Volunteer and ratoon cotton

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The control of unwanted cotton in the farming system is an essential part of good integrated pest and disease management. Unwanted cotton is generally described as either

Volunteer cotton – plants that have germinated, emerged and established unintentionally and can be in field or external to the field (roadsides, fence lines etc).

'Ratoon' cotton – Also known as 'stub' cotton, ratoon is cotton that has regrown from left over root stock from a previous season.

Control of volunteers

Cultivation and herbicides are the two most common methods of volunteer cotton control. Both require the cotton plants to have germinated and emerged before control can occur. Planning to control volunteers is a key part of an integrated weed management strategy and should consider issues such as rotational crops, and other weeds present in the field. Reducing the amount of viable seed left in fields (through clean pick, stubble management) and around farm (through clean up after module removal and spillages) will reduce the amount of volunteers that germinate. It is also important to remember that volunteers and ratoons that are left to set seed will also contribute to volunteers.

Reasons why ratoon and volunteer cotton must go

1. Mealybugs survive from one season to the next on these food sources, infesting crops earlier in the following season.
2. Cotton aphids with resistance to neonicotinoids survive between seasons on these plants, reducing insecticide effectiveness.
3. Bunchy top disease can be transmitted by cotton aphids from infected ratoons to new cotton crops.
4. Silverleaf whitefly survive between seasons on these plants, resulting in earlier infestation in the following season.
5. They provide a winter host for pale cotton stainers and solenopsis mealybugs.
6. Inoculum of soil-borne diseases such as black root rot, Fusarium and Verticillium builds up in ratoons.
7. Ratoon plants place extra selection pressure on Bt
8. Ratoon cotton can be used as a host by the earliest and latest Helicoverpa generations.
9. Ratoon plants may only express sub-lethal doses of the Bt proteins, therefore increasing resistance selection pressure.
10. Fields with ratoons from Bt cotton are unsuitable for planting refuge crops, as the refuges cannot be effective if contaminated with Bt cotton plants.
11. Removing ratoons may be a costly exercise, but it is cheaper than the costs of dealing with the problems resulting from not removing them.
12. They are a biosecurity risk. Ratoons harbour pests and are a potential point of establishment for exotic pests.

Cultural

- Broadacre cultivation will control seedling volunteers as well as large volunteers in a fallow situation. Effective cultivation will only occur if the cultivation implement cultivates both the furrow and hill avoiding strips being left uncultivated. Cultivation will also manage other weeds besides seedling volunteer cotton which makes it an excellent non-chemical control to include within a integrated weed management program. The disadvantage of cultivation is that it only controls established seedlings, is slow and can cause moisture loss or soil damage if conducted at the wrong time.
- Seedling volunteers can be controlled reasonably well with less invasive physical removal such as kelly chains. These break the seedling cotton stems and can be particularly useful close to planting.
- Where isolated plants remain during a fallow and in non-field areas, spot spraying and physical removal by chipping is extremely effective.
- In crop cultivation with sweeps that lift or till out volunteers and other weeds are effective tools for control when volunteers are small.

Chemical

- The broad spectrum herbicide glyphosate has often been used extensively to control seedling volunteer cotton. Control has either been deliberate or inadvertent when targeting other weeds prior to cotton planting as a fallow spray or within-crop as a shielded spray. Glyphosate rates of 1.2 L/ha (450 g/L.) will easily control seedling cotton at the 1st and 2nd true leaf stage.
- The release and widespread adoption of Roundup Ready Flex® cotton, which has a gene allowing the tolerance of over-the-top applications of glyphosate, eliminates the use of glyphosate as a potential control herbicide for seedling volunteer Roundup Ready Flex® cotton. Likewise Liberty Link® volunteer seedlings cannot be readily controlled with glufosinate.
- With all contact herbicides, excellent spray coverage is essential for adequate control. This often means high (e.g. 100L/ha) water volumes per hectare. Coverage can often be compromised due to shading, stubble & lint. Ensure appropriate spray quality which may vary depending on the product selected, but generally a medium-coarse spray quality would be adequate at 100L/ha.
- Rotation cropping enables residuals to be included in the mix and is a good cultural control. Where rotations are planned, ensure that good control is achieved as cotton plants hidden within subsequent crops can continue to harbour pests and disease and won't be as obvious as bare fallows.
- Most herbicide options work best on seedling volunteers. Where plants become well established control is much more difficult. Double knock technique may be useful for these plants.
- Ensure label directions are followed, especially where volunteers are located near water ways.

Ratoon cotton

In theory ratoon cotton should not occur due to the requirement of harvested cotton to be controlled with adequate cultivation and soil disturbance as soon as practical after picking. This usually involves some sort of mulching and/or root cutting followed by cultivation to destroy the cotton root system. In conducting this cultivation an additional aim is to destroy over-wintering Helicoverpa pupae. This pupae control is a frontline strategy in managing insecticide resistance for the cotton industry and is mandatory if growing Bollgard II® cotton

Thorough crop destruction can be particularly challenging in a zero till situation, where the only soil disturbance is pupae busting. This operation should be conducted carefully to minimize the number of ratoons that survive.

Ratoon cotton is extremely difficult to control with herbicides as there is a small leaf area for herbicide absorption compared to the large root system available for carbon and nutrient supply. Table 3 in WEEDpak section F4.4 shows that for selected herbicides on ratoon cotton 20 days after treatment. there was greater than 90% regrowth on all treatments.

Table 34 (below) provides a list of herbicides that have registration for control of volunteer cotton. Not all brands of these actives have volunteer cotton on the label. Refer to label for specific use information.

ALWAYS FOLLOW LABEL DIRECTIONS

TABLE 34: Herbicides that have registration for control of volunteer cotton

Actives	MOA	Conc & forumulation	Appl rate	Stage	Comment
Amitrole + Ammonium Thiocyanate	Q	250 g/L + 220 g/L SL	4.3–5.6L/ha	Cotyledon – 8 leaf	See label for rain fastness. Apply in 50–100L/ha water. Addition of 0.25% LI700 may improve results. Tank mix with glyphosate. Sowing can occur immediately after application. Bleaching of isolated crop leaves may be seen after emergence
Amitrole + Paraquat	Q + L	250 g/L + 125 g/L SC	2–4 L/ha	Up to 8 leaf	Can be applied after an initial spray of a glyphosate herbicide (Double Knockdown). Refer to label for spot spray rates.
Bromoxynil	C	200 g/L EC	1.5L/ha or 1–1.5L/ha with glyphosate	Cotyledon – 6 leaves	Apply in minimum of 80L/ha water for Roundup Ready cotton. See label for rain fastness. Refer to label for restrictions on spray quality & condition.
Carfentrazone-Ethyl	G	400 g/L EC	Roundup Ready: 0.045 – 0.060 L/ha plus adjuvant Conventional 0.030 – 0.045 L/ha	2–6 leaf	Apply minimum spray volume of 80 L/ha. Tank mix with glyphosate, or products containing paraquat. Refer to label for adjuvant recommendation
	G	240 g/L EC	Roundup Ready: 0.075–0.1 L/ha plus adjuvant Conventional 0.050–0.075 L/ha		
Paraquat + Diquat	L	135 g/L + 115 g/L SL	1.6–2.4 L/ha SL 2.4–3.2 L/ha	1–4 leaf 5–9 leaf	Apply in 50–100L water/ha. For best results, spray during humid conditions in the late evening.
Flumetsulam	B	800 g/kg WG	50 g/ha	Pre-emergent	Do not apply post-emergent treatments if rain is likely within 4 hours. Do not irrigate (any method) treated crop of pasture for 48 hours after application. May be banded (>40%) over the row or broadcast. Minimum spray volume 150L/ha for optimum results.
Flumioxazin	G	500 g/kg WG	45 g/ha plus adjuvant	up to 4 leaf	Do not apply post-sowing pre-emergent. Apply up to 24 hours prior to sowing. Can be tank mixed with glyphosate. Refer to label for adjuvant details.
Glufosinate-Ammonium	N	200 g/L SL	3.75 L/ha in 100L water	2–6 leaf	Only apply to Liberty Link cotton varieties. Max 2.25kg a.i./ha/season (3 applications). As a contact herbicide coverage is critical to effectiveness. Will not control Liberty Link cotton volunteers.
Metribuzin	C	750 g/kg WG	470 g/ha	Pre-emergent	Registered for control of volunteer cotton in pigeon pea. Refer to label for critical comments.
		480 g/L SC	0.750 L/ha	Pre-emergent	Registered for control of volunteer cotton in pigeon pea. Refer to label for critical comments.
Fluroxypyr	I	333g/L	0.45 L/ha 0.6 L/ha	2–6 leaf 5–7 leaf	Summer fallow.
Saflufenacil	G	700 g/kg	9-26 g/ha plus Bonza 1%	2–6 leaf	May be tank mixed with Roundup Attack herbicide. Apply in 80–250L water per ha. Mandatory down wind no spray zone 100–250m