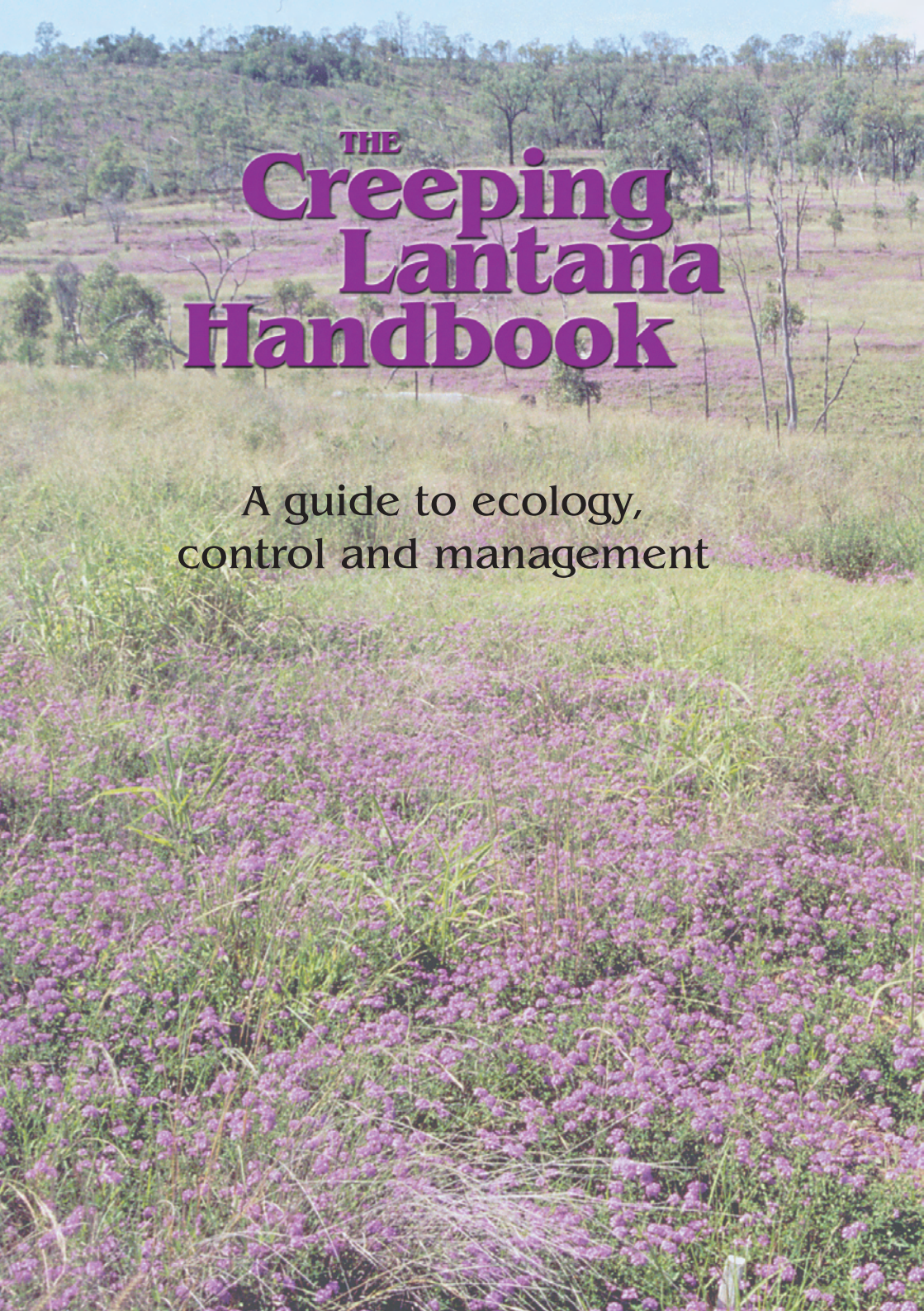

THE Creeping Lantana Handbook

A guide to ecology,
control and management

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QI02030

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Foreword

Creeping lantana has been a problem plant in the Burnett for many years having first been identified early last century. The plant threatens the natural environment in both a productive and an ecological sense by replacing native and improved pastures. Initially the spread was very slow and seemed to be confined to the more inaccessible parts of the landscape.

However during the 1980s and the early 1990s the level of infestation seemed to reach a critical level and the impact of the plant increased dramatically. Some grazing properties in the North Burnett suffered decreases in carrying capacity that jeopardised the viability of those enterprises. Land values decreased and severe infestations on public land such as National Parks became apparent. The plant often grows in large tracts of rough terrain where traditional control measures are not practical. A report commissioned in 1997 indicated that the potential for further spread in South East Queensland in particular, and Queensland generally, was significant.

These factors lead to a groundswell of community feeling that the issue needed to be addressed at a landscape scale rather than a property level. This resulted in the formation of the Creeping Lantana Action Group -a subcommittee of the North Burnett Landcare Group- in 1996. The group was initially focused on biocontrol. However a dearth of botanical information about the plant impeded early forays into this field of research. Further it was recognised that land management would always be part of the solution regardless of the success or otherwise of biocontrol.

In response to these issues, the CLAG applied for and was granted NHT funding for a project entitled 'Integrated Land Management Central and North Burnett'. The project did not focus on a 'silver bullet' solution but rather on gaining an understanding of the life cycle of the plant, identifying the weak links and targeting control strategies at those weaknesses. This handbook is the major output of that project and I am grateful for the assistance of Meat and Livestock Australia in funding this phase of the project. It is designed to be a practical guide and I commend it to managers of public and private land.

One of the features of the project has been the government agency and community cooperation. Staff from DPI, DNR&M, EPA and Brian Pastures Research Station collaborated with community members to successfully manage this project. I take this opportunity to gratefully acknowledge the contribution of all those involved.

In closing, I must reiterate the concern, that creeping lantana often infests large tracts of inaccessible terrain where land management options are very limited. Most landholders are of the opinion that biocontrol remains the only realistic possibility in these areas. I believe that the results of this project should not languish in the annals of scientific archives but should be used as an aid in identifying appropriate biocontrol agents to suppress and reduce these infestations of creeping lantana.

Paul Francis
CLAG Chairman

A bit of weed science

Many people have attempted to define what a weed is. These include:

- A plant out of place, or growing where it is not wanted.
- A plant whose virtues have not been discovered.
- A plant that grows spontaneously in a habitat that has been greatly modified by human action.
- Introduced plant species which takes possession of cultivated or fallow fields or pastures.
- A useless, undesirable and often very unsightly plant of wild growth, usually found in land which has been cultivated, or in an area developed by man for specific purposes other than cultivation.
- A herbaceous plant not valued for use or beauty, growing wild and rank and regarded as cumbering the ground or hindering the growth of superior vegetation.
- Any plant which is a nuisance to or which interferes with human activity.
- Plants existing at places and/or times at which they are considered undesirable.

Most of these definitions state or imply that weeds are perceived to have some sort of negative impact in time or space from the viewpoint of humans. The first and fourth definitions would probably best describe creeping lantana.

Creeping lantana's abundance is also favoured by its ability to persist during periods of extended drought and an ability to grow and reproduce under conditions of both shade and full sunlight. Although it survives or persists through dry periods, there is evidence to suggest that creeping lantana grows and spreads at a faster rate during very wet periods.

Characteristics of the 'ideal' weed (Baker and Stebbins 1965)

1. Germination possible in many environments.
2. Discontinuous (staggered) germination and seed longevity (long-lived).
3. Rapid growth through vegetative phase and early flowering.
4. Continuous seed production through the growing season.
5. Self-compatible but not completely self-pollinated.
6. When cross-pollinated, unspecialised visitor or wind is utilised.
7. Very high seed output in good environmental conditions.
8. Produces some seed in a wide range of environments.
9. Adapted for short- and long distance dispersal.
10. If a perennial, has vigorous vegetative reproduction.
11. Ability to compete interspecifically.

In contrast to the notion that creeping lantana abundance is related to over-grazing there is scientific evidence that suggests creeping lantana establishes more readily in undisturbed or light to medium grazed conditions. It is only **after** the plant is established that over-grazed conditions favour its spread.

The characteristics of Creeping lantana fit almost all of those of an 'ideal' weed listed above.

Introduction

The situation

Creeping lantana (*Lantana montevidensis*) has invaded native and improved pasture in open forest and scrub country in National parks and grazing land. This has resulted in a change in the ecosystem and a reduction in biodiversity, with negative impacts on native animals and trees. The abundance of native and improved pasture has also been reduced, with a consequent reduction in the carrying capacity. This has reduced land values and production potential.

A survey carried out in 1997 showed that 150 000 ha of land is infested with creeping lantana and there is potential for a further exponential growth of the infestation.

Creeping lantana occurs predominantly in the sub-coastal and coastal regions between Rockhampton and the Queensland/New South Wales border. It has been present in Australia for over a century. The earliest Australian herbarium specimen (held by the Queensland herbarium) was collected from Ipswich in 1888. A specimen collected by the Government botanist near Gayndah in 1917 is noted with the comment 'a very common weed'. Despite the long history of the plant in Australia there was little published scientific information available.

The Creeping Lantana Action Group (CLAG), a sub-committee of the North Burnett Landcare Group, obtained funding from the Natural Heritage Trust and established the 'Creeping lantana project' in

Severe Creeping lantana infestation of native pasture in the Burnett.

1998. The project initiated research into the biology and ecology of creeping lantana and acquired new information about the plant that is reported in this book.

Stakeholders can apply some or all of this new information and develop more effective integrated management practices. It is not intended as a 'fixed-recipe' approach but one that presents the findings in a manner that allows individual stakeholders to identify what might work in their particular circumstances.

Description

Creeping lantana takes the species portion of its name from the city of Montevideo, the capital of Uruguay, and the region from which the plant originates (Parsons and Cuthbertson 1992). It is known by several alternative names including purple lantana, small lantana, trailing lantana, weeping lantana, polecat geranium, wild verbena and various synonyms: *Lantana sellowiana, L. sellowii, L. selowiana, L. delicatissima* and *Lippia montevidensis*. **Note**: Wild verbena is also a common name for blue heliotrope and has also been used for some verbena species.

Creeping lantana in full bloom.

The plant is a creeping, trailing, decumbent or scrambling woody weed or low shrub, often mat forming with very short but profusely flowered branches. Stems are four-angled, without prickles and have the ability to root at the nodes. Leaves are opposite and vary in size from 8-30 mm. Flowers are light purple/lilac with a white or yellow centre, tubular and four-lobed. Fruits (technical name is Drupe) are up to 8 mm diameter, green at first and ripening to a dark brown or purple/black colour (Munir 1996, Stanley 1986). Each fruit has the potential to produce two seedlings.

A significant feature of creeping lantana is a large underground woody structure called a 'xylopodium' which acts as a carbohydrate storage organ and confers much of the resilience that the species exhibits with respect to fire, drought and herbicide.

Two forms of creeping lantana occur in Australia;

- a sterile ornamental or garden form which flowers profusely but does not produce seed. This variety is widely sold by the nursery industry; and
- the wild, weedy, fertile form which has become naturalised throughout parts of Queensland.

Research in this project was conducted on the fertile/wild variety.

Creeping lantana colonises diverse habitats including stony and rocky hills, alluvial flats, open woodland, riverbanks, roadsides and native pasture ecosystems. Reports as to possible toxicity effects after ingestion by cattle are conflicting. Everist (1974) reported that the plant was suspected of producing effects similar to toxic forms of bush or common lantana whilst Dowling and McKenzie (1993) reported that the plant was not toxic. An explanation could be that if cattle have grazed pastures infested with creeping lantana since birth they develop resistance or immunity but introduced cattle may have an adverse reaction when grazing infested pasture.

Distribution

Creeping lantana is most common in coastal and sub-coastal districts between Rockhampton and the Queensland/New South Wales border, with the worst infestations occurring in the Burnett district. In the 1960s and 1970s, populations of the fertile form were recorded from rural properties at Casino in north eastern New South Wales and from

near Penrith in Sydney. These infestations do not appear to have worsened or spread, as present-day local authorities in those areas are not aware of any occurrences of the plant. The sterile form of the plant is known to exist in gardens and other cultivated situations from the Torres Strait to Sydney, Melbourne and Adelaide. As the fertile and sterile forms have similar climatic preferences, the fertile form may well spread beyond its present range.

Figure 1: Map showing area in Queensland where the fertile form of Creeping lantana occurs (Modified after Flannery 1997).

Lifecycle and ecology

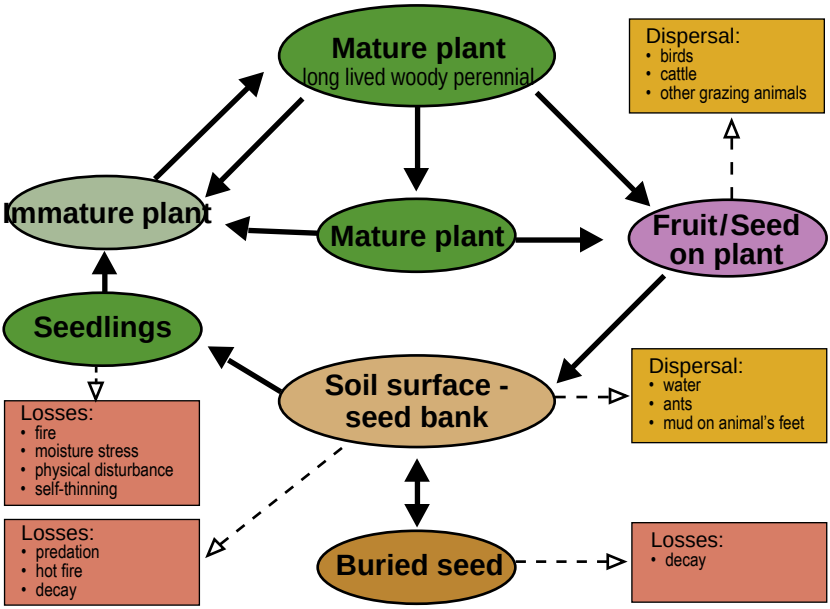


Figure 2: Creeping lantana life-cycle diagram

Seeds and Germination

Creeping lantana plants flower in response to rainfall, with seed production occurring about five weeks after flowering. Heavy flowering usually occurs when there is good rain after a protracted dry period such as the first good spring rain. Seed production can be quite high. At one location, which was monitored for two years, 5175 seed/m^2 were produced in 1999 and 4965 seed/m^2 in 2000. Each seed has two embryos, and therefore the potential to produce two seedlings, but usually only approximately 30 per cent of seeds in the field produce a second seedling.

In the field one major germination flush occurred in June/July when winter rain coincided with some very cold nights while another occurred in November following 175 mm of rain. Seed germinated all year round in irrigated glasshouse trials and a major flush was also triggered in the unheated plant-house in June after a series of nights when screen temperatures fell below 0°C.

In other germination experiments it was found that only surface-sown seed of creeping lantana germinated. There was no germination from seed buried at a relatively shallow depth of 1–2 cm. *This finding has practical implications for landholders who may consider cultivating to plant a crop or pasture in areas infested with creeping lantana. As well as killing creeping lantana plants, seed will be buried thus stopping germination.*

A 'longevity' experiment found that all surface-sown seed was dead after two years. However, about 20 per cent of the buried seed was still viable although viability was declining. Creeping lantana seed is therefore relatively short-lived. Depending on seasonal conditions, plants are capable of flowering and setting fruit more than once a year. Plants have been observed to remain in fruit from early summer through to mid-winter.

Another experiment has shown that creeping lantana fruits/seeds survive passage through the digestive system of cattle. If cattle are moved from a paddock infested with creeping lantana (when it is fruiting), it would be prudent to use simple quarantine measures, such as holding the cattle in yards or a holding paddock until all gut contents have been expelled (about five or six days), before allowing the cattle to graze clean pastures. By containing seed from undesirable species in a small area, control is quite simple and does not draw heavily on resources.

Landholders have observed sulphur-crested cockatoos, other parrot species, currawongs, crows and emus eating the ripe fruits.

Ant nest

Burning trials showed that a hot pasture fire kills nearly all creeping lantana seed that is on the soil surface. Buried seed, however, escapes the effect of fire. Ants transport creeping lantana seed and bury it when building their nests. If this buried seed becomes exposed within about two years, it could still be viable and germinable. Although a

hot fire kills creeping lantana seed, **smoke, derived from burnt pasture grass, stimulated seed germination**. Seed exposed to 5 or 15 minutes of smoke had germination rates 6 or 15 times higher, respectively, than the seed that was not smoked or seed that was heated to the same temperature as the smoked seed.

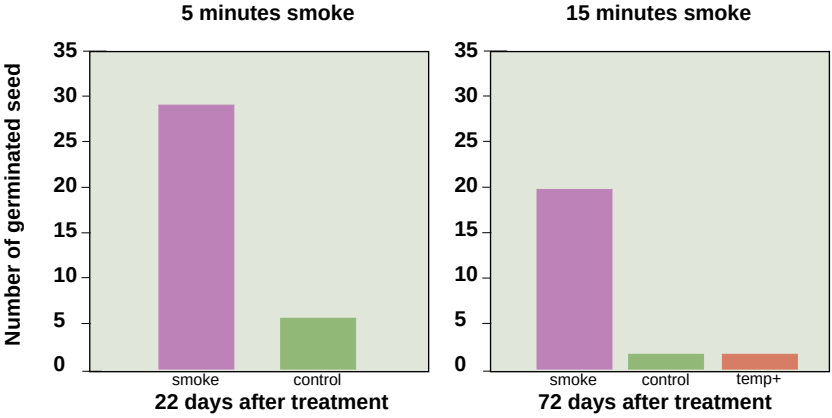


Figure 3: Effect of smoke from burning on the germination of Creeping lantana seed.

Many affected stakeholders use fire as a tool to manage pasture composition and control woody-plant regrowth. An added benefit, or even the primary aim of using fire, can be an effective reduction in the creeping lantana seedbank. Any seed that escapes the heat from the fire could be stimulated to germinate by the smoke, thus providing a further opportunity to attack the plant at a weak point.

Seedlings

The period following germination is critical, and many seedlings fail to develop into mature plants. Mortality can be caused by moisture stress, physical disturbance, fire or herbicides, although other factors may also be involved. Seedlings will establish more readily in protected areas such as:

- stony outcrops and areas protected from cattle movement;
- beneath fences or fallen tree branches and logs;
- within the tussocks of grasses that are not readily eaten such as wiregrass; or
- in pastures that are not subjected to hot fires.

In a trial investigating the establishment of creeping lantana seedlings in bare areas in pasture, all seedlings that established in a grazed situation perished from trampling but the seedlings in the corresponding ungrazed treatment all survived.

Even under well-watered conditions, growth of seedlings is surprisingly slow for the first few months while the root system develops. At one site monitored for 12 months during a period of average rainfall, seedlings grew to a height of only 11 cm with about fifteen leaves.

In experimental work that looked at how creeping lantana germinates in gaps in pasture, it was found that seeds will germinate in gaps as small as 5 cm in diameter. However, maximum emergence occurred in 10 to 20 cm gaps. A much smaller amount germinated in 40 cm gaps. No germination occurred where there was no bare area in the surrounding pasture. Although more seeds germinated in the smaller gaps, growth over the ensuing 12 months was greatest in the 40 cm gaps presumably due to lower levels of competition.

Because initial growth is slow, the seedling stage is a relatively weak area in the life cycle of creeping lantana. Seedlings can be killed effectively with a hot fire, herbicides, or physical disturbance.

Adult or mature plants

Creeping lantana is mature when it is capable of flowering. Under favourable conditions in the plant-house, creeping lantana plants reached maturity in less than 12 months from germination. Under field conditions, it is unlikely that plants would reach maturity in less than 12 months.

It is not known how long plants live. Observations during this project suggest that it lives for more than five years.

Plants also propagate vegetatively and a branch that rooted at a node and then became detached from the original plant could flower almost immediately.

Controlling adult plants is difficult. They are very resilient with respect to fire, drought, mechanical disturbance and some herbicides. However, pruning of woody stems at ground level proved effective in controlling mature plants. Although they regrew after the first two prunings, plants died after the third.

Integrated weed management

Listed below are five main categories of weed control. When two or more categories are used together a landholder can be said to be using an 'Integrated Weed Management (IWM)' approach. Landholders should strive to implement as many techniques as practicable from each category. An 'integrated' approach will be far more effective than any single approach.

1. Preventive and quarantine methods

The old saying, 'an ounce of prevention is worth more than a pound of cure' applies particularly to weeds like creeping lantana. Because of the difficult and inaccessible terrain often colonised by the plant, control poses extraordinary challenges. Implementing quarantine measures to prevent any invasive plant from becoming established is sound management practice and far more cost effective than attempting remedial action after an incursion has occurred.

Pasture- or crop-seed hygiene

Contaminated pasture-seed is not considered a likely way of introducing creeping lantana onto a property.

Fodder hygiene

It is worth observing the usual quarantine protocols for suspect animal fodder that is transported around in times of drought. Infested pasture should not be used as a source of hay.

Animal hygiene

Seed will pass through cattle without loss of viability, so quarantining animals that have been grazing creeping lantana infested pastures (when creeping lantana is bearing ripe fruits) in holding yards or in a holding paddock for 5 or 6 days will help prevent seed being dispersed into clean pastures.

Vehicle hygiene

Seed can be transported in mud and plants can regenerate from fragments, so observe the usual vehicle and machinery cleaning protocols.

Buffer strips

The use of buffer strips between infested and non-infested areas is a simple yet useful means of monitoring and controlling undesirable weeds like creeping lantana that spread laterally.

2. Mechanical (physical) methods

Tillage – plough, dozer, hand pulling or chipping

Mechanical disturbance trials found that an offset disc plough gave better control of creeping lantana and also gave a better seedbed, than did a chisel plough. One pass with either implement gave only limited control. The chisel plough caused fragmentation of creeping lantana with an increase in plant numbers. Field observations have shown that preparation of a full seedbed will kill adult plants and give satisfactory control.

A bulldozer that scraped the earth to a depth of 15 cm gave reasonable control of creeping lantana but the bare ground was quickly colonised by other weeds such as blue heliotrope. Some regrowth of creeping lantana occurred from exposed woody roots.

Mulching

Hay mulch was found to kill adult plants but it had to be applied at a thickness of at least 20 cm.

Mowing, slashing and pruning

As previously mentioned, creeping lantana plants died after three prunings where all the branches and leaves were removed.

3. Chemical control methods

Herbicides — Summary

- Starane® gave best overall control.
- Timing of glyphosate appears critical (apply at the end, not beginning, of growing season).
- Lantana DP-600® appeared to work well for up to two years. Significant regrowth occurred after this time in plants that had previously appeared to be dead.
- No chemical gave 100 per cent control. Regrowth (of adult plants) occurred for all chemicals with time.

Herbicide trials were conducted at Cania Gorge (Monto) and on Brian Pastures Research Station (Gayndah). As creeping lantana has a large woody root system, a selection of '**weak-acid**' type herbicides, which are translocated to the root system of plants, were chosen for these trials.

In the Cania Gorge trials, herbicides were applied in April following a summer season that had good rainfall. Plants were in full leaf and were flowering. Efficacy was assessed at five weeks, nine months and 27 months after spraying.

One of the most interesting findings from the herbicide trials was that creeping lantana plants would suddenly produce regrowth up to two years after they had appeared to have been killed. This is evident in Figure 4, which shows that as the time since spraying increased, control, as determined by observations of plants that appeared to be dead, diminished. The other important point is that **no herbicide**

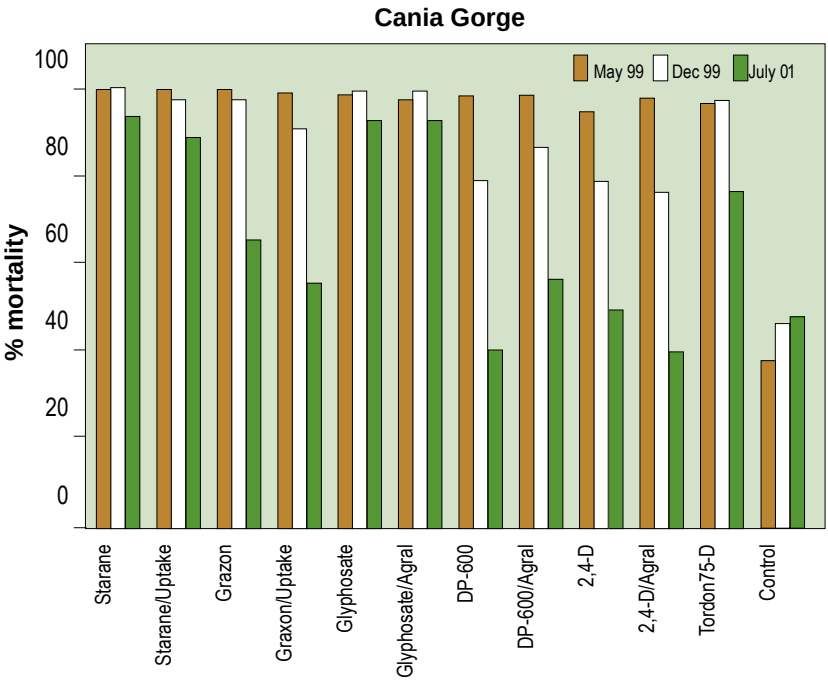


Figure 4: Results from the Cania Gorge herbicide trials.

gave 100 per cent control with a single spraying. The addition of Uptake® or Agral® did not increase the efficacy of the Starane® or glyphosate treatments.

Herbicide trials at Brian Pastures Research Station were conducted on a section of burnt and unburnt pasture before the start of the main growing season (late November). Starane®, Access®, Lantana DP-600® and glyphosate were used at full and half-recommended label rates. There was no difference in chemical performance between burnt or unburnt pasture. The unusual feature of this trial was the failure of glyphosate to provide any control of creeping lantana. It killed all the grasses leaving only patches of creeping lantana and bare ground. This is in contrast to the Cania Gorge herbicide trials, where glyphosate applied at the end of the growing season gave good control. As timing of glyphosate application appears critical, **it is not recommended for use on creeping lantana at the start of the growing season**.

The chemical Starane® performed well in these trials and there was no difference between rates of Starane® used – the half rate performed as well as the full rate. Access (+ diesel) at the full rate gave good control.

An interesting outcome and a consequence of the good creeping lantana control by the Starane® and Access® treatments was the rapid regrowth of grass within 3 months of the spraying. These treatments responded with an average of 5600 kg/ha grass of which about 50 per cent was black speargrass and 50 per cent was wiregrass.

Assessment of the chemical Lantana DP-600® needs to be monitored for longer than 12 months. In the Cania Gorge herbicide trials, Lantana DP-600® appeared to give good initial control but subsequent regrowth occurred from plants that were previously assessed to be dead. This was supported by other work. At the Mt. Perry trial site Lantana DP-600® gave good initial control of Creeping lantana and appeared to continue doing so until sometime between 21 months and 27 months after spraying when 100 per cent regrowth occurred. Although Lantana DP-600® failed to provide long-term control, it did allow desirable pasture grasses to become established although this could also have been achieved with Starane®.

4. Agronomic

- Sowing improved pastures.
- Fertiliser to boost competitive ability of grasses.
- Use of fire to manage pasture composition.
- Spelling and resting pastures.

Pasture vigour can play a role in reducing establishment of creeping lantana. The tussocky nature of native pastures will not prevent seed from germinating but a vigorous, competitive pasture can play a role in impeding the growth of seedlings. If seedlings are kept small they are easier to control with other techniques (herbicide, fire) and more likely to succumb to other factors such as water stress or trampling by cattle.

The 'Competitive Pasture Species' trials showed that Keppel indian bluegrass (*Bothriochloa pertusa*) and Premier digit grass (*Digitaria eriantha*) provided good grass biomass as well as some suppression of creeping lantana. Bisset and Hatch creeping bluegrasses (*Bothriochloa insculpta* cv. Bisset and *B. insculpta* cv. Hatch, respectively) provided good biomass but gave no suppression of creeping lantana. Buffel grass (*Cenchrus ciliaris*) competed reasonably well.

At the Cania Gorge site, all the grass plots that were sown in combination with Wynn cassia (*Chamaecrista*

Keppel indian bluegrass *(Bothriochloa pertusa)*

Premier digit grass *(Digitaria eriantha)*

rotundifolia) had fewer creeping lantana plants. Wynn cassia is known to release large pulses of nitrogen, which can boost the competitive ability of grasses (R. L. Clem pers. comm.). It is also possible that the suppression of creeping lantana was caused by the sprawling, smothering growth habit of Wynn cassia or perhaps a combination of this and the nitrogen pulse.

Black speargrass (*Heteropogon contortus*) did not establish in large numbers but in other work we found that black speargrass can establish in creeping lantana infested situations without any seedbed preparation.

Some of the 'control' plots (i.e. plots not sown with grass) in the 'Competitive Pasture Species' trials were also colonised by black speargrass. The ability of black speargrass to establish in creeping lantana infested situations without ground (seedbed) preparation is probably due to the drilling action of the hygroscopic awn on the seed of black speargrass. This feature enables the seed to travel through the creeping lantana leaf litter and into the soil.

Other grasses can also establish among creeping lantana and all the species that were sown in the Cania Gorge pasture trials established successfully. Based on this finding and some other pasture seed germination work we do not believe that creeping lantana has any allelopathic (inhibitory, poisonous) effect on pasture grass germination and establishment.

In plots designed to measure the amount of lateral growth of creeping lantana, red natal grass often became established among creeping lantana plants. When this occurred, creeping lantana's rate of spread was reduced. It would seem that simply destocking and resting can allow desirable grasses to re-establish but this would also be dependent to some extent on having a viable and germinable seedbank.

For information on the use of fire to manage pasture composition and on the benefits of resting and spelling pastures refer to Partridge (1993) 'Managing southern speargrass – a grazier's guide' and Partridge (1992) 'Managing native pastures: a grazier's guide'.

5. Biological control methods

Though not currently applicable, biological control of creeping lantana could come from any of the following categories:

- Plant-eating insects
- Live mulches
- Grazing
- Nematodes
- Rusts
- Viruses.

Investigation on a number of biological control agents has been unsuccessful. Work may continue if funding is available.

Management suggestions

Prevention and early detection of creeping lantana

Know how to identify creeping lantana – flower colour and the aromatic smell of the leaves are the best diagnostic features.

Newly germinated plant

Know what creeping lantana seed and newly germinated seedlings looks like. When creeping lantana germinates the first leaves are cotyledons. The first pair of true leaves begin to grow after only a few days. These first leaves are characterised by the aromatic leaf smell therefore it is relatively easy, to identify creeping lantana seedlings when they are only a few days old.

Carry out regular inspection and monitoring of places where creeping lantana is likely to establish. These places include:

- Bird nesting and roosting sites such as beneath trees and fences, especially if these are areas of low competition.
- Gullies, watercourses or any other area where water flows after rain – creeping lantana seed floats.

Mature Creeping lantana

- Other areas that are undisturbed and low in plant competition – rocky outcrops, areas of unpalatable grasses.

The best time to check for creeping lantana is when it is flowering – it can blend in with surrounding vegetation when not in flower. Flowering occurs in response to rain. The first good rain after a protracted dry period usually initiates a profuse flowering.

Creeping lantana can spread vegetatively – a controlled buffer strip between an infested and non-infested area can help impede this spread.

Quarantine cattle from infested areas in a holding yard / paddock for 5 to 6 days before allowing onto clean pasture. Monitor this location for all unwanted species.

Do not use infested pastures as a source of hay.

Purchased hay or fodder should be free of all weed seed.

The type of cover typical of native tussocky pastures may not prevent germination of creeping lantana seed but good cover and competition from healthy pasture grasses will impede the growth of creeping lantana seedlings.

Monitor pastures

Monitor the condition and trend of your pasture.

Because creeping lantana does not grow very high (unless supported) it can be present in a seemingly healthy pasture without the owner being aware of its presence. Checking a well-grassed pasture for creeping lantana cannot be done from inside a vehicle, on horseback or even by just walking through it. Pasture grasses need to be parted and a careful inspection of the flora growing beneath the grass canopy at ground level needs to be made.

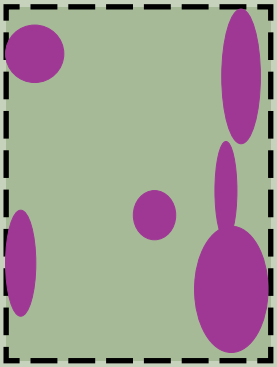
When covered or shaded by overlying vegetation creeping lantana often takes a different growth form, which is characterised by rapid lateral growth, and large leaves spaced at longer intervals along the stem. The conspicuous purple/lilac coloured flowers are also absent under shaded conditions and this can make detection more difficult. When a series of events arise, such as drought and heavy utilisation of remaining grasses, creeping lantana becomes exposed

and flowering can then occur. This coupled with the fact that it is adapted to and persists during prolonged droughts often gives the perception that it has recently invaded the pasture or is increasing during dry periods.

Monitoring pastures and pasture composition can help to develop an understanding of the ecology of both creeping lantana and other pasture species and can help landholders relate changes in composition to environmental factors and management practices. The DPI's 'GRASS Check' (1994) manual is a valuable tool for people who wish to monitor the condition of their pastures.

Creeping lantana and grazing

Although grazing and heavy utilisation of pasture are often blamed for the incursion of undesirable plants there are some examples where moderately grazed, infrequently disturbed pastures, have a greater abundance of creeping lantana than pastures which are heavily utilised.



Consider Figure 5. Here an ungrazed experimental plot containing native grasses is heavily infested with creeping lantana but the surrounding grazed pasture is not infested. There is a constant source of creeping lantana seed on a hill only 100 metres away. It is likely that the creeping lantana plants growing in the experimental plot started from seed deposited by birds sitting on the fence that surround the plot. Given this scenario, the creeping lantana should be spreading in both directions from the point of origin yet the spread has been only into the protected, ungrazed plot. This stark contrast where creeping lantana has flourished in an ungrazed situation with excellent grass cover but not in the adjacent grazed pasture is one example of where the abundance of creeping lantana is not related to grazing.

Figure 5: Diagram of a long term pasture monitoring trial that shows Creeping lantana is growing abundantly in the protected, ungrazed section but not in the surrounding grazed pasture.

Another interesting example comes from DPI's long-term grazing trial at Galloway Plains. Here, in a paddock stocked at one beast to 5 ha, the incidence of creeping lantana has increased four-fold since 1989. Plant numbers were static for the first 6 years to 1995 but numbers have increased steadily since then. See Figure 6.

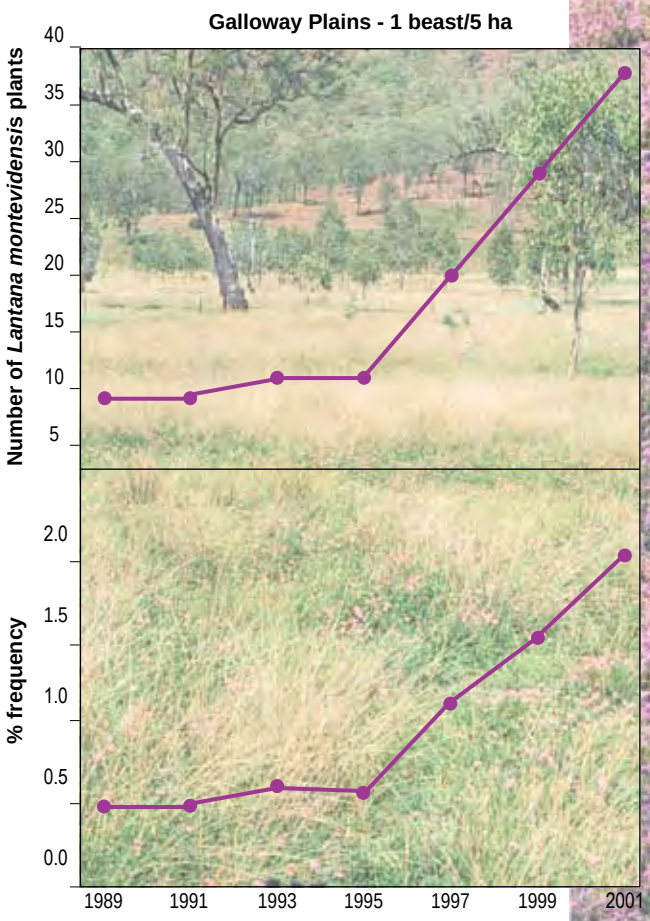


Figure 6: Results from DPI's Galloway Plains trial showing how Creeping lantana abundance has increased over time in a paddock stocked lightly at 1 beast to 5 ha (data provided by R.L. Clem).

In an experiment that imposed drought conditions for two years with three simulated levels of grazing (ungrazed, moderately grazed and over-grazed), creeping lantana spread more quickly in the ungrazed section when water was applied. The over-grazed section was quickly re-colonised by Blue heliotrope (*Heliotropium amplexicaule*). Creeping lantana then spread through the Blue heliotrope but it did not colonise the bare ground.

These findings are consistent with observations made throughout the district where there are paddocks which have little grass cover and are devoid of creeping lantana but neighbouring paddocks, with

reasonable grass cover, are heavily infested.

The relationship between grazing levels and creeping lantana incidence remains unclear. However it would appear that conservative stocking rates combined with some form of pasture spelling and judicious use of fire is likely to be the most effective way to maintain the vigour and competitive ability of native pastures.

Use of fire

Fire is used as a pasture management tool to simultaneously increase black speargrass, reduce wiregrass populations and control woody weed regrowth.

We have already seen that a hot fire will kill creeping lantana seed and seedlings. Unfortunately fire will not kill adult plants, as they resprout immediately after being burnt. Although flowering is delayed, actual flower numbers (and therefore seed production) can be higher on plants that have been burnt.

As already stated fire kills seed and seedlings which effectively means that fire prevents new individuals from being recruited into the population. As adult plants reach the end of their life populations should decline if new individuals have not been recruited. (As stated earlier, longevity of the plant has not been measured but is believed to be more than five years.) A negative impact from the use of fire may be the creation of gaps or bare ground that can facilitate the incursion of other unwanted species.

Planning control options

Management and control of creeping lantana should be included in a Property Management Plan. Do a cost/benefit analysis and decide how much time and how much money to allocate for control operations. Take account of the initial costs (chemicals, pasture seed, adjusting stocking rates, labour, hiring and operating machinery etc). Determine where control of creeping lantana will maximise an increase in animal production. There might not be justification for controlling creeping lantana on a steep, stony hill if that parcel of land does not support much animal production. It may be more economical to concentrate efforts on the better country but beware that there will always be a source of seed and a potential for new populations to spread from areas that are not controlled.

From the foregoing information in this booklet, land managers should be able to determine which, if any, control method/s would be most practicable and beneficial in their respective situations. The following control strategies are examples that would have a positive impact on reducing the incidence and abundance of creeping lantana. Some could be used alone but an integrated approach would be more beneficial.

In any situation control of creeping lantana will target one or more stages of the life cycle. To be effective a control program would:

1. Deplete the seedbank
2. Kill all seedlings
3. Kill all adult plants
4. Incorporate measures that reduce or prevent new seed or plant fragments moving onto the property
5. Carry out regular monitoring for new occurrences
6. Implement best practice grazing and pasture management techniques.

All these tasks can be difficult and because birds and running water disperse seed, step 4 can be hard to achieve so step 5 becomes essential.

Steep, hilly country

Situation	Control
Isolated plants	Spot spray with Starane® (glyphosate can be used at end of the growing season) or chip out, mulch or prune all stems/branches (requires three successive operations).
Dense infestation	Spray with Starane® then use a hot fire to kill seed and seedlings. Oversow with grass and legume. Rest pasture to allow desirable grasses to regenerate - reduce stocking rate or de-stock. Oversow any suitable grass and legume. If the above options are not practical maintenance of a buffer strip will help to prevent colonisation of clean areas. Be aware of potential soil erosion problems on steep, hilly country. Although it is an undesirable plant, creeping lantana is functionally similar in at least one respect to the grasses it displaced – it is holding the soil together. If it is sprayed out and no other vegetation becomes established quickly soil erosion could occur.

Flat country, workable with machinery

Situation	Control
Isolated plants	Spot spray with Starane® (glyphosate can be used at end of the growing season) or chip out, mulch or prune all stems/branches (requires 3 successive operations)
Dense infestation	Use hot fire to reduce seedbank and kill seedlings. Prepare ground and plant. Sow grasses that provide good suppression of creeping lantana AND reasonable grass biomass for cattle feed (*Keppel indian bluegrass* or Digit grass with Wynn cassia or other suitable legume) OR Sow with grasses that provide no suppression of creeping lantana but provide excellent grass biomass for cattle feed (Bisset bluegrass, Hatch creeping bluegrass, Buffel grass or any other grass suited to local conditions). Spot spray any remaining plants the following season with Starane®. Spray with Starane® then rest. Spray with Starane® then oversow with black speargrass and Wynn cassia or other suitable grass and legume. Rest.

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Notes

Notes


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LANDCARE
QUEENSLAND


Queensland Government
Department of Primary Industries
Natural Resources and Mines
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