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STUDIES ON CALOTROPE (*Calotropis procera*) IN NORTHERN AUSTRALIA

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BACKGROUND

Calotrope (*Calotropis procera*), also known as 'rubber bush', is an exotic weed from Africa and Asia which has invaded tropical and sub tropical rangelands in northern Australia. The plant is a soft wooded, perennial shrub or small tree growing to 4 m high. The tap root reaches depths of 1.7 to 3.0m.

Models have indicated that it has the potential to further invade vast areas across northern Australia – on most soil types (from cracking clays to coarse sands) where the average annual rainfall (AAR) ranges from 150 to 1000 mm. Plants have also been observed on well drained soils in localities where the AAR is as high as 2000 mm. Current infestations are in habitats such as river banks, native pastures, abandoned cultivation paddocks, coastal fore dunes and mining sites. Calotrope has the potential to become a serious problem in rangelands by suppressing pastures and interfering with stock handling.

The potential for calotrope to spread rapidly in northern Australia is enhanced by its high seed production and wind dispersal mechanism (the seed structure includes a papas). Calotrope can be toxic to stock. It may suppress establishment of other species due to its allelopathic properties.

STUDIES ON CALOTROPE

Review of current knowledge and research

There has been substantial overseas research into the plant's characteristics and properties, particularly for medicinal purposes. However, there has been very limited research into the ecology of calotrope. Current research in Australia includes several herbicide trials being conducted by government departments across northern Australia. Commercial herbicide treatment of calotrope near Katherine in the NT indicated that 'Garlon 600' at 1:60 with diesel applied as basal bark application was very effective; the cut-stump method was relatively ineffective with the same chemical (Desailly, *pers comm.*).

Several aspects of calotrope were studied in this project, *viz.* temperature requirements for germination, seed production and plant interaction with buffel grass (*Cenchrus ciliaris*).

Temperature requirements for germination

Seeds were collected in April 2003 from a location 60 km north-east of Charters Towers on the Burdekin River in north Queensland. Thirteen plants were randomly selected within a stand and nylon sampling bags placed over a total of 24 randomly selected pods. Seeds from individual pods were kept separate for the germination test.

A thermogradient plate was used to provide a range of ten temperatures for germination. The minimum temperature was set at 10°C and the maximum temperature set at 45°C. Individual groups of 50 seeds were placed under each temperature treatment. This process was replicated twice.

The seeds were not subjected to any influence of photoperiod. Previous experiments showed little difference in results between seeds subjected to 24 hours of darkness and 12 hour dark/light rotations (Vogler and Brooks 2001). Germination was recorded as occurring if the radical was protruding 3 mm

from the seed coat. The seeds were monitored daily over a 12 day period for each replicate. A summary of the results is in Table 1.

Table 1. Germination of calotrope (*Calotropis procera*) seeds in a thermogradient plate.

Temperature (°C)	10	14	18	22	26	30	33	37	41	45
Germination (%)	0	0	1	34	81	50	20	1	0	0

It was concluded that:

- Maximum germination occurs at approximately 26°C.
- Significant germination occurs between approximately 20°C and 35°C.
- Germination may occur at temperatures as low as 18°C.
- Germination may occur at temperatures as high as 37°C.
- Germination will probably not occur below approximately 16°C.
- Germination will probably not occur above approximately 40°C.

There was a 'lag phase' of approximately four days before the first germination was recorded. Most of the germination then occurred in the following five days, declining significantly through to the 12th day.

The wide range of temperatures in which calotrope can germinate means that it will have a significant period throughout the year in most localities in which it can respond to rainfall. The maximum and minimum temperatures for germination may provide a guide for land managers on the time-frame in which they can control calotrope in the seedling stage.

Seed count

Counts of individual seeds indicated that there was an average of 500 seeds per pod. This indicates that calotrope is a prolific seeder, and even an individual plant would provide ample opportunity for rapid encroachment.

Interaction with buffel grass

Previous work in W.A. indicated that calotrope may be suppressed by buffel grass (Cheam 1984). However, observations at several sites across north Queensland indicated that calotrope can grow actively within buffel grass stands.

RECOMMENDATIONS

From the serious threat posed by calotrope, it is strongly recommended that further research be conducted into the ecology of calotrope in Australia to provide the basis for effective management and control.

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