

HERBICIDES FOR PIGEON PEA TRAP CROPS

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Weeds can be a major problem in pigeon pea trap crops. This crop at Emerald was over-run by amaranthus and black pigweed.

Herbicides for use with pigeon pea trap crops grown in conjunction with Bollgard II cotton. Products are covered by registration or minor use permit.

Pre-planting	Broadcast	Post-emergence
		Directed spray
pendimethalin (330 g/L) @ 2.5 to 3 L/ha	Falcon WG (250 g/kg) @ 180 g/ha	prometryn (500 g/L) @ up to 4.5 L/ha
pendimethalin (455 g/L) @ 1.8 to 2.2 L/ha	Fusilade WG (212 g/L) @ 1 L/ha	prometryn (900 g/kg) @ up to 2.5 kg/ha
trifluralin (400 g/L) @ up to 2.8 L/ha	quizalofop (99.5 g/L) @ 250-1000 mL/ha	
trifluralin (480 g/L) @ up to 2.3 L/ha	Select (240 g/L) @ 250-375 mL/ha	
prometryn (500 g/L) @ up to 4.5 L/ha	Sencor 480 (480 g/L) @ 750 mL/ha	
prometryn (900 g/kg) @ up to 2.5 kg/ha	Sertin Plus (120 g/L) @ 1.6 L/ha	
Sencor 480 (480 g/L) @ 750 mL/ha	Verdict (130 g/L) @ 0.6 L/ha	
	Verdict (520 g/L) @ 0.6 L/ha	

Background

Pigeon peas are being grown throughout the cotton industry as a trap crop and refuge for beneficial insects. These crops are grown as part of the insect management strategy, in association with Bollgard II® cotton and area wide management. However, poor weed management

has been a major problem in many pigeon pea crops.

Basic agronomy work to develop pigeon peas as a commercial cash crop was undertaken in the 1980s. As part of this work, a range of herbicides was screened for use with pigeon peas (Tables 1 & 2). Herbicide phytotoxicity was rated 0 (no phytotoxicity) to 5 (dead plants).

Table 1. Herbicides applied to pigeon pea pre-planting.

Herbicide	Rate (kg or L)	Phytotoxicity*
Gesagard	3	0
Stomp	3	0
Teflan	1.4	0
Gesagard	4	0.5
Sencor 700	0.5	0.5
Scepter	1	0.5
Scepter	1.5	1
Dual	3	1
Simazine	2	1
Diuron 500	2	2
Atrazine	3	3
Simazine	3	3

*Herbicide phytotoxicity was rated 0 (no phytotoxicity) to 5 (dead plants).

Of the herbicides applied pre-planting, Gesagard, Stomp and Treflan all appeared to be relatively safe to use with pigeon peas. Varying degrees of phytotoxicity were observed with the remaining herbicides applied pre-planting and with all the herbicides applied post-emergence.

Table 2. Herbicides applied broadcast, post-planting to pigeon peas.

Herbicide	Rate (kg or L)	Phytotoxicity
Basagran	2	1
Sencor 700	0.35	1
Scepter	1	1
Gesagard	2	2
Scepter	1.5	3
Gesagard	4	3
Blazer	2	3
Diuron	2	3

Sencor 480 and pendimethalin are registered for use on pigeon peas and registration is included on some trifluralin labels but not on others.

With the introduction of Bollgard II cotton, trap crops and area wide management, pigeon peas have been widely planted throughout the cotton industry. With limited herbicide options available, these trap crops are often the weediest crops on a farm. Problem weeds range from bellvine and wild sunflower, to amaranthus and black pigweed. Broad-leaf weed control is a major issue for pigeon peas.



Another weedy pigeon pea crop infested with broad-leaf weeds including wild sunflower and sesbania.

Pre-emergent herbicides

A range of pre-emergent herbicides was tested in the 1999/2000 season in trials at Narrabri, Theodore and Emerald. The experiments focused on the herbicides and herbicide combinations that are currently used in cotton. These herbicides have the advantage that they are readily available on cotton farms and have no plant-back problems to cotton. Crop safety (phytotoxicity) and the weed control (weed pressure index) attained with each treatment was recorded.

The weed pressure index was estimated by recording the presence of weeds in each plot and adding the numbers, after weighting the data for the bigger (more competitive) weeds. This index is expressed as small weed equivalents per m². The data were averaged over the 3 sites (Table 3).

Table 3. Early- and mid-season weed control from the herbicides applied pre-planting and incorporated, or post-planting broadcast.

Treatment	Weed index	
	Early-	Mid-
Untreated	76.6	28.0
Treflan 1.4 L/ha	13.2	5.1
Treflan 2.8 L/ha	11.0	5.5
Stomp 3 L/ha	51.2	18.1
Gesagard 2.25 L/ha	8.5	9.1
Gesagard 4.5 L/ha	3.8	6.2
Cotoran 2 L/ha	25.0	9.0
Cotoran 4 L/ha	5.1	3.3
Spinnaker 0.2 L/ha	21.9	11.2
Spinnaker 0.4 L/ha	15.6	3.8
Treflan 2.8 + Gesagard 4.5 L/ha	1.5	2.6
Treflan 2.8 + Cotoran 4 L/ha	0.9	1.4
Stomp 3 + Gesagard 4.5 L/ha	2.6	6.5
Stomp 3 + Cotoran 4 L/ha	5	2.4

Post-emergence treatments

Basagran 1 L/ha	11.7
Basagran 2 L/ha	24.8
Sencor 0.7 L/ha	13.9
Sencor 1.4 L/ha	21.6
Spinnaker 0.2 L/ha	14.5
Spinnaker 0.4 L/ha	9.1

Three additional herbicides were applied broadcast, post-emergence at each site. Results from a second set of observations include the additional herbicides. None of the herbicides applied post-emergence gave as good weed control as the pre-planting combinations.

All treatments gave some weed control compared to the untreated plots, with the best control on the herbicide combinations that included Treflan. The poor result from Stomp was due to very poor weed control on only one of the three sites. Large numbers of common sowthistle and blackberry nightshade were present on this site, but were not controlled by Stomp. Good control was observed with Stomp on the other two sites where these two weeds were not so abundant.

Crop safety

Not all the herbicides used were safe on pigeon peas.

Phytotoxicity was observed on the diuron treatment on the first trial at Narrabri, as expected from the earlier data. No problems were apparent with the other herbicides.

However, 50 to 75 mm of rain occurred during crop emergence at Theodore and Emerald and a large proportion of the seedlings on the Cotoran treatments and combinations including Cotoran were killed (Table 4).

Table 4. Phytotoxicity from the herbicides and combinations applied pre-emergence.

Herbicide	Phytotoxicity rating
Untreated	0
Treflan 1.4 L/ha	0
Treflan 2.8 L/ha	0.13
Stomp 3 L/ha	0
Gesagard 2.25 L/ha	0
Gesagard 4.5 L/ha	0
Cotoran 2 L/ha	0.54
Cotoran 4 L/ha	1.21
Diuron 2 L/ha	1.11
Spinnaker 0.2 L/ha	0.28
Spinnaker 0.4 L/ha	0
Treflan 2.8 + Gesagard 4.5 L/ha	0.38
Treflan 2.8 + Cotoran 4 L/ha	2.63
Stomp 3 + Gesagard 4.5 L/ha	0.17
Stomp 3 + Cotoran 4 L/ha	1.33

Given the similar levels of weed control observed with both Gesagard and Cotoran and their combinations, Cotoran was dropped due to its risk of phytotoxicity, in favour of Gesagard which showed no phytotoxicity, even with rain during emergence.



Pigeon pea seedlings killed by Cotoran following rain during emergence at Theodore (above) and Emerald (below).



A small amount of stunting was observed with the high rate of Treflan, but the damage was minor and the plants soon grew out of this damage.

Post-emergence options

A further experiment examined the best options for post-emergence weed control, using some of the selective grass herbicides, and standard broad-leaf herbicides as directed sprays.

All herbicides were applied over-the-top of 70-cm high pigeon peas to test the level of phytotoxicity of these herbicides. This was done on the assumption that the herbicide that caused the least damage when applied over-the-top, would have the least potential to cause damage when applied as a directed spray.

Phytotoxicity was assessed 8, 28 and 48 days after treatment, by assessing the extent of damage to old growth (growth present at the time of spraying), the damage to new growth, and the effect on flowering.

Pigeon peas were completely tolerant of the selective grass herbicides used, which had no effect on growth or flowering.

All the broad-leaf herbicides damaged the pigeon peas, with diuron causing the most damage and Gesagard the least damage (Table 5).

Table 5. Percentage leaf damage 48 days after herbicide application over-the-top of 70-cm high pigeon peas.

Treatment	Bottom leaves	Top leaves
	(old growth)	(new growth)
Untreated	0	0
Diuron 0.9 L/ha	55	5.5
Diuron 1.8 L/ha	82.8	7.4
Diuron 3.5 L/ha	87.5	20.1
Cotoran 1.4 L/ha	17.5	0
Cotoran 2.8 L/ha	29.9	2.8
Cotoran 5.6 L/ha	52.4	6.6
Cotogard 0.9 L/ha	7.3	0.2
Cotogard 1.8 L/ha	20.3	0.5
Cotogard 3.5 L/ha	42.5	2.3
Gesagard 1.12 L/ha	14.6	0
Gesagard 2.25 L/ha	20.3	1.5
Gesagard 4.5 L/ha	32.6	0.4

The herbicides had surprisingly little effect on flowering (Table 6), even though the over-the-top treatments caused a large amount of leaf damage to the pigeon peas. Even the highest rate of diuron, which caused an 88% loss of the sprayed leaves, resulted in only a 32% reduction in flowering. There was an 7% reduction in flowering from applying the heaviest rate of Gesagard over-the-top.

Figure 6. Percentage flowers relative to untreated plots 48 days after spraying.

Treatment	% Flowering
Diuron 0.9 L/ha	85
Diuron 1.8 L/ha	75
Diuron 3.5 L/ha	68
Cotoran 1.4 L/ha	100
Cotoran 2.8 L/ha	90
Cotoran 5.6 L/ha	83
Cotogard 0.9 L/ha	98
Cotogard 1.8 L/ha	98
Cotogard 3.5 L/ha	88
Gesagard 1.12 L/ha	100
Gesagard 2.25 L/ha	90
Gesagard 4.5 L/ha	93

Summary

Pigeon peas are useful as a trap crop and refuge for beneficial insects.

A range of herbicides are now available for use with pigeon peas, covered by product registration (refer to the product label) and a minor use permit from the Australian Pesticides & Veterinary Medicines Authority (refer to the APVMA web site for details). The products covered by the permit may only be used on pigeon peas that are not used for human or livestock consumption. These crops can only be harvested for planting seed for future trap crops.

Weeds in pigeon peas can be best managed using a pre-planting application of prometryn or Sencor and either trifluralin or pendimethalin, and post-emergence applications of prometryn as a directed spray, or Sencor, or one of the selective grass herbicides listed.