

# Managing Malvaceae weeds — cotton's relatives

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There are a number of weeds that are relatives of cotton that are difficult to control in the crop. The most widespread of these are narrow and wide leaf bladder ketmia, found in over 80 per cent of fields surveyed by Ian Taylor throughout NSW and Queensland. Anoda weed, although less common, is widespread throughout Queensland and is spreading into areas in NSW.

Velvetleaf is less widespread again, and very uncommon in southern Queensland but found in small areas in NSW, despite being a major summer cropping weed in North America.

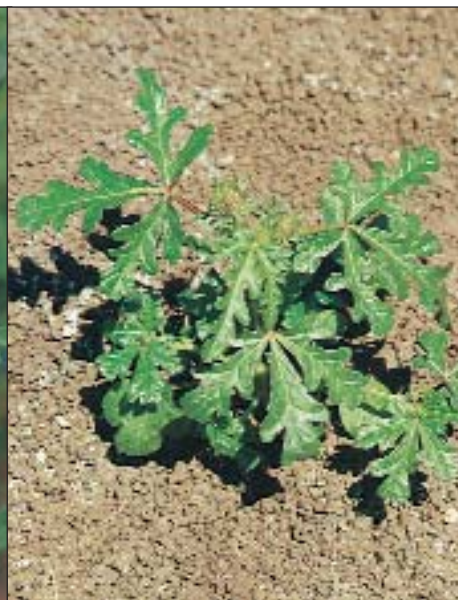
To manage these weeds effectively, it is important to understand their reproductive biology and lifecycle. In doing so, potential weaknesses in the lifecycle of the weeds may then be found and exploited for more effective weed management. This article details lifecycle and seed production investigations on these weed species in a series of glasshouse and field trials conducted over the period 2001–2003. A general section on the management of these weeds can be found at the end of the article.

## LIFECYCLE STUDIES

Seedling flushes of each of these species occur after rainfall and irrigation events.



Wide leaf bladder ketmia — Left top: red centre flower type; Left bottom: yellow centre flower type; and, Right: seedling plant.



Narrow leaf bladder ketmia — Left: flower and Right: seedling.

Because of their rapid growth rate and relatively short minimum times until mature seeds are produced, on-going control is needed throughout the cotton season and in fallow.

### Narrow leaf bladder ketmia

Narrow leaf bladder ketmia can flower within a minimum of four weeks of emergence and go to seed in six weeks (Table 1). Although narrow leaf bladder ketmia

can be found growing all year round, it is especially problematic in summer and autumn. Management needs to focus on controlling this weed throughout the year to prevent seed production.

### Wide leaf bladder ketmia

Wide leaf bladder ketmia can flower within a minimum of four weeks and produce mature seed in seven weeks (Table 1). Wide leaf bladder ketmia grows throughout the spring–autumn period, but does not appear to produce mature seed before mid to late December. Management needs to focus on the mid summer and autumn period to prevent seed production.

### Velvetleaf

Velvetleaf can flower within six weeks and can produce mature seed in nine weeks (Table 1). It is important to manage this weed in summer and autumn to prevent this from occurring.

### Anoda weed

Although anoda weed can produce flowers within eight weeks and mature seed within 10 weeks, it very rarely goes to seed before mid February, possibly due to a requirement for short daylength conditions for flowering to occur (Table 1). Management needs to focus on the period up until mid February to ensure seed set does not occur.

### SEED PRODUCTION STUDIES

All of these weeds had a huge capacity to produce seed.

Wide and narrow leaf bladder ketmia may produce an average of 2500 and 5600 seeds per plant respectively (Table

2). Anoda weed and velvetleaf produce 1200 and 5000 seeds per plant.

A moderate infestation of two plants per square metre of any of these weeds can result in 20–100 million new weed seeds per hectare added to the soil per year.

**TABLE 1: Minimum average times to flowering and seed set for the weed species that are related to cotton — in the glasshouse**

Weed species	Days to flowering	Days to seed set	When to manage
Narrow leaf bladder ketmia	30 (26–32)	45 (42–48)	All year round, in summer especially and autumn
Wide leaf bladder ketmia	32 (28–39)	51 (49–54)	Mid summer to season's end
Anoda weed	56 (55–57)	73 (72–74)	February until season's end
Velvetleaf	43 (40–46)	61 (58–68)	December until season's end

(Numbers in brackets indicate ranges)

Because these numbers were derived from medium sized plants only, even greater numbers of seeds can be expected with larger plants and in weedier fields — those with over two plants per square metre.

These numbers demonstrate the importance of weed control before weeds set seed.

They also explain why it is difficult to control many of these weeds once a population becomes established on a field.

Research is continuing into how long these seeds last in the soil and the factors that promote seed germination and establishment.

### MANAGEMENT

#### Bladder ketmia

Narrow leaf bladder ketmia grows all year round and can produce mature seeds in six weeks. Management in cotton crops

and fallows is needed. Wide leaf bladder ketmia produces mature seeds in seven to eight weeks — but seed production starts in December and ceases after plants are killed by frost.

Control of narrow and wide leaf bladder ketmia may be achieved by using integrated weed management strategies such as:

**In crop**

- The use of herbicides both pre and post-planting in cotton crops. For example:
  - Pre-planting: glyphosate or paraquat/diquat;
  - Roundup Ready (RR) herbicide in RR varieties.
- Timely inter-row cultivation.
- Strategic use of chipping, whether on foot or on chipping bikes.

**All year**

- Good farm hygiene including removal of plants in irrigation storages, channels and return systems.
- The use of effective herbicides in fallows or summer rotation crops — for example atrazine in sorghum.

**Anoda weed**

As anoda weed rarely produces seeds before mid February there is a relatively long period in which to manage this weed.

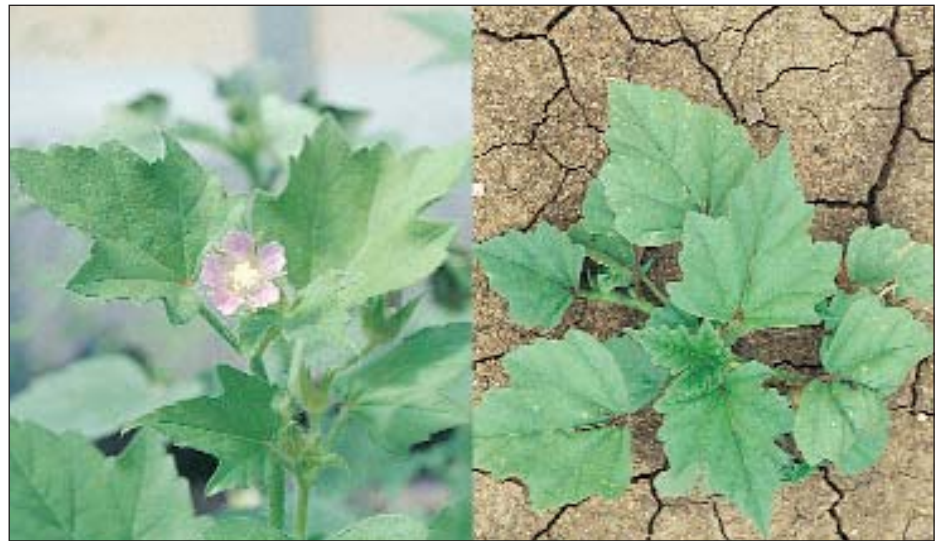
- Herbicides: Zoliar can be applied pre-plant, and Staple periodically post-planting to anoda weed seedlings, according to label directions.
- Strategic chipping can be used to identify and remove this weed throughout the season.
- Anoda weed is easily observed above the cotton canopy from February onwards. At this stage plants should be removed from the field and burnt as green seed heads can mature and add to the soil seed bank.

- Good hygiene is needed to prevent the further spread of this weed, in particular by cleaning harvest and cultivation machinery and old module pad areas as seeds can be transported in harvested cotton.

**Velvetleaf**

Although there are no herbicide registrations for velvetleaf in Australia, there are in the US where it is a significant weed of cotton crops.

This means that cultivation, chipping and good farm hygiene are essential in preventing the spread of this weed. Velvetleaf spreads in irrigation and flood water, so particular attention needs to be paid to the irrigation system, where overland flood flows have occurred and where floodwater has been pumped into stor-



Anoda weed — Left: flower and Right: seedling.



Velvetleaf — Left: flower and Right: seedling.

**TABLE 2: Average yearly seed production by a range of weeds that are related to cotton**

	Wide leaf bladder ketmia	Narrow leaf bladder ketmia	Anoda	Velvetleaf weed
Seedheads/plant (medium sized field plants)	67	164	88	192
Seeds/seed head	37	34	14	26
<b>Total seeds/plant</b>	<b>2500</b>	<b>5600</b>	<b>1200</b>	<b>5000</b>
	(0-7800)	(0-15,800)	(0-3800)	(01-3300)
<b>Total seed production in field</b>				
2 plants/m <sup>2</sup> (moderate)	5000	11,200	2400	10,000
10 plants/m <sup>2</sup> (heavy)	25,000	56,000	12,200	50,000
<b>Seeds/ha produced from 2 plants/m<sup>2</sup></b>	<b>50 million</b>	<b>112 million</b>	<b>24 million</b>	<b>100 million</b>
<small>(Numbers in brackets indicate ranges)</small>				

ages, to ensure that this weed is not growing in these areas.

Further details and growers experiences with managing these weeds can be found in WEEDpak on the internet at

[www.cotton.crc.org.au](http://www.cotton.crc.org.au)  
 Contact the Australian Cotton CRC for a hard copy or CD of WEEDpak.  
 For all other enquires contact: Dr. Stephen Johnson, ACRI, Ph: 02 6799 1500 or email: [stephen.johnson@agric.nsw.gov.au](mailto:stephen.johnson@agric.nsw.gov.au)