MANAGING LIPPIA IN THE COTTON FARMING SYSTEM

Graham Charles
(NSW Dept of Primary Industries)

Contents

Lippia is an aggressive perennial weed that is rapidly spreading through the inland river system.

Background

Lippia (*Phyla nodiflora*), is a highly invasive weed which is rapidly spreading in the Murray Darling Basin, and currently infests over 5 million ha. It is seriously degrading the riparian and floodplain environments in this region, reducing biodiversity and threatening valuable ecosystems.

As well as its major environmental impact, lippia has serious negative implications for the grazing industry. Lippia competes very strongly with all native and introduced pasture species, establishing on what is often the most valuable grazing areas. Once established, lippia out-competes other pasture species, resulting in almost pure lippia stands with little grazing value.

Lippia spreads until it forms an almost continuous mat, out competing other species. Note the lack of any vegetation bulk in this infestation in the Gwydir valley.

Lippia flowers prolifically, establishes readily from seed, and also spreads from vegetative parts that are carried in mud and flood waters. It is a perennial plant that grows rapidly in wet conditions, but can survive prolonged dry periods.

Lippia is extremely tolerant of grazing, but has little grazing value. Neither heavy grazing nor the exclusion of grazing appear to restrict the spread of this weed.

However, lippia doesn't tolerate cultivation, and so isn't normally a problem in conventional farming systems. Yet, lippia has the potential to directly impact the cotton industry in a number of ways.

Lippia and irrigation structures

Lippia has an extensive and well developed root system that enables it to dry the soil to depth. This drying can result in severe cracking in heavy clay soils, opening the soil to erosion. Lippia infested creek and river banks are often unstable and heavily eroded. The same effect could occur on

irrigation structures, reducing bank stability, leading to erosion and bank failures.

Lippia could easily establish above the water level in a turkey's nest dam and grow over the banks. If this happens, lippia will eventually cause extensive cracking of the banks, and will inevitably lead to bank failure.

Turkey's nest dams with lippia established on the walls are predisposed to fail.

It is critical that lippia not be allowed to establish on irrigation structures.

Lippia can cause severe cracking, destabilizing banks and causing slumping. (Photo: Mike Lucy)

Lippia and water movement

Heavy infestations of lippia result in a great reduction in the bulk of vegetation on the ground, potentially increasing the rate of water movement and the potential for erosion and soil movement.

Continuing expansion of the lippia infested areas in the river valleys is likely to result in an increase in the rate of water flow in these valleys during flood times, increasing erosion and soil movement problems.

Lippia and farming

Lippia is not a problem in conventional farming systems, as it doesn't tolerate cultivation. However, lippia is likely to become problematic in zero-tillage systems, where it does tolerate the herbicides commonly used.

Inclusion of strategic cultivation into a zero-tillage system may become a necessary management input where lippia becomes a problem.

Lippia and grazing

The spread of lippia in pastures can be reduced by good grazing management, encouraging other pasture species. Competitive pasture species may need to be introduced to degraded areas, and over-grazing and set-stocking should be avoided.

Nonetheless, research from Queensland indicates that lippia is likely to out compete any and all pasture species in the long-term. Careful grazing management is essential to ensure the longevity of pastures in susceptible areas.

Lippia and the riparian zone

Moves by the cotton industry towards better management of the riparian zone are being hampered by heavy lippia infestations where these occur. Re-establishment of native species into areas degraded by lippia will be very difficult and will probably necessitate short-term control of lippia with cultivation and/or herbicides.

Herbicides for controlling lippia

Lippia doesn't tolerate cultivation, but cultivation isn't a desirable option in easily erodible areas, in pastures or treed areas, or in close proximity to water, the areas where lippia is most frequently found.

A range of herbicides that control lippia is available, although repeated applications are always necessary, as lippia rapidly re-establishes from seed and surviving plants and plant pieces.

Lippia is also likely to reinvade clean areas after flood inundation. Management must make allowances for the movement of this weed in flood water, and in high-flow water pumped from rivers during flood events.

A table-drain uniformly infested with lippia was used for a herbicide screening experiment.

Lantana 600®, an Agricrop product, is registered at 5 L/ha for use on lippia on non-crop areas.

The Australian Pesticides & Veterinary Medicines Authority (APVMA) has also approved the use of 2 and 3 way mixtures of glyphosate (450 g/L) at 2.6 - 5.4 L/ha plus 2,4-D amine (225 g/L) at 2.4 L/ha and/or metsulfuron (600 g/kg) at 15 – 30 g/ha for lippia control on fallows in NSW and Qld. Effective control of this weed requires 2 applications over summer when possible. For more information on the permits and herbicide use, refer to the APVMA Permit web site at: www.apvma.gov.au. The current permits also allow for the use of 2,4-D amine (500 g/L) at 2 – 4 L/ha for controlling lippia in pastures.

However, 2,4-D can not be safely used around cotton, and metsulfuron has a long plant-back to cotton and some other species, especially when applied to alkaline soils.

So how effective are glyphosate and Lantana 600 alone?

The best control over a 2 year period from a field experiment in the Namoi valley was observed with Roundup CT® at 20 L/ha and Arsenal® at 6 L/ha (Table 1). Roundup CT at 5 L/ha was also still giving a reasonable level of control after 1 year. This result suggests that repeated applications of Roundup CT at around 5 L/ha are necessary to give effective long-term control of lippia, and are allowed under the current APVMA permit.

Table 1. The long-term control of lippia following a single herbicide application in autumn 2000 in the lower Namoi Valley. Weed kill was assessed 60 days, 1 and 2 years after application.

Herbicide	% Weed kill		
	60 days	1 year	2 years
Arsenal 6 L/ha	67	77	40
Arsenal 2 L/ha	30	10	10
Roundup CT 20 L/ha	100	80	37
Roundup CT 5 L/ha	70	60	27
Lantana 600 6 L/ha	63	43	27
Lantana 600 3 L/ha	53	33	23
Tordon 75D 5 L/ha	97	13	10
Starane 6 L/ha	57	3	10
Starane 2 L/ha	80	3	7
Tordon 242 5 L/ha	30	7	10
Garlon 2 L/ha	77	7	10
Grazon 2 L/ha	47	7	10
Untreated	0	0	3

Note Lantana 600® is the only herbicide registered for the control of lippia. Glyphosate may be used under an APVMA permit.*

Given the high cost of a 6 L/ha rate of Arsenal, the lack of registration of this product for this use and the problems sometimes associated with the use of this herbicide, the results from this experiment don't justify the use of Arsenal to control lippia.

None of the other herbicides that might be used in a fallow over summer, Tordon®, Starane®, or Grazon® were effective in controlling lippia. These results are supported by the findings of Mike Lucy (QDPI&F) and others who recorded similarly poor results from a range of fallow herbicides.

Lippia control was improved by repeated applications of Lantana 600 and Roundup CT (Table 2). Both herbicides gave good results, and better control from a repeated application of a lower rate than was achieved with a single application at a higher rate. Lantana 600 at 5 L/ha (twice) gave very good control after 1 year (90%). Two applications of Roundup CT at 5 L/ha also gave good results on a difficult-to-control weed.

Clearly, both these herbicides gave good levels of control with repeated applications at their label/permit rates and would be suitable for controlling lippia in fallows.

Lantana 600 has an advantage over Roundup CT for spot applications in that it acts extremely quickly when applied to flowering lippia, rapidly dulling the flowers. This readily distinguishes sprayed and unsprayed patches, simplifying spot applications.

Lower rates of Arsenal didn't give control comparable with the results of Lantana 600 or Roundup CT and should not be used for the reasons previously stated.

Table 2. The long-term control of lippia following herbicide applications in summer and autumn 2000/2001. Weed kill was assessed 60 days and 1 year after the initial herbicide application. The % ground cover of other species 1 year after the initial herbicide application is also shown.

Herbicide		% Weed control		% Other species
		60 days	1 year	1 year
Lantana 600 5 L/ha	Lantana 600 5 L/ha	95	90	83
Roundup CT 10 L/ha	Roundup CT 10 L/ha	95	70	57
Roundup CT 5 L/ha	Roundup CT 5 L/ha	95	70	63
Roundup CT 15 L/ha		80	47	60
Roundup CT 10 L/ha		70	55	50
Roundup CT 5 L/ha		57	40	57
Lantana 600 10 L/ha		53	33	73
Lantana 600 5 L/ha		80	47	60
Arsenal 2 L/ha	Arsenal 2 L/ha	100	37	23
Arsenal 1 L/ha	Arsenal 1 L/ha	93	20	37
Arsenal 2 L/ha	Roundup CT 5 L/ha	79	7	27
Arsenal 4 L/ha		93	33	43
Arsenal 2 L/ha		67	10	27
Arsenal 1 L/ha		72	57	60
Untreated		3	7	23

Note Lantana 600® is the only herbicide registered for the control of lippia. Glyphosate may be used under an APVMA permit.*

Combinations of glyphosate + 2,4-D amine and glyphosate + Ally appeared to give some improvement in lippia control compared to these herbicides alone but the onset of drought conditions made it impossible to determine the long-term effect of these treatments (Table 3). None of the combinations gave improved control compared to Lantana 600 but some did give better control than Roundup CT alone.

2,4-D and 2,4-D or metsulfuron combinations with glyphosate could be useful in fallow applications where there is no risk of herbicide drift to sensitive crops such as cotton, and where there is sufficient time between the herbicide application and the following cotton crop.

Table 3. The control of lippia following a single herbicide application in November 2001 in the lower Namoi Valley. Weed kill was assessed 60 days after application.

Herbicide	% Weed kill 60 days
Lantana 600 10 L/ha	82
Lantana 600 5 L/ha	67
Tordon granules 20 kg/ha	52
Roundup CT 5 L/ha	41
2,4-D amine 4 L/ha	28
2,4-D amine 2 L/ha	15
Ally 30 g/ha	15
Roundup CT 2.5 L/ha	7
Ally 15 g/ha	7
Tordon granules 20 kg/ha	4
Roundup CT 5 L/ha + Ally 30 g/ha	67
Roundup CT 5 L/ha + Tordon 20 kg/ha	63
Roundup CT 5 L/ha + 2,4-D amine 4 L/ha	56
Roundup CT 5 L/ha + 2,4-D amine 4 L/ha + Ally 30 g/ha	44
Roundup CT 2.5 L/ha + 2,4-D amine 2 L/ha + Ally 15 g/ha	33
Roundup CT 2.5 L/ha + 2,4-D amine 2 L/ha	30
Roundup CT 2.5 L/ha + Tordon 10 kg/ha	26
Roundup CT 2.5 L/ha + Ally 15 g/ha	15
Untreated	0

Note Lantana 600® is the only herbicide registered for the control of lippia. Glyphosate, 2,4-D amine and metsulfuron may be used under an APVMA permit.*

Roundup CT® at 5 L/ha gave good short and medium-term control of lippia in a table-drain, but also removed all other species..

Management of lippia not only involves the control of the lippia, but also the re-establishment of other competitive species. Lantana 600 is the herbicide of choice where other species are present as it is relatively soft on most other species, leaving more of these species to compete with any re-establishing lippia. This feature is important to the success of a lippia management program, as lippia is likely to reinvade clean areas. Areas treated twice with Lantana 600 at 5 L/ha (Table 2) had the best recovery of other species with 83% ground cover of other species 1 year after the first herbicide application. Lantana 600 will control some other species including galvanised burr, spear thistle and harrisia cactus.

For the same reasons, lower rates of glyphosate should be used where possible to allow for the retention of other species.

Summary

Lippia is a highly undesirable weed and should not be allowed to establish in the cotton industry. Particular care must be taken to ensure that lippia doesn't establish on irrigation structures as its presence is likely to lead to the failure of these structures.

Lippia should be controlled with cultivation where appropriate, or repeated applications of Lantana 600 on non-crop areas, or glyphosate on fallows. Glyphosate plus metsulfuron is the preferred option on fallows on non-alkaline soils, where cotton will not be a following crop.

2,4-D amine may be used to control lippia in pastures provided that there is no risk of spray drift to sensitive crops such as cotton.