Queensland Government
Department of Agriculture, Fisheries and Forestry

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SOUTH AUSTRALIAN RESEARCH AND DEVELOPMENT INSTITUTE

Decision Making for Insect Management in Grain Crops

Pest Management in Winter Cereals

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Key Pests

Decision Making for Insect Management in Grain Crops

Crop stage/pest	Pre sowing	Establishment	Vegetative	Flowering	Grainfill
Cutworm					
Blue Oat Mite					
Brown wheat mites					
Aphids					
Armyworm					
Helicoverpa					

	Pest may be present in the crop
	Crop susceptible to crop loss by pests

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Key Aphid Species

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- Oat aphid
  - July to end Aug
  - Crown and lower stems

- Corn aphid
  - Aug to early Sept
  - Whorl and top leaf axis

- Rose-grain aphid
  - Late Aug to Sept
  - Upper leaves

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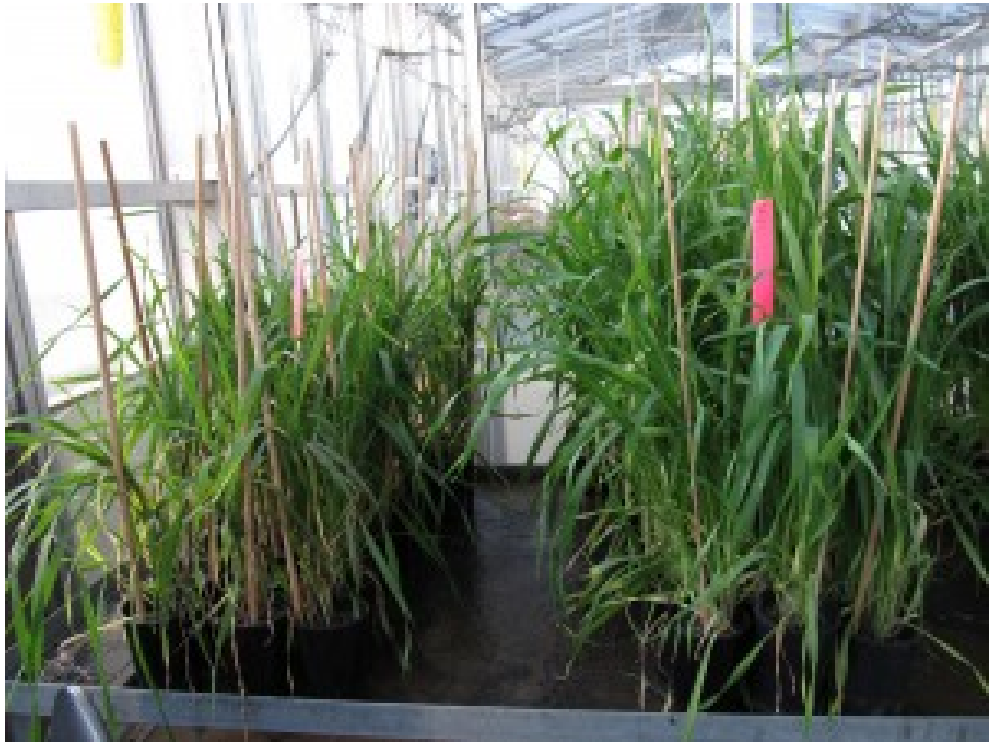
When is the crop at risk from Aphids?

High risk	Reduced risk	Low risk
• Green bridge • Wet summer and autumn • Warm, dry growing season	• Alternative hosts controlled pre-season • Large numbers aphid predators and/or aphid mummies	• Dry, cool summer/wet, cool winter • Heavy grazing reduces hosts

Impact of aphids

- Direct feeding
- Honeydew
  - sooty mould
- Virus transmission



Early and continuous infestation

Late infestation

Means of direct damage for aphids in glasshouse trial 2012

Parameter	Early infestation	Late infestation	Control	LSD
Number of tillers	4.3a	6.3b	6.7b	0.5
Plant height (cm)	57.6a	63.6b	65.3b	3.9
Effective heads per plant	2.8a	4.8b	5.8c	0.47
Seed weight per plant	0.8a	1.6b	2.1c	0.3
100 seed weight	4.6a	4.8a	5.0a	0.37

Virus transmission

Yellow dwarf viruses

- Historically low in N-region
- Yield losses
  - Up to 80% (early infection),
  - Up to 10% (post-tiller)
- Summer/autumn “green bridge” increases aphid and virus survival

Monitor aphids

Decision Making
for Insect Management
in Grain Crops

- Monitor and record
  - aphids and beneficials
  - from seedling to booting
- Repeat sampling
  - population dynamics
- Six locations
  - 5 plants at each

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Suggested Thresholds

Current fixed thresholds - 10-20 or more aphids on 50% of the tillers.

Some research indicates >10 aphids per tiller can reduce yield by around 10%

When is foliar insecticide warranted?

The key trigger points (NGA)

- Aphid numbers >~10-15/tiller and increasing
- Crop stage ~tillering to boot/head emergence
- No sign of beneficial activity

Management considerations

- Is the population increasing?
- Intensity, duration and distribution of infestation
- Beneficial activity?
- Crop development stage?

  (Infested post milky grain - no yield loss)
- Is the crop stressed?
- Weather conditions

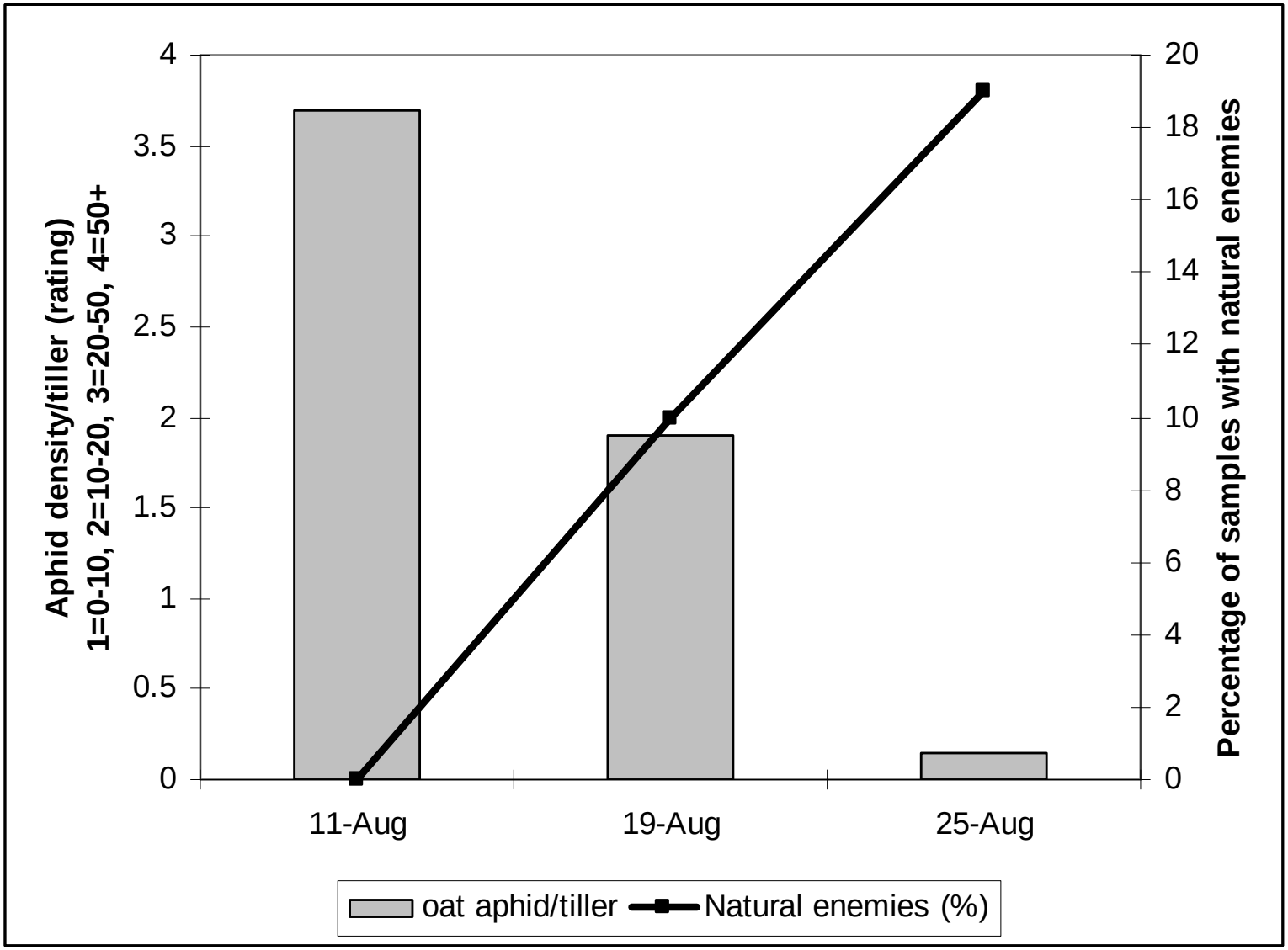
Aphids - IPM opportunities

Decision Making for Insect Management in Grain Crops

- Cultural
  - weed control, reflective surfaces, kaolin
- Biological
  - beneficial insects
- Chemical
  - mineral oils
  - Aphid specific insecticides
  - Seed dressings

Kaolin

Hover fly larvae


Aphid density/tiller (rating)
1=0-10, 2=10-20, 3=20-50, 4=50+
Percentage of samples with natural enemies
4
3.5
3
2.5
2
1.5
1
0.5
0
20
18
16
14
12
10
8
6
4
2
0
11-Aug
19-Aug
25-Aug
oat aphid/tiller
Natural enemies (%)

Aphid mummies

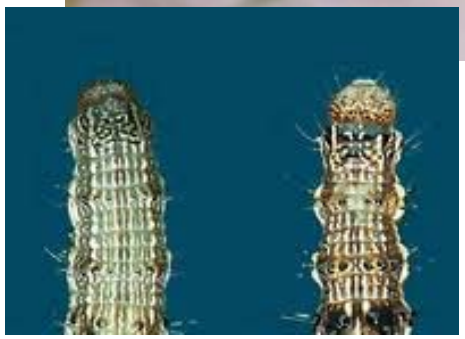
Lady beetles

Damsel bug

Brown Lacewing

Hoverfly

Caterpillar pests



- Armyworms
  - sever heads
- Helicoverpa
  - graze on exposed tips

When is the crop at risk of Armyworm?

- Rain follows a dry period – encourages egg lays
- Crops sown into standing stubble
- Large larvae when crop at late ripening stage

Armyworm

- Monitor
  - Sweep net, ground searches
  - Scalloped leaves, droppings
  - Increase frequency at ripening
- Record
  - number and size
  - Size - predict if larvae reach a damaging size when crop susceptible.
  - When most larvae are 35-40 mm - almost completed development and will pupate soon - damage potential low.

Armyworm economic thresholds

Decision Making for Insect Management in Grain Crops

Cost of control ($/ha)	Crop value ($/t)			
	100	150	200	250
20	0.6	0.4	0.3	0.2
25	0.7	0.5	0.4	0.3
30	0.9	0.6	0.4	0.3
35	1.0	0.7	0.5	0.4

The economic threshold (larvae/ m2) based on a total potential yield loss per larva of 350 kg/ha

Army worm management

Key questions

- How quickly do larvae reach damaging size?
- When is this in relation to crop maturity and susceptibility

Small larvae take 8-10 days to reach a size capable of head lopping

- Low risk – crop near maturity and small grubs
- High risk – late green crop with above threshold of small larvae

Also consider – weather conditions that impact on crop maturity

Best Bet Table: Armyworm

Pre-season	Establishment	Winter	Spring
Control weeds and other green material especially ryegrass Know the pest: do not confuse with *Helicoverpa*	Traps for regional presence: lures of 10% port, 15% raw sugar and 75% water	<u>High risk</u> When good rain follows a dry period Traps Monitor at dusk with sweep net Ground search for larvae and droppings Look for scalloped leaf margins Control larvae when small	<u>High risk</u> ↑ monitoring when crop dries down Consider crop stage before control Control late in day when larvae feeding

Scenario 1

- Crop nearing maturity
- Grubs are small

Scenario 2

- Late crop – still green
- Early seed fill
- Above threshold of small larvae

Helicoverpa

Most helicoverpa present are *H. armigera*

Native budworm *H. punctigera* does not feed on grasses.

Often in low numbers but in some seasons high numbers cause economic damage

H. armigera has developed resistance to many of the older insecticide groups.

When is the crop at risk of Helicoverpa?

- High numbers in previous crop
- Alternative hosts

  - Broadleaf weeds can host larvae and when weeds dry off – medium to large larvae move to winter cereals

Management of helicoverpa

Monitor

- As the crop starts to mature
- Use a sweep net at a number of sites (10 sweeps = 1 m^2 sampled)

Calculate larval density in the crop

Density/m2 = number of larvae per m row/row spacing (m)

Helicoverpa thresholds

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Estimated consumption of one larvae = 2.4 g

One larvae per square metre can cause 24 kg grain loss/ha.

Cereal price ($/t)	Value of crop loss		
	4 larvae/m²	6 larvae/m²	8 larvae/m²
150	14.4	21.6	28.8
200	19.2	28.8	38.4
250	24.0	36.0	48.0
300	28.8	43.2	57.6
350	33.6	50.4	67.2
400	38.4	57.6	76.8
450	43.2	64.8	86.4

Management and control

Biopesticides (NPV)
- target small larvae (<7 mm)
- not effective on larger larvae (> 13 mm).

Insecticides
- selective insecticides
- synthetic pyrethroids not recommended
    - historically high resistance

Natural enemies
- can provide effective control
- broad spectrum insecticides - fewer beneficials
    - survival of larvae may be greater than in untreated fields

Key messages

- Cultural control
  - Control weeds
- Weather
- Biological control
  - Monitor beneficials
- Chemical control
  - Selective insecticides
  - Border or spot sprays