WEEDS, A COSTLY SQUATTER?

Graham Charles, Research Agronomist (Weeds in Cotton),
NSW Agriculture & Fisheries, Agricultural Research Station, Narrabri, NSW 2390.

Introduction

Over the past 20 years, the Australian cotton industry has become increasingly sophisticated, until it is now a world leader. However, despite the research push in pest management, plant breeding, nutritional and soil problems, the humble weed has been a largely overlooked, but costly squatter. Weed control costs the industry about $30 million each year; the cost of reduced yields, lint contamination, increased pest and disease problems, enforced rotations, and reduced cultivation, irrigation and harvesting efficiency would far exceed this. Weeds result in the inefficient use of resources in an otherwise efficient industry.

In late 1988 a research program was commenced at Narrabri Research Station looking at weeds in cotton, jointly funded by NSW Agriculture & Fisheries and the Cotton Research Council. This project is focusing on defining the weed problems in cotton, the factors contributing to these problems and the practices available to overcome them. It has initially involved a survey of weeds and weed control practices, and the development of a weeds research program.

This article presents some of the results of the weed survey, which was conducted in 1989, covering 67 600 ha, representing 48% of the NSW cotton area, and involving 52 growers. The survey used a set format, but involved an interview where a wide range of issues were discussed.

History for weeds!

The cost of weed control

The first, and probably most difficult section of the survey related to the cost of weed control and the components of this cost (Table 1). There was a wide range in costs between properties, varying from $101 to $357 ha^{-1}, and averaging $187 ha^{-1}. The hand chipping cost was particularly variable, ranging from $180 (on 2 separate properties), to $12 ha^{-1}. On a couple of properties, hand chipping had largely been replaced by spot spraying and shielded applications of Glyphosate.

The current weed control strategies rely heavily on herbicides and hand chipping. Accurate and timely applications of herbicides reduce the need for chipping, but because of the marginal safety of cotton herbicides, chipping is

needed in most situations. Many growers consider that the potential loss of cotton from high herbicide rates, far outweighs the extra chipping costs associated with lower rates.

Table 1. The breakdown of variable costs for weed control in cotton.

Variable costs of weed control in cotton ($ ha^{-1})			
Inputs		Variable cost	Totals
In cotton	Cultivation	19	
	Herbicides	76	
	Chipping	67	161
In fallow	Cultivation	4	
	Herbicides	3	7
On roads &	Cultivation	11	
channels	Herbicides	6	17
	Total		$187

The long-term importance of maintaining very low weed levels in cotton is difficult to quantify, due to the complexity of the factors involved. Surprisingly, weeds are frequently tolerated in fallows and alternate crops, where seed numbers build up. Weeds are important as alternate hosts for cotton pests (such as mites) and diseases (such as *Verticillium* wilt), but may also be important as beneficial hosts for essential soil mycorrhizae.

Weeds, too costly to ignore!!

The problem cotton weeds

The second section related to the weeds which are major problems on individual properties. Growers identified 34 weed genera* as problems in cotton, although 6 genera were only mentioned by single growers. Thirteen genera were important on at least 15% of the properties surveyed and are listed in Table 2.

In most cases, the important weeds affect a large proportion of the cotton area (Noogoora burr, noted as the worst weed, affects 44%), but are generally under control with the present strategies (trend of -3.6 for Noogoora). Nutgrass is the

* A genus (plural genera) is a group of very closely related species which may be difficult to distinguish in the field.

major exception, noted as the second worst weed. It affects only 15% of the cotton area, but is rapidly spreading in fields (trend of 7.6). Similarly, Sesbania, Haloragis Take All and Polymeria Take All are major problems on some properties, and could become industry problems.

Table 2. The problem weeds identified by farmers.

Important weed	% of Properties	Importance[1]	% of Area	Trend[2]
Noogoora burr	87	6.6	44	-3.6
Nutgrass	79	5.3	15	7.1
Bathurst burr	60	4.7	34	-1.5
Chinese lantern	46	3.2	18	-1.7
Peach vine	42	3.1	20	-1.8
Bladder ketmia	40	2.9	22	-2.9
Thornapple	38	2.6	14	-3.3
Yellow vine	37	2.5	16	-2.5
Haloragis take all	37	1.8	4	4.2
Polymeria take all	23	1.5	3	3.3
Sesbania	25	1.4	4	6.3
Barnyard grass	21	1.1	10	-3.3
Mint weed	17	1.1	5	-2.5

Note[1]. Weeds were listed in order of their importance. A score of 10 means every grower considers the weed to be the most important.

Note[2]. The trend in weed incidence. A score of 10 means the incidence is increasing, 0 the weed is stable, and -10 the incidence is diminishing.

Weeds, a growing problem!!!

Are you satisfied with your weed management strategies?

This was the obvious question to ask cotton growers. On the basis of the results listed in Table 2, the answer should be no, and this was the overall response of growers (Table 3).

This view was particularly strong in the Macintyre and Namoi Valleys. However, the data shows no obvious reason for the variation in opinion between the valleys. Although the Macintyre and Namoi valleys were the least satisfied with

their weed control, the weed control costs are highest in the Gwydir and Macquarie Valleys, and the major weed problems are also at least as bad in these valleys.

Table 3. Farmers' opinions of the effectiveness of their cotton weed control strategies and the break-down of the weed control costs.

River valley	Strategy[1]	Chipping bill ($ ha^{-1})	Herbicide bill ($ ha^{-1})	Total weed control bill ($ ha^{-1})
Macintyre	-6.0	44	66	163
Gwydir	1.1	59	73	207
Namoi	-5.6	91	78	177
Macquarie	-1.0	54	100	209

Note[1]. Growers replies were graded from 10 if their control was satisfactory, to -10 if it was not.

The large input of herbicides in the Macquarie Valley can be related to the high weed incidence in this region, particularly the incidence of burrs (the Macquarie had the highest incidence of 7 of the 13 major weeds), but appears to be giving relatively good weed control. Conversely, the problems in the Macintyre Valley can be related to the relatively low inputs of both herbicides and chipping in this region. The dissatisfaction in the Namoi Valley may be related to the imbalance between chipping and herbicides apparent in the data.

Cutting weed control won't cut it with weeds!!

The future for weeds research!

The final section of the weed survey asked growers to identify areas where they perceive a gap in the current weed research programs in the cotton industry, and to identify the area they felt should have top priority in a research program. The answers were many and varied, but have been categorised and presented below.

Research into nutgrass was the most commonly mentioned area where the current research is inadequate. Nutgrass is a major long-term problem to the cotton industry. It is not being controlled by the present management strategies, even though nutgrass has been the focus of intensive cultivation, rotation and herbicide programs by many growers.

Growers are often dissatisfied with the variability of herbicide performance and many failures have been attributed to poor application or to ineffective herbicides.

Many factors influence herbicide efficacy including temperature, humidity, rainfall, soil moisture, soil nutrition, soil type, weed growth and development stage, physiological stress, accurate weed identification and herbicide application.

Table 4. Areas where cotton growers feel there is an absence of, or a need for further weed research in cotton.

Areas requiring a research input	% of growers
Nutgrass	37
Herbicide application technology	32
The development of new herbicides	28
Field evaluation of the existing herbicides	26
The development of herbicide resistant cotton	21
Strategies for channel weed control	13
Evaluation of weed herbicide resistance	13
Weed ecology	10
Cultivation technology	10
The long term effect of residual herbicides	8
The development of lower cost systems	7
Strategies for fallow weed control	4
The importance of weed seeds in irrigation water	4

The development of new herbicides and herbicide resistant cotton is impossible in this program, but there is a large need for cooperative work with the organisations involved, to integrate new and existing technology into effective weed management strategies, and to develop new strategies for the use of techniques such as minimum tillage and permanent beds, and the introduction of herbicide resistant varieties.

The need for further field evaluation of the current herbicides arises from a number of sources, including problems with weed identification, herbicide application and timing, and many other factors which influence the plant, including the other inputs into the weed management system, such as cultivation, irrigation and the other herbicides. There is a great need to look at these interactions and develop integrated weed management systems.

American data on the quantity of weed seed in irrigation water suggests that this is not an important source of weed infestation, and is far less important than good cultural practices in the cotton field.

Table 5. The top priorities for weed research identified by cotton growers.

Top research priorities	% of growers
Nutgrass	29
The development of new herbicides	16
The development of herbicide resistant cotton	11
Developing new management systems	11
Research on the Take All weeds	10
The ecology of problem weeds	7
Other areas	8
No research required	6

Of the research priorities in Table 5, all require some input from a comprehensive weed research program, although there are limits to the number of topics that can be examined at any one time. Some research into the herbicide sensitivity of the Take All weeds has already been carried out, but there is a need to further examine these species, which are natives and largely confined to the Northern NSW irrigation areas. On the basis of the survey information, it has been determined that research into the nutgrass problem will be the top priority of this research program.

Weeds, here today, worse tomorrow!!!

Conclusions

Weeds are a major cost to the cotton industry which has not in the past been adequately addressed.

A number of major weeds are adversely affecting a large proportion of the cotton area, and some of these are not being controlled with the current weed management strategies.

There is a clear need for a weeds research program into long-term weed problems. Weeds are a major cost to the industry and there is a need to look at integrated management approaches, incorporating herbicides, cultivation, rotations and other cultural practices.

The current weeds program at Narrabri can be a vital component of the research push that is needed to evaluate our long-term weed problems.

Sustainable cotton, not sustained weeds!!!!