MAKING HELICOVERPA CONTROL DECISIONS FOR CHICKPEAS

Loss of chickpea yield and quality from helicoverpa damage only occurs from pod set to maturity. During vegetative to early flowering stages high populations have no impact on yield or quality. In rare situations, control may be warranted during the vegetative and flowering stages, when pest pressure is extreme (more than 20 medium to large larvae per square metre).

But from mid-flower/early pod set through to maturity close monitoring of helicoverpa populations is needed. And based on the value of crop loss calculated (see Table 1) control maybe required.

- Recent research by DPI&F has determined the consumption rate of a helicoverpa larvae surviving from hatchling to pupation is 2.0 g of grain.
- Loss attributed to a particular larval density is calculated on the basis that medium and large larvae are doing the majority of damage.
- Control decisions are made by comparing the value of the potential yield loss with the cost of control.

CALCULATING POTENTIAL ECONOMIC LOSS

STEP 1: Determine the field average for small, medium and large larvae. Only count larvae that will cause damage.

Helicoverpa larval size categories and actual sizes

Actual larval size	Larval length (mm)	Size category
	1-3	Very small
	4-7	Small
	8-13	Medium
	14-30 +	Large

You need to take several samples and calculate the average numbers for both small and large larvae per metre of row (refer to larval size guide).

Numbers of very small larvae (less than 3 mm) cannot be assessed accurately in the field with a beatsheet. Very small larvae are not included in threshold calculations for this reason. Regular crop monitoring will ensure these larvae are picked up in subsequent counts.

Not all small larvae will survive to become large larvae. A survival rate of 70 per cent from small to large is average for field populations. Apply this rate to the number of small larvae (small x 0.7) when calculating the number of larvae per square metre for the threshold calculation.

Larger larvae cause the vast majority of pod damage. Control decisions need to be made to prevent larvae reaching these stages.

Sampling is by the linear metre, however, the level of infestation in a square metre depends on the row spacing (eg. a crop with 1 m row spacing has 1 row metre per square metre (m^2), whilst a crop with 50 cm row spacing has 2 row metres per m^2, and therefore double the potential infestation within the crop).

You will see the correction for row spacing in the formula below.

$$\text{No. of larvae per m}^2 = \frac{(\text{No. small larvae} \times 0.7) + \text{No. medium and large larvae}}{\text{row spacing (metres)}}$$

STEP 2 : Calculate the value of yield loss that will occur if larvae are NOT controlled

$$\text{Yield loss (\$/ha)} = \frac{\text{Avg No. of larvae per m}^2 \times 2.0^* \times \text{chickpea price (\$/t)}}{100}$$

*2.0 g consumed by each larva

Table 1 has been produced using the equation in Step 2, for a range of larval densities and crop prices. Doing this calculation allows growers and consultants to answer the question 'what will I lose if I don't spray?', or alternatively 'What will I potentially save if I do spray?'

TABLE 1: The value of crop loss caused by helicoverpa larvae in chickpea, for a range of larval densities and grain prices = breakeven cost of control

Chickpea price ($/t)	Value of crop loss ($/ha)				
	1 larva/m^2	2 larva/m^2	3 larva/m^2	4 larva/m^2	5 larva/m^2
300	6	12	18	24	30
400	8	16	24	32	40
500	10	20	30	40	50
600	12	24	36	48	60
700	14	28	42	56	70

STEP 3 : Review the calculated yield loss in relation to the cost of control and the working benefit:cost ratio

- In deciding to spray, you need to consider the benefit:cost ratio. For example, if your preferred benefit:cost ratio is 1.5 to 1 you wouldn't initiate control measures until you save $1.50 in crop yield for every $1 you spend on the control.
- As well as providing the yield loss in dollars per hectare, the table above also gives you a guide as to the per hectare 'break even' cost of control measures.
- For example, if your cost of control is $24 per hectare, and you are using a 1.5:1 benefit:cost ratio, you would want your saving in crop yield to be $36 per hectare before you commenced spraying. Therefore, based on the current market price for the crop and the sampling you have completed, you can determine when the infestation gets to a point that would justify the commencement of spraying.

Grain quality

- Recent trials have shown that in the range of 1 to 4 larvae per m^2, defective grain is well below the level at which penalties apply (6 per cent by weight, NACMA standard). Given this result, we can be confident that within the range of larval densities for which it is economic to control the potential cost of quality loss does not need to be factored into the economic threshold.

Other considerations

- At present there are no data on the behaviour of larvae in extremely moisture stressed crops versus crops with adequate soil moisture. So it is unclear whether there is greater or earlier flower and pod feeding when foliage appears to be less attractive.
- Pod damage indicates lost yield and cannot be used in the same way as the larval economic threshold, which is designed to prevent yield loss occurring. Compare the number of undamaged pods as well as the number of damaged pods (per metre of row), to better evaluate the amount of damage relative to the overall pod load.
- Yield and quality loss from helicoverpa does not occur during the chickpea flowering stage.