USING PRE-EMERGENT HERBICIDES FOR THE CONTROL OF SICKLEPOD (*SENNA OBTUSIFOLIA*) IN THE WET TROPICS

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ABSTRACT

Sicklepod (*Senna obtusifolia*) is a significant weed of many parts of Queensland, from Mackay to Cape York. It can invade pastures, crops, road and power line corridors, clearings and creek banks. Previous research identified a suite of pre-emergent herbicides that when applied pre-wet season proved to be successful in controlling the seed/seedling bank during the short "Wet" season in the Dry Tropics. This study tests whether these herbicides will also prove effective in wetter tropical areas infested with sicklepod.

The herbicides are being tested in various landscapes of the Wet Tropics where sicklepod has become dominant such as riparian zones, steep hillsides, adjacent pasture and fallow agricultural areas.

Additional impediments to weed control in the wet tropics include a shorter window of opportunity for herbicide application and longer wet periods with higher rainfall totals. However, the higher productivity of arable and grazing land in the wet tropics environment makes herbicide application for weed control a viable option.

Using the same herbicides and rates as proven successful in the Dry Tropics, with the addition of Valor®, initial baseline data has been collected and treatments of both post and pre-emergent herbicides have been applied. Valor® was included as a post emergent treatment as it may be more suited to higher rainfall areas. The post-emergent treatments were added to ensure the ground is clear of sicklepod prior to pre-emergent herbicide application.

Early results indicate a significant reduction in seedling emergence. Further pre-emergent treatments will need to be applied to exhaust the existing seed bank.

Keywords: pasture weed, arsenic weed, wet season pre-emergence.

INTRODUCTION

Sicklepod (*Senna obtusifolia*) is a serious weed of many parts of Northern Queensland, from Cape York to Mackay, and in many situations, including pastures, crops, and corridors such as road and power-line clearings and creek banks. It is a member of the Fabaceae family with other closely related weedy species being *Senna hirsuta* (hairy senna) and *Senna tora* (foetid senna). Sicklepod can occur as a monoculture

but is predominately as an invader of grazing pastures and unmanaged lands in North Queensland.

Several herbicides are registered for post-emergent control of sicklepod, including Grazon® Extra, Conqueror® or similar herbicides. However, there is a lack of registered pre-emergent herbicides to help maintain a cycle of control during extremely wet conditions when infestations can be inaccessible and/or can go to seed hampering long term control.

Often, in the Dry Tropics of Cape York, Queensland, sicklepod grows in areas that are inaccessible during key points of its lifecycle allowing it to set seed and continue to re infest. Several pre-emergence herbicides were identified that when applied prior to the beginning of the wet season were effective at killing germinating seeds and maintaining areas free of sicklepod plants during the wet season.

Although not quite so dramatically seasonal, there are many places in the Wet Tropics where sicklepod infestations exist and are unable to be accessed and controlled at key times during the growth cycle. As well as the initial efficacy of pre-emergence herbicides on sicklepod seedling emergence, this study is determining whether the herbicides persist long enough in the soil to be an effective control tool within the higher rainfall environment of the wet tropics. Initial research findings are presented in this paper.

MATERIALS AND METHODS

Four geographically separated sites, all of which have average annual rainfall over 1500mm were chosen: Mossman, Goldsborough, Ingham and Yalboroo (Figure1). Sites were chosen to be representative of the different land use situations where sicklepod occurs. The Mossman field site is a fallow sugar cane paddock, the Goldsborough and Ingham sites are being actively grazed, while the Yalboroo site is a very lightly grazed pasture. The plots were placed in weed monocultures and avoided the inclusion of native trees or shrubs as much as possible.

Figure 1. The location of the trial sites in Queensland.

A randomised complete block design with five main treatments, three sub treatments and three replications was established to determine herbicide and application timing effects on sicklepod. The five main treatments consist of different herbicides plus an untreated control (Tables 2 & 3); the three sub treatments consist of herbicide/timing combinations (Table 1).

Plot size was 3m x 3m, leaving at least a 1m buffer surrounding each plot. Assessments included:

- Plant and seedling density, which were counted in four 25 X 25 cm quadrats in each plot
- Height and basal diameter measurements of representative samples of 10 plants randomly chosen from one plot of each treatment type
- Soil seed samples of three 5 x 7.5 cm round cores randomly retrieved from one plot of each treatment type
- Percent brownout after treatment was physically assessed by two operators and averaged for each plot
- Species composition within each plot was recorded and monitored for changes over time and potential off target effects.

Table 1. Timing schedule of different sub treatment application regimes.

	Treatment 1	*Treatment 2*	*Treatment 3*
Date	Herbicide	Herbicide	Herbicide
Mar-24	Post-Emergent Application	Post-Emergent Application	NIL
Oct-24	Pre-Emergent Application 1	Pre-Emergent Application 1	Pre-Emergent Application 1
Oct-25	Pre-Emergent Application 2	Pre-Emergent Application 2	Pre-Emergent Application 2
Oct-26	Pre-Emergent Application 3	NIL	Pre-Emergent Application 3

Post-emergent treatments were applied in March 2024, followed by a pre-emergent treatment in October 2024. Treatments will be applied as per Table 1. Data collection will continue until Oct 2027.

Herbicide: Post-emergent.

In our previous dry tropics study, the pre-emergent herbicides were applied to the (mostly) bare ground under the sicklepod infestations after the sicklepod had died off as per its annual lifecycle (Setter *et al* 2023). In the wetter tropics, bare ground is not expected therefore a post-emergent treatment was added to half the herbicide treated plots (see Table 2) to allow easier access to the ground level for pre-emergence herbicide application. These herbicides are all registered for the knock down control of pre flowering sicklepod. The post-emergent herbicide is the same as the herbicide assigned for the subsequent pre-emergent treatment for each plot. The only exception to this will be Tordon 75-D® substituted for Stuka flexi® because Stuka flexi® alone is not registered as a knock down herbicide.

Table 2. Post-emergent herbicides and rates used**.**

Group	Trade name	Product Rate ha^{-1}	Active ingredient application rate (g a.i. ha^{-1})
4	Grazon® extra	3.75 L	triclopyr + picloram as hexyloxypropylamine salt + aminopyralid (1125 + 375 + 30)
4	Conqueror®	3.75 L	triclopyr + picloram as hexyloxyproplamine salt (1125 + 375)
4	Tordon® 75-D	5 L	2,4-D + picloram as triisopropanolamine salt (1500 + 375)
14	Valor® 500 WG	0.7kg	flumioxazin (350)

Herbicide: Pre-emergent.
Herbicides/rates have been selected due to their residual efficacy with controlling sicklepod seed germination demonstrated in previous trials (Table 3) (Setter *et al.* 2023).

Table 3. Pre-emergent herbicides and rates used**.**

Group	Trade name	Product Rate ha^{-1}	Active ingredient application rate (g a.i. ha^{-1})
4	Grazon® extra	3.75 L	triclopyr + picloram as hexyloxypropylamine salt + aminopyralid (1125 + 375 + 30)
4	Conqueror®	3.75 L	triclopyr + picloram as hexyloxyproplamine salt (1125 + 375)
4	Stuka Flexi ®	1.25 L	picloram as potassium salt (300)
14	Valor® 500 WG	0.7 kg	flumioxazin (350)

The exception to the tables above was that Valor® was not used at the Ingham site, at landholder's request (concerned about withholding periods). Therefore only three herbicides were used at the Ingham site.

RESULTS

Post-emergent herbicides were applied to allocated plots in March 2024 and evaluated three months later. Conqueror®, Grazon® Extra and Tordon75-D® all appeared to be efficacious in causing pre flowering mortality. Valor® appeared to be less efficacious and often yielded only partial kills with plants going on to reproduce.

Pre-emergent herbicides were applied in October 2024, monitoring is ongoing, however preliminary indications are that Conqueror®, Grazon® Extra, and Stuka flexi® all of which contained the active ingredient picloram will be highly efficacious. Once again Valor® appears to show the least efficacy with higher seedling counts in Valor® treated plots.

In some of our research plots, the pre-emergent herbicide and combined post- and pre-emergent herbicide treatments appeared to be efficacious in minimising sicklepod emergence and growth and allowing re-establishment of pasture. As results are only

preliminary, we are speaking qualitatively until full data collection and analysis has been conducted. A Yalboroo plot is an early example of this (see Figure 2). In other sites, different species were becoming apparent, e.g. guinea grass at the Mossman site, and *Sida sp*. at the Goldsborough site.

Figure 2. Left: an untreated (Control) plot at the Yalboroo site in January 2025.
Right: The grass square of a treated plot (Grazon® Extra as post and pre-emergent treatment) amongst untreated edges of sicklepod at the Yalboroo site in January 2025.

DISCUSSION

For sicklepod, the soil seedbank is at least seven years in the Wet Tropics (Stephen Setter unpublished data). Successful management relies on the prevention of seed input and a reduction in seedling recruitment. Once nil input is achieved, the application of multiple pre-emergent treatments in combination with competition from other pasture species can help restore productivity.

To date, there doesn't appear to be much benefit in the application of the post emergent herbicides, but full analysis is ongoing. At the time of applying the pre-emergent herbicide treatments it became apparent that the application of a post emergent prior to the pre-emergent was unnecessary. Early observations don't support the need to apply a post emergent treatment for seedling reduction to occur.

The post emergent treatment was also included in case perennation occurred. Anecdotal evidence has suggested that sicklepod plants may perennate under certain conditions. However this is not supported by trial work where at each location, 10 tagged mature plants in control plots did not persist beyond one season at both the Dry and Wet Tropics sites.

There are various herbicides already registered for the control of adult sicklepod, and early results indicate the tested herbicides containing the active ingredient picloram are the most successful for use as both a post and pre-emergent treatment. High efficacy was achieved with Conqueror®, Grazon® Extra, Stuka flexi® and Tordon75-D®.

We noted that the dry tropics had a much more sudden germination flush after the first substantial rains, typically November, whereas in the wetter Tropics, it was a more gradual trickle of germination post seed production. This may mean a longer window of application of pre-emergent herbicide (perhaps August-October) will be more beneficial in the wet tropics compared to the later (October) timeframe as used in the previous dry tropic's trials. No horizontal movement of herbicide from plots by water observed, as can be seen in Figure 2 (Right).

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