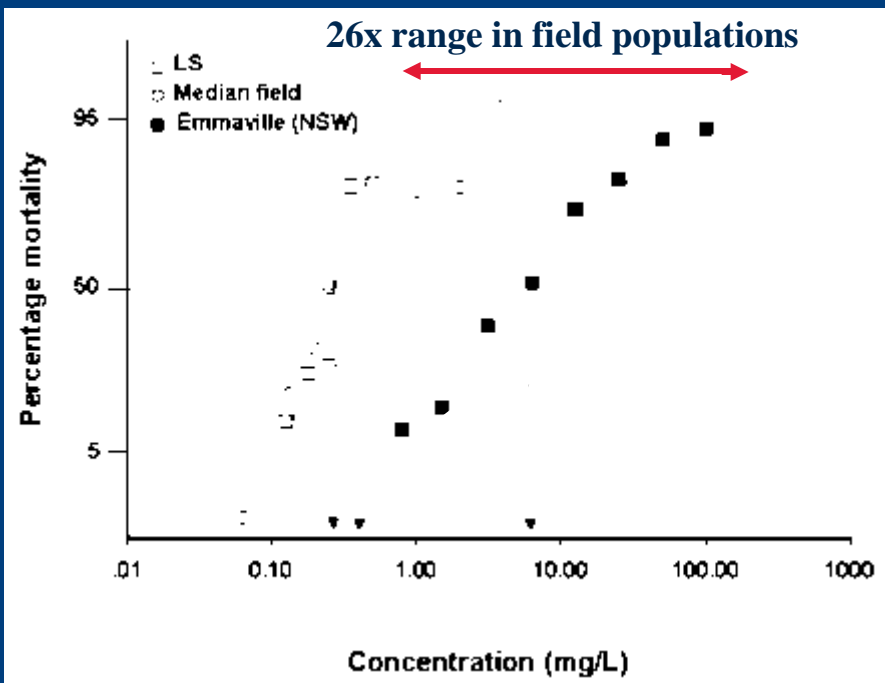
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# Measuring resistance



# RESISTANCE - diflubenzuron

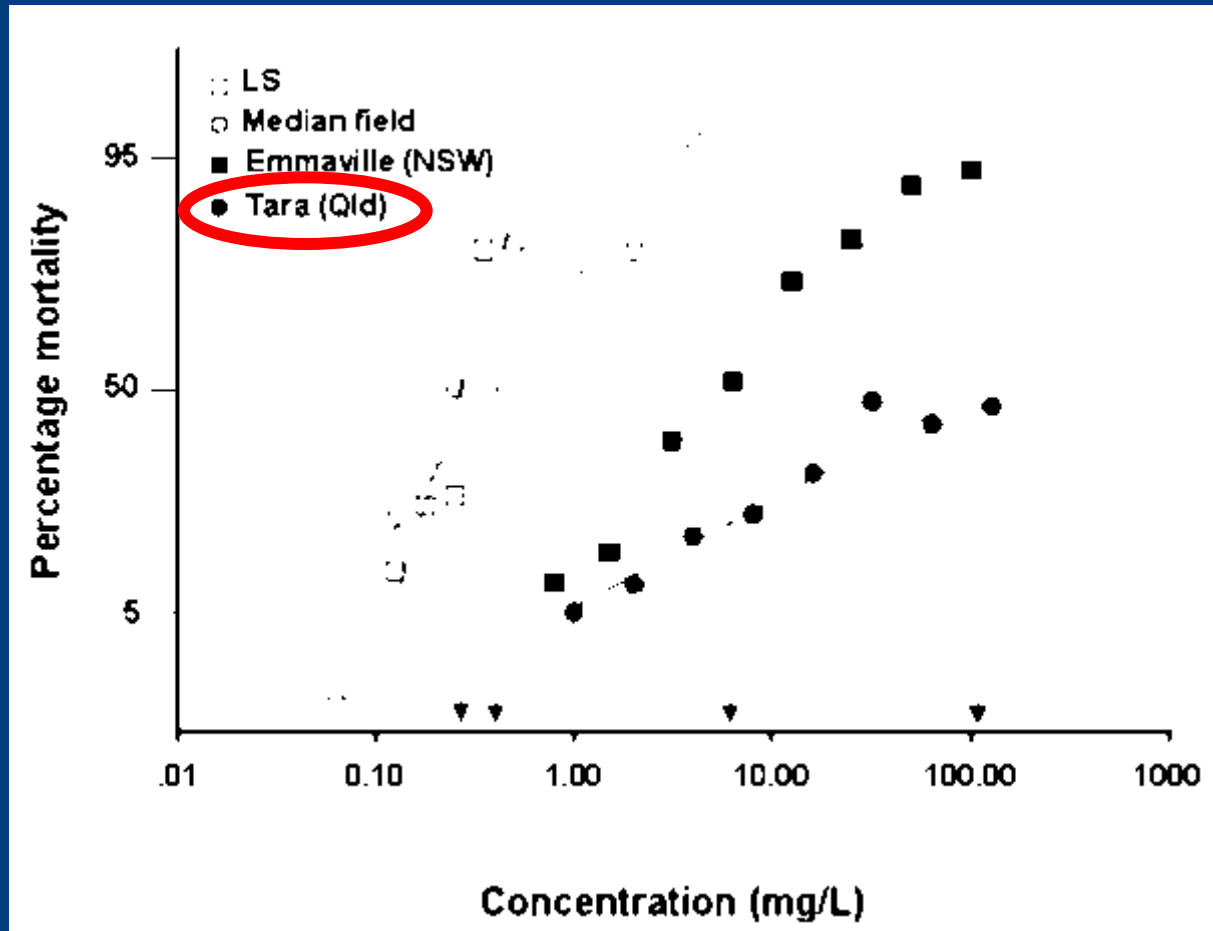
## Field responses to diflubenzuron in bioassays 1993-2000



- Risk Factor: High variability in susceptibility within target population  
(related to susceptibility to diazinon)

# RESISTANCE - diflubenzuron

Field responses to diflubenzuron 2002



# RESISTANCE – diflubenzuron

## The “TARA” experience .....

- Complete failure to protect sheep in 3rd year of use
- Previous total reliance on diflubenzuron
- Split shearings - all sheep treated for lice and flystrike protection

Risk Factor: Over reliance on a single chemical class

Take home message #2:

*Over reliance on a single chemical class is unwise.*



# RESISTANCE – cyromazine/dicyclanil

- Nimmitabel property, December 2010, cyromazine (under-dosing) failure.

## Risk Factor: *Poor application*

- Cyromazine resistance screen (1 mg/kg) produced (4%) survivors.

## Take home message #3:

*Ensure correct application of products.*





# LOW resistance only!

1. Larval mortality in the 'field susceptible' and Nimmitabel strains after feeding on cyromazine or dicyclanil treated homogenate.

INSECTICIDE	STRAIN	LC50	RF <sub>50</sub>	LC95	RF <sub>95</sub>	100 % mortality (mg kg <sup>-1</sup> )
Cyromazine	'Field susceptible'	0.26	-	0.43	-	0.5
	Nimmitabel	0.60	2.3	1.44	3.3	4
Dicyclanil	'Field susceptible'	0.02	-	0.04	-	0.05
	Nimmitabel	0.03	1.3	0.08	2.1	0.1

## Laboratory selection to produce a 'pure-breeding' resistant strain

Insecticide	Strain	LC50 (mg/kg)	R.F.	100% mortality (mg/kg)
Cyromazine	Field (susceptible)	0.26	-	0.5
	Nimmitabel (original)	0.60	2.3	4
	Nimmitabel (selected)	2.14	8.1	8
Dicyclanil	Field (susceptible)	0.02	-	0.05
	Nimmitabel (original)	0.03	1.3	0.1
	Nimmitabel (selected)	0.06	2.8	0.125

# ***ACKNOWLEDGEMENTS***

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*another* australian wool  
*innovation* limited



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