

Anoda weed — spreading to a field near you?

By Dr Stephen Johnson¹

Anoda weed (*Anoda cristata*) is a minor but troublesome weed in many summer crops including irrigated and dryland cotton, peanuts, maize, sorghum, and in pasture situations. A consultant survey in 1996 rated it among the top 10 weeds in cotton growing areas in Queensland with small, but increasing infestations found in NSW.

This weed is difficult to manage in cotton crops because of the limited number of herbicides registered for its control, the similarity of the weeds foliage to cotton (making it difficult for chippers to spot) and the longevity of the seed in the soil.

This article outlines information to aid in the identification of the weed, areas where the weed has been found generally, the lifecycle of the plant and how it spreads. This information is important for two rea-

sons. Firstly it forms part of the integrated weed management plan outlined to reduce anoda weed problems, and secondly to help reduce the rapid spread of this weed in many areas.

IDENTIFICATION

Anoda weed plants can be readily identified by the following features:

Seedlings

The seedling leaves or cotyledons are 10–13 mm long and 11–14 mm wide. While both cotyledons have slightly notched bases, one leaf is roughly circular while the other is broadly egg-shaped (Photo 1). These leaves have stems up to seven mm long. Both leaf edges and plant stems are covered in short (0.5 mm) hairs.

Early true leaves

The first true leaf also has a broad egg-

shape but has shallow rounded teeth around its margin. Older leaves become more triangular in shape (Photos 1 and 2).

Adult leaves

These leaves are triangular to oval shaped, 35–100 mm long, 28–95 mm wide, with three to five lobes and irregular teeth along the margins (Photo 3). The leaves are light to mid green and may have a scarlet/red splash of colour where the leaf is attached to the petiole (Photo 2).

Mature plants

Can grow up to two metres high with many semi-erect branches. The stems and leaves may be covered in small hairs. Young plants are often difficult to detect in the plant line because of the similar colour of the weed compared to the cotton

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leaves. Mature plants grow above the crop canopy from January onwards (Photo 4).

Flowers

Are hibiscus-like and can generally be found from late January (Photo 3). They range in colour from nearly white through to lavender/blue, are up to 25 mm wide and borne on 20–60 mm long stems. The flowers are inconspicuous and initially produced in the main stem leaf joints and then later on branches.

Mature seedheads

Are star-shaped, 15–35 mm wide with a central round section much like a sliced pie with 9–20 segments (Photo 5). One seed is found in each segment of this central pie section. The seed head turns from mid green to brown once it matures.

WHERE CAN IT BE FOUND?

Anoda weed was introduced into Australia, near Ipswich, well over 100 years ago and spread rapidly across southern Queensland where it is now a signifi-

cant problem on the Darling Downs, in the South Burnett, the Macintyre and the St George irrigation area. The weed is a minor problem in the Dawson/Callide and Emerald irrigation areas.

NSW cotton cropping areas appeared to remain free of anoda weed until the 1980s after which it spread rapidly, possibly as a result of poor hygiene when harvest machinery was moved between farms and regions. Currently there are small but increasing infestations of the weed around Moree and east of Collarenebri (Gwydir),



Photo 1: Anoda weed seedling with one true leaf. One cotyledon is circular and the other broadly egg-shaped.



Photo 2: Anoda weed seedling with five true leaves.

west and north of Wee Waa (lower Namoi), north of Trangie and Warren (Macquarie), and at Bourke.

Anoda weed continues to spread from these isolated sites to uninfested fields on contaminated farms and also onto previously clean farms. One example of this is an agronomist's report that the number of infested fields on farm had increased three fold over several years, with the seed appearing to have been transferred on dirty machinery — while neighbouring farms also reported new infestations where the weed was not previously present. Careful attention to identification and management (detailed later) is needed to prevent this weed spreading further throughout the NSW cotton cropping areas.

THE LIFECYCLE OF ANODA WEED

Anoda weed emerges and grows throughout spring, summer and autumn. Emergence is linked to rainfall and irrigation. Seedling numbers exceeding 100 per square metre have been recorded with significant seedling mortality under non irrigated conditions.

Anoda weed is frost sensitive and will not grow through winter. Plant death is generally caused by frost and/or moisture stress.

Observations indicate that cotton defoliant cause considerable leaf and reproductive growth loss. The action of cotton defoliant and pre-harvest herbicide applications on anoda weed growth and seed production requires investigation.

Although small numbers of mature seed heads have been recorded in December and January (far less than one per plant), mature seed heads commonly appear in late February and early March, peaking in the period late March–May. While mature seed can be produced 10 weeks after emergence, the weed appears to require specific conditions for floral initiation to occur.

Such specific conditions have also been identified in some *Xanthium* burrs — for example Noogoora burr (*Xanthium occidentale*), Italian cocklebur or Hunter burr (*X. italicum*) and Californian burr (*X. orientale*) — where floral initiation only occurs after a minimum number of hours of darkness. Short days during autumn, winter and early spring result in rapid flowering in *Xanthium* burr plants irrespective of plant size — and also, it appears, in anoda weed. Investigations are continuing into the specific conditions required for floral initiation in anoda weed so that management can be further fine tuned to prevent seed set from occurring.

Plants can produce an average of 1200 seeds with a hard seed coat that aids in survival in the soil. Research data from an ongoing trial indicates that seed survival appears to increase with depth of burial with up to 40 per cent of seed still viable at 15 cm depth after 18 months.

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Photo 3: Anoda weed flower and adult leaves.



Photo 4: Anoda weed that has emerged above the cotton canopy.

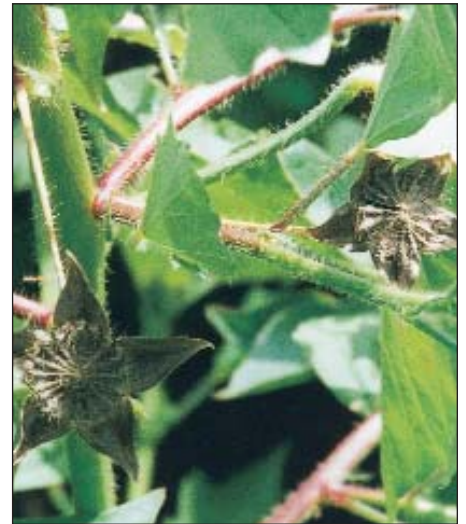


Photo 5: Mature anoda weed seed head.

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In contrast, over 95 per cent of seed buried at one cm was non viable after 18 months. Overall, it is likely that some seeds will continue to survive in the soil for a number of years, making perennial management necessary.

HOW DOES ANODA WEED SPREAD?

Anoda weed appears to be easily spread on dirty harvest machinery. The weed can also be spread in mud on cultivation machinery, in harvested cotton lint, in forage (hay) and perhaps in water.

MANAGEMENT OF ANODA WEED

Anoda weed needs to be managed in crop, in fallow situations, in waste areas beside fields and in irrigation systems. There are three main aspects needed to manage this weed:

- Controlling successive seedling emergence events;
- Preventing seed set; and,
- Good farm hygiene.

These have been outlined below. The vegetative phase of this weed is relatively long and this presents a number of opportunities for management.

Pre-planting options

Both broadacre cultivation and herbicide applications need to be considered to control seedling flushes. Pre-irrigation to initiate a seedling flush may also be an option when water is not limited. Zoliar (norflurazon) is registered for the control of anoda weed, although a number of other herbicides appear to kill weed seedlings.

Post-planting options

Inter-row cultivation should be combined with applications of Staple (pyrithiobac-sodi-

um) — registered for over-the-top cotton applications on small anoda weed plants.

Chipping

Fields should be chipped twice with the first chip during November and December to rogue out as many plants as possible missed by cultivation and herbicide applications. Young anoda weed plants are difficult to detect in crop because they have similar coloured and shaped foliage to cotton.

Pot specimens to educate chippers may help overcome these problems. The second chip is needed before late February, before mature seed is set.

Adult plants with green seed heads on them should be removed from the field after they are chipped to prevent any further seed maturing and being added to the soil seed bank. These plants should be carefully collected and burnt, and the burning area inspected regularly to ensure seedlings have not re-emerged from any unburnt seed.

GOOD FARM HYGIENE

Anoda weed is easily spread on harvest machinery used in grain and cotton farming systems, on cultivation machinery, on dirty vehicles, on equipment or clothing, in cotton lint and probably in irrigation water. It is important to isolate anoda weed infestations and prevent spread by the following means:

- All harvest machinery that has been working in 'dirty' areas should be cleaned before entering 'clean' areas. The message "Come clean Go clean" needs to be applied at a field level on farm to prevent anoda weed from spreading. In addition, consider cultivating and harvesting fields infested with anoda weed last so that the spread of seeds is minimised and machinery can be cleaned properly afterwards.

- Anoda weed seed is easily spread in cotton lint because seed production coincides with cotton harvest. Areas where waste lint falls or is left beside fields for example in module pad areas require special attention to ensure that these populations do not act as weed seed reservoirs.
- Controlling anoda weed in non-crop areas is critical to stop the weed from spreading to cropping areas. These areas include fallow fields, roads and roadside edges, along fence lines and riverbanks, in pasture country and in other disturbed wasteland. Parking cultivation and other machinery on weedy wasteland is a sure way to spread weeds onto fields.
- As already mentioned, removing dead plants with green seed heads and burning them will help prevent seeds from being added to the seed bank.
- Plants should be removed in all irrigation system infrastructure, for example around storage walls, supply and return channels, where practical. This will help prevent weed seed being moved around in irrigation water.

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