Vol 24, No 5, page 50 October–November, 2003

What bladder ketmia have you got?

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The positive identification of bladder ketmia, a weed closely related to cotton in the family Malvaceae, is important to ensure that the correct management strategies are employed for the particular variety or type.

The Malvaceae family also includes species such as anoda weed, velvetleaf or swamp Chinese lantern, native rosella, marshmallow and spiked malvastrum. All are common summer growing weeds, with the exception of marshmallow.

The various varieties of bladder ketmia (wide leaf and narrow leaf) are widespread throughout the cotton industry. In a recent survey by Ian Taylor, NSW Agriculture (ACRI), conducted from Hillston in southern NSW to Emerald in central Queensland, bladder ketmia was found to be the most troublesome and widespread weed, infesting nearly 85 per cent of the cotton properties surveyed.

While individual plants are not overly competitive, bladder ketmia plants often occur in dense stands that can cause considerable localised yield losses. Bladder ketmia is extremely difficult to control, most notably because there are a number of seedling flushes throughout the season — typically following irrigation and rainfall.

The weed also has prolific seed production, and since it is related to cotton, there is a limited range of herbicides that can be used without the risk of crop injury.

Different bladder ketmia varieties

There are two different varieties of bladder ketmia, generally distinguished by their leaf shape — wide leaf bladder ketmia and narrow leaf bladder ketmia (see photos). Wide leaf bladder ketmia is generally found in the hotter, western and northern cotton areas, while narrow leaf bladder ketmia is found mainly in the cooler, eastern areas (see map). Both varieties are commonly found around the line on the map.

Wide leaf bladder ketmia (Hibiscus trionum var. vesicarius)

Wide leaf bladder ketmia is an erect annual plant, five to 150 cm tall with waxy, green leaves that are around 90 to 100 mm long and 70 to 80 mm wide. There are two types of wide leaf bladder ketmia. Both have cream or yellow petalled hibiscus-like flowers, but are differentiated by the colour found at the centre of the flower.

Wide leaf bladder ketmia prior to flowering showing the distinctive waxy, green leaves.

Narrow leaf bladder ketmia prior to flowering showing multi-lobed leaves, some tinged with purple around the edges.

One type of wide leaf bladder ketmia has flowers with a yellow centre (see photos, page 52). It is commonly found throughout NSW and southern Queensland — for example in the Macintyre valley, on the Darling Downs around Dalby and Jimbour and at St George.

The other type of wide leaf bladder ketmia has flowers with crimson/red centres and is commonly found throughout central and western Queensland. It is likely that both types co-exist in a number of areas as they have been found growing together near Jimbour on the Darling Downs and in the St. George irrigation area.

Narrow leaf bladder ketmia (Hibiscus trionum var. trionum)

Narrow leaf bladder ketmia is a semi-prostrate to erect annual plant, five to 130 cm tall with leaves that are around 70 mm long and 90 mm wide (see photo, page 54). Plants tend to be shorter than wide leaf bladder ketmia and have more deeply divided leaves. The flowers of narrow leaf bladder ketmia have cream coloured petals with a deep purple centre.

Narrow leaf bladder ketmia is common in eastern and southern NSW and on the Darling Downs in Queensland. It is probably the only variety of bladder ketmia found in the Gunnedah area and to the east of Dalby. It is commonly found growing with the yellow centre flower type of wide leaf bladder ketmia in the Namoi, Macquarie and Lachlan valleys and with both wide leaf types around Jimbour on the Darling Downs.

Why are these differences important?

Timely management

It is important to recognise the differences between both varieties of bladder ketmia to ensure that management is done in a timely fashion when the plant is vegetative and easier to kill, and so that herbicide selection is optimised.

For example, narrow leaf bladder ketmia can flower and produce mature seed faster than the wide leaf types and needs to be managed within the first four weeks of emergence, before flowering occurs. Even within the wide leaf bladder ketmia types, timing is important. For instance, the vegetative phase of the yellow flowering type is five weeks whereas it is nearly six weeks for the red flower type, giving one to two weeks longer to manage plants.

Depending on the type of wide leaf bladder ketmia, mature seed is set within 53–61 days, (Table 1). Each mature seed head has an average of 33–34 seeds and between 0–199 (an average of 67) seed heads are produced over the annual lifecycle of this plant. This results in an average of 2300 new seeds added to the soil for each mature plant. There appear to be other differences between the two types of wide leaf

The yellow centre flower type of wide leaf bladder ketmia. This type is commonly found throughout NSW and in southern Queensland.

The crimson/red centre flower type of wide leaf bladder ketmia. It is commonly found throughout Queensland and co-exists with the yellow centre flower type on the Darling Downs and around St George.

bladder ketmia, most particularly in leaf size, the times required until flowers are produced and seed heads matured, and the number of mature seed heads produced.

In narrow leaf bladder ketmia, flowering and seed set occurs more rapidly with flowering within 30 days of plant emergence and mature seed set within 46 days (Table 1). Each mature seed head has an average of 34 seeds, and between 0–395 (an average of 164) seed heads are produced annually. This results in an average of 5600 new seeds added to the soil for each mature plant.

It is important to note that the figures presented above are glasshouse averages and that times may vary in the field. In particular, plants may go to seed quicker under shorter daylength conditions, for example, towards the season's end. Research is still being conducted to see if this is the case.

Both types of bladder ketmia need to be monitored throughout the season to reduce or prevent seed set, not only because flowering and seed set occurs relatively quickly, but also because there are a number of emergence events throughout the season after rainfall and irrigation. Reducing seed set is particularly important because a relatively light infestation of two plants per square metre can result in between 46 and 112 million new seeds added to the soil seed bank per hectare every year for wide and narrow leaf bladder ketmia respectively.

Bladder ketmia seed is strongly dormant and will be an issue for well over five years. Trials are continuing to determine if there are differences between the varieties. With strong seed dormancy it is easy to see that once seed set has occurred in one year, it is very difficult to reduce the weed problem that bladder ketmia causes for many years thereafter.

Herbicide control

Bladder ketmia is difficult to control using the current herbicide range. It can only be effectively managed with good integrated weed management (IWM) including cultivation, chipping, good farm hygiene and herbicide applications in fallow and in-crop.

Although herbicide applications are only part of an IWM program, there are a number of options available. The following information forms part of a series of best bet management recommendations in WEEDpak, obtained from interviewing a number of cotton growers and consultants.

Prior to planting, glyphosate and oxyfluorfen, or paraquat/diquat may be used, followed by either diuron or fluometuron and prometryn at planting. Roundup Ready (RR) herbicide should be used in RR varieties applied over-the-top (up to the fourth true leaf stage), then an early lay-by of prometryn and/or diuron depending on the

TABLE 1: A summary of the differences between wide and narrow leaf bladder ketmia

Character	Wide leaf bladder ketmia	Narrow leaf bladder ketmia
Introduced/native	Native	Probably introduced
Approx. distribution	Warmer, western and northern growing areas	Cooler, eastern cotton growing areas
Plant height and habit	Always erect and up to 1.5 m high	Semi-prostrate to erect and up to 1.3 m
Leaf appearance	Waxy and mid to dark green Leaves with 3 lobes, not deeply divided Margins not toothed (entire)	Leaves less waxy, often with purple tinged edges Leaves have 3, sometimes 5 lobes, deeply divided Margins are toothed
Leaf size (l x w)	92 x 83 mm (yellow) 101 x 72 mm (red)	72 x 93 mm
Flower appearance	Cream with yellow centres, or with crimson/red centres	Yellow/cream petals with deep purple centres
Time to flowering (glasshouse average)	37 days (yellow) 40 days (red)	30 days
Time to mature seed heads (g'house ave.)	53 days (yellow) 61 days (red)	46 days
Seed head appearance	Straw coloured and rough in texture with raised ribs. Not see-through upon maturity	Light grey and papery with soft, purple raised ridges Nearly see-through at maturity
Seed heads/plant	67 (range 0–199)	164 (range 0–395)
Seed appearance Seed number/head	Larger by 50% and black 34 (range 24–39) yellow 33 (range 26–39) red	Smaller and light to mid grey 34 (range 29–40)
Total seeds/plant	2300 (range 50–7800)	5600 (range 1500–15 900)
Seed production/m^2		
@2 plants/m^2 (light)	4600	11 200
@10 plants/m^2 (heavy)	23 000	56 000

herbicides already applied. Season long management is needed.

Varietal differences may result in differences in management

Knowing the difference between the bladder ketmia varieties can also influence herbicide choice in some situations. For example, Scott Wallace, a former University of New England student found that while glyphosate (510 grams per litre of active ingredient) applied at label rates (1.35 litres per hectare) to adult plants that were in the early stages of flowering and producing green seed heads achieved good control of both varieties, these applications were more effective on the wide leaf variety. This result fits well with growers' experiences of controlling both varieties of bladder ketmia in Roundup Ready crops.

Conclusion

Bladder ketmia is a widespread and troublesome weed found throughout the Australian cotton industry. It is important to correctly identify the different varieties and types of bladder ketmia to ensure timely, season-long management.

Narrow leaf bladder ketmia can produce mature seed within six weeks of emergence and requires prompt management. The wide leaf bladder ketmia types (with either yellow and red centre flowers) require management within eight to nine weeks to prevent seed production.

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02 6799 1500 or stephenj@mv.pi.csiro.au. For further photos of the various growth stages or best bet management information refer to WEEDpak. Copies of WEEDpak are available on the COTTONpak's CD, from Cotton Industry Development (Extension) Officers, and directly from the Technology Resource Centre of the Australian Cotton Cooperative Research Centre.

The research outlined in this article formed part of a CRDC funded Post Doctoral Research Fellowship.

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