INTERACTIONS BETWEEN SEED DEPTH, THICKNESS OF TRASH BLANKET AND HERBICIDE TREATMENTS ON EMERGENCE OF VINE WEEDS IN SUGARCANE

By

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Abstract

VINE weeds are appearing more frequently in sugarcane fields, particularly with the increasing adoption of green cane trash blanketing (GCTB). Current control measures are not effectively providing adequate control of these weeds. A project to develop strategies for managing vine weeds has been initiated and included three trials studying the factors influencing emergence of three *Ipomoea* species sown in trays. In the first trial, seeds of *I. triloba* and *I. obscura* were found to emerge at depths beyond 8 cm while germination of *I. nil* was reduced at seed depths greater than 4 cm. In the second trial, emergence of the three vine species was found to be unaffected by a trash layer of 5 cm whereas a significant reduction was observed as trash thickness was increased to 10 cm. An interaction between depth of the vine seed and thickness of trash layer was also noted; i.e. emergence of seeds at depths between 2 and 4 cm was reduced by more than 75% when covered by a trash layer of 10 cm. In the third trial, six pre-emergence herbicide treatments namely atrazine, atrazine + hexazinone, sulfentrazone, amicarbazone, trifloxysulfuron + ametryn, and diclosulam were tested for their efficacy against *I. triloba* sown at soil depths of 2, 6 and 10 cm. At 6 weeks after spraying (WAS), irrespective of seed depth, all herbicide treatments provided satisfactory control. The interaction between herbicide treatment and seed depth was significant at 12 WAS; irrespective of sowing depths, only sulfentrazone provided less than 5% germination over a period of 18 WAS. These results indicate that both thickness of the trash layer and choice of the herbicide treatment should be taken into consideration in the development of strategies to control vines in sugarcane under GCTB.

Introduction

Vine weed infestations are increasingly reported in sugarcane fields. Unlike other broad-leaved weeds, grasses and sedges normally present in sugarcane, vines have the ability to develop late in the season and spread long distances both horizontally and vertically, making control difficult. Vine infestations are often associated with green cane trash blanketing (GCTB) in both mechanised and manually harvested fields. The development of vine weeds is becoming a serious drawback to the adoption of GCTB, which is an economically and ecologically sustainable system in sugarcane (Seeruttun *et al.*, 1992; Morandini *et al.*, 2005).

The presence of vines in sugarcane is not new; studies date back to 1954 when Thakar and Singh (1954) reported that *Ipomoea hederacea* infestations caused losses of 20–25% in sugarcane in the Pusa area of Bihar by twining around clumps, bending the cane, damaging tops, causing stalks to remain undeveloped, and interfering with the harvest. In Australia, the problem emerged in the 1980s following the adoption of mechanised harvest in green cane (Calcino, 1986). Studies conducted in Brazil have shown that a trash cover of up to 20 t/ha did not totally prevent the emergence of *Ipomoea* spp. (Azania *et al.*, 2002; Manechini *et al.*, 2005). *Ipomoea coccinea* has been reported as the most common and troublesome broad-leaved weed in Louisiana sugarcane fields (Jones, 2006); its competition with the crop can reduce yield as much as 30% over a season (Millhollon, 1988).

In Mauritius, *Paederia foetida* and *Passiflora suberosa* have always been found as localised infestations in sugarcane fields; these perennial species are effectively controlled by the recommended post-emergence herbicide tank-mixes (Seeruttun *et al.*, 2005). Several new and more invasive vine species have been observed in recent years; these are partly attributed to changes in some cultural practices including trash management (Ismael *et al.*, 2008). The new species which have been favoured by the more conducive conditions include *Ipomoea triloba, I. nil, I. hederifolia* and *I. obscura*. These vines are annuals and reproduce exclusively by large amounts of large seeds.

I. nil and *I. triloba* are the most commonly found species and occur mainly in the humid and subhumid regions of the island. Earlier, it was thought that the rapid expansion of these two vines was due to the non-use of a pre-emergence herbicide treatment under GCTB conditions. However, it is observed that even in cases where pre-emergence herbicide treatments are applied several weeks after harvest when the trash has decayed, the vines are still ineffectively controlled. As several of the currently used pre-emergence herbicides are known to be effective on vines, the poor control remains unexplained. Furthermore, the use of post-emergence herbicides for the control of vines is not very practical as several flushes can emerge and application in well-developed or tall cane is not easy. This study has been initiated to investigate the individual and combined effects of seed depth, thickness of trash cover and some pre-emergence herbicide treatments on the germination and emergence of *Ipomoea* spp. in sugarcane with the final aim of developing appropriate management strategies.

Materials and methods

Three trials were established in fibreglass trays in 2008 at the Réduit Experimental Station of the Mauritius Sugar Industry Research Institute. *Ipomoea nil*, *I. obscura* and *I. triloba* were included in the first two trials whereas only *I. triloba* was involved in the third trial. The seeds of *I. nil* and *I. triloba* were obtained from vine plants grown on the station in 2007 whereas seeds of *I. obscura* were collected in a locality 10 km away where the agro-climatic conditions were similar to those prevailing at Réduit. To ensure a homogeneous germination, all seeds used were scarified with 98% sulfuric acid (Suwanketnikom and Julakasewee, 2004). The fibreglass trays, which had holes pierced at the bottom to allow drainage of excess water after irrigation, were filled with soil collected from the same experimental station. The soil used is equivalent to an Oxisol, containing some 80% clay and 4.7% organic matter (Parish and Feillafé, 1965; Soil Survey Staff, 1999).

Trial I—Vine species × sowing depths

Trial I was established on 3 March 2008 and each tray (0.60 m × 0.30 m × 0.16 m) was partitioned into five compartments with metal sheets. Each compartment represented the experimental unit where 10 vine seeds were buried at depths of 0, 2, 4, 8 and 12 cm.

Each vine species was sown in a separate fibreglass tray. Each treatment was replicated four times in a split-plot design with vine species as the main plot and sowing depths as the sub-plot. The trays were placed in the open air and irrigated when required. Germination counts were carried out every 3 days after sowing over three weeks, during which the mean minimum and maximum temperature was 20°C and 27°C respectively. The rainfall recorded over the three weeks of experimentation was 154 mm. At the end of the trial, the seedlings of each vine species and at varying sowing depths were cautiously uprooted to measure the length of the hypocotyl.

Trial II—Vine species × trash layer × sowing depths

Trial II was set up on 28 March and the trays (0.90 m × 0.45 m × 0.25 m) were placed outdoor in a split-split plot design with vine species as the main plots, trash layers as the sub-plots and sowing depths as the sub-sub-plots. Each tray was divided into two compartments along the length with iron sheets and each compartment was further sub-divided into five equal sections in which the same sowing depths as tested in Trial I were randomised. Two such trays represented the main plot where 10 seeds of *I. nil, I. obscura* and *I. triloba* were planted at the different depths. Three of the four compartments were afterwards covered with 5, 10 and 15 cm layers of dry trash from the commercial sugarcane variety M 1176/77. The height of each compartment was extended with iron sheets in order to accommodate the various trash layers. Samples of trash were also oven-dried to determine the dry matter equivalents for each layer. The fourth compartment did not receive any trash cover and represented the control. Each treatment was replicated four times.

The trial was watered when required and germination counts were undertaken on a 3 day interval over a period of 3 weeks where the mean minimum and maximum temperatures was 19°C and 28 °C, respectively. The total rainfall recorded during that period was 63 mm.

Trial III—Herbicide treatments × Sowing depths

Trial III was initiated on 9 October 2008 and lasted 18 weeks to study the efficacy of different herbicide treatments on the germination and emergence of *I. triloba* sown at three dates within that period. This trial was carried out under a shed where only the roof was covered with perspex sheets and temperatures were similar to the ambient conditions. The trays (0.90 m × 0.45 m × 0.25 m) were displayed in a split-plot design with three replicates. Seven herbicide treatments (including an untreated control) were imposed as the main-plot treatment whereas the sub-plots represented three sowing depths. The trays were divided into two equal parts along the length to accommodate the two main-plot treatments; they were partitioned using metal sheets. The latter were further divided into three to represent the sub-plot treatments in which 10 seeds of *I. triloba* were sown at depths of 2, 6 and 10 cm. Each main-plot was afterwards sprayed with the respective herbicide treatments using the Micron Autodos precision sprayer (MSIRI, 2007) equipped with an air-injet nozzle.

The herbicide treatments consisted of atrazine @ 4.0 kg a.i./ha, atrazine + hexazinone @ 2.4 + 0.6 kg a.i./ha, sulfentrazone @ 1.5 kg a.i./ha, amicarbazone @ 1.05 kg a.i./ha, trifloxysulfuron + ametryn @ 0.037 + 1.463 kg a.i./ha and diclosulam @ 0.09 kg a.i./ha. After spraying, the trays were watered regularly.

Seed germination and emergence of the seeds sown at the start of the trial were monitored over a period of 6 weeks after which the *I. triloba* seedlings were harvested for dry weight determination. A second batch of *I. triloba* seeds was sown on the same day in the same respective treatment; the seedlings were harvested six weeks later for assessing the effects of the various herbicide treatments on emergence and development. A third batch of seeds was sown and monitored in the same way as for the first two six-week periods before dry weight determination. The respective mean minimum and maximum temperatures for each assessment period (of 6 weeks) were respectively 18, 20, 22 °C and 26, 28, 29 °C.

Data analysis

Statistical analyses were carried out using GenStat Release 7.2 DE (PC/Windows XP) (GenStat, 2007). In trials I and II, data for the final germination count at the end of the three-weeks study were analysed and the means were compared at P<0.05 for statistical significance. Values for the dry weights at the three dates of sampling in Trial III had to undergo the transformation $(x+0.5)^{0.5}$ to mitigate the large coefficient of variance due to the presence of zero values in the data (Steel *et al.*, 1997). After analysis, the transformed data were de-transformed.

Results

Trial I—Vine species × sowing depths

The germination count, made 3 weeks after sowing, revealed that *I. obscura* and *I. triloba* had a significantly greater ability to germinate and emerge from the different sowing depths than *I. nil* (Table 1). In general, a significant reduction in the rate of seedling emergence of the three

Ipomoea spp. was apparent beyond a soil depth of 4 cm; this was more important for *I. nil* than the other two species with a reduction of more than 20% in the mean number of plants that emerged (Table 1).

Emergence of *I. obscura* and *I. triloba* was unaffected until their seeds were found deeper than 8 cm in the soil, causing a sharp decrease of more than 37% and 50% respectively in the mean number of seedlings (Table 1). No germination and emergence of *I. nil* at 12 cm depth was recorded.

Measurements revealed that the three *Ipomoea* species had the ability to produce longer hypocotyls in order to emerge from greater soil depths (Figure 1). Extension of the hypocotyl was particularly important when seeds were found at 4 cm in the soil or deeper.

At each depth, no difference in length of the hypocotyl was noted between the three vine species. No measurements were made for the length of the hypocotyl at 12 cm depth as only a few seedlings of *I. obscura* and *I. triloba* had emerged.

Table 1—Effects of different sowing depths (cm) on the emergence of *Ipomoea* spp. 3 weeks after sowing.

Depth of sowing (cm) Vine species	Germination count (mean number of plants)					
	0	2	4	8	12	*Mean (Vine species)*
I. nil	5.00	6.00	3.75	1.75	0.00	*3.30b*
I. obscura	8.00	8.25	8.25	7.75	5.00	*7.45a*
I. triloba	6.25	7.75	7.75	5.50	2.50	*5.95a*
Mean (sowing depths)	*6.42a*	*7.33a*	*6.58a*	*5.00b*	*2.50c*	

Values are means of four replications. Standard error of difference (s.e.d.) of means for main plot—vine species (d.f. = 6) = 0.870 and s.e.d. of means for subplot treatments—depth of sowing (d.f.= 36)= 0.632. S.e.d. for comparing between means with same level of vine species = 2.220 (d.f. = 36). Mean values in the same row or column not sharing the same letter are significantly different at P < 0.05 (LSD test).

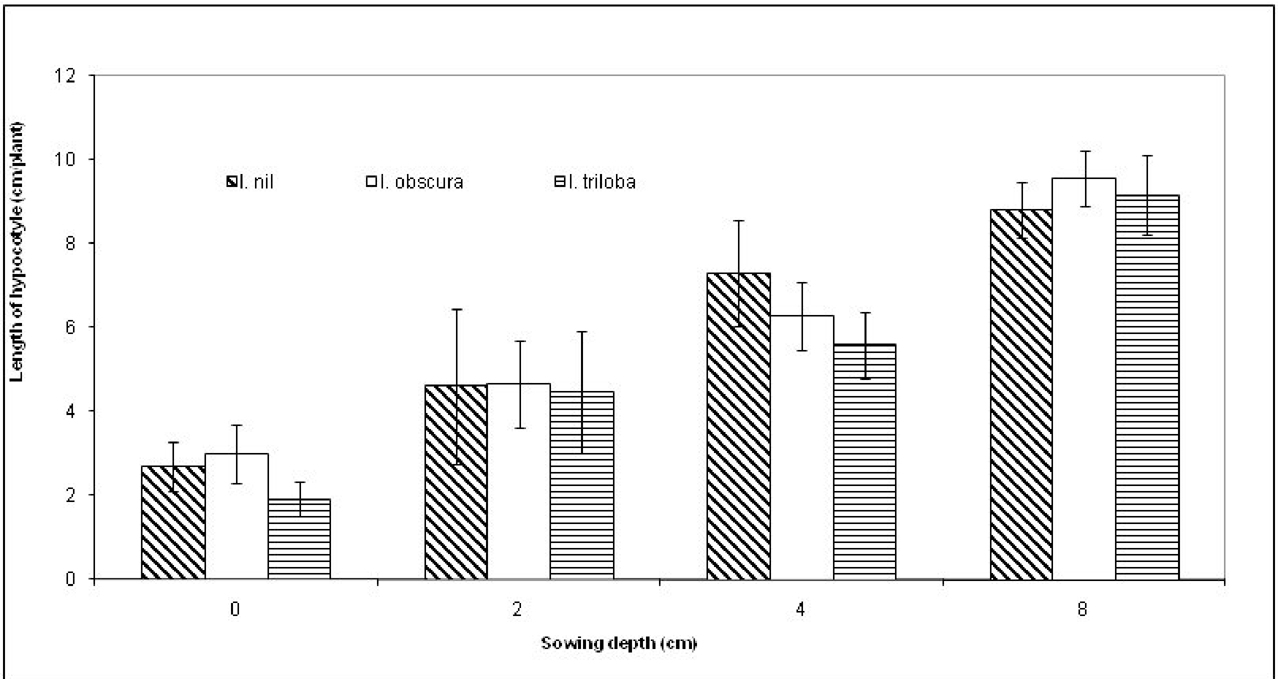

Fig. 1—Length of hypocotyl of *Ipomoea* spp. at different sowing depths.

Trial II—Vine species × trash layer × sowing depths

The higher ability of *I. obscura* and *I. triloba* to emerge compared to *I. nil* was again demonstrated in the second trial (Table 2).

This trial showed that, irrespective of vine species, a trash cover of 5 cm did not impede the growth of the vine species; emergence was found to be significantly reduced at 10 cm and more drastically with a 15 cm trash layer (Table 2).

Table 2—Combined effects of different trash layers and sowing depths on the germination of *Ipomoea* spp. seeds 3 weeks after sowing.

		Germination count – Mean number of plants					
Vine species	Trash layer (cm)	Sowing depths (cm)					*Mean trash layer*
		0	2	4	8	12	
I. nil	No trash	2.75	4.50	2.00	1.25	1.00	*2.30*
	5	4.50	3.25	4.00	1.25	0.75	*2.75*
	10	3.00	1.50	0.50	0.25	0.00	*1.05*
	15	0.75	0.75	0.00	0.00	0.00	*0.30*
	Mean sowing depths	*2.75*	*2.50*	*1.63*	*0.69*	*0.44*	*(1.60)*
I. obscura	No trash	4.50	5.00	5.75	3.50	1.00	*3.95*
	5	6.50	5.00	6.00	2.75	0.75	*4.20*
	10	2.00	0.75	1.00	1.50	0.00	*1.05*
	15	0.50	0.25	0.25	0.00	0.00	*0.20*
	Mean sowing depths	*3.38*	*2.75*	*3.25*	*1.94*	*0.44*	*(2.35)*
I. triloba	No trash	4.50	7.25	7.50	5.00	2.00	*5.25*
	5	7.00	7.50	7.00	3.00	1.75	*5.25*
	10	2.00	1.75	0.50	1.25	0.00	*1.10*
	15	0.00	0.25	0.00	0.00	0.00	*0.05*
	Mean sowing depths	*3.38*	*4.19*	*3.75*	*2.31*	*0.94*	*(2.91)*
Mean vine species	No trash	3.92	5.58	5.08	3.25	1.33	*3.83*
	5	6.00	5.25	5.67	2.33	1.08	*4.07*
	10	2.33	1.33	0.67	1.00	0.00	*1.07*
	15	0.42	0.42	0.08	0.00	0.00	*0.18*
	Mean sowing depths	*3.17*	*3.15*	*2.88*	*1.65*	*0.60*	

Values are means of four replications. Standard error of difference (s.e.d.) of means for main plot -vine species (d.f. = 6) = 0.218, s.e.d. of means for subplot treatments – thickness of trash layer (d.f.= 27)= 0.273 and s.e.d. of means for the sub-sub-plot treatments – sowing depth (d.f. = 144) = 0.285. S.e.d. of means for the interaction between vine species × thickness of trash layer = 0.473 (d.f. = 27); for interaction between thickness of trash layer × sowing = 0.493 (d.f.= 144).

Irrespective of the vine species and trash cover, emergence was not adversely affected when seeds were sown at 4 cm depth or less (Table 2). As from 8 cm depth, emergence was significantly reduced and this was even more pronounced at 12 cm depth. These results were similar to those observed in Trial 1.

The interaction between thickness of trash cover and depth of sowing was significant. With a trash cover of up to 5 cm, no reduction in vine emergence was observed for seed sown at depths of less than 8 cm (Table 2). Beyond this depth, vine emergence was significantly reduced and was more pronounced at the 12 cm. As trash cover was increased to 10 cm, emergence of vines was significantly reduced when seeds were sown at depths of 4 cm or more.

With a 15 cm trash layer, emergence was significantly reduced at all depths including those seed sown at the surface. The presence of a trash cover of 5 cm was also found to be more conducive for seeds germinating from the surface.

Trial III—Herbicide treatments × sowing depths

Efficacy of herbicides 6 WAS

The residual effect of the various herbicide treatments during the first six weeks is expressed as the dry weight of all seedlings of *I. triloba* (Table 3).

Irrespective of the sowing depths, no significant difference in the efficacy of the six herbicide treatments was observed; all treated plots provided a very good level of control as compared to the untreated one.

The good control obtained for the seeds sown deeper in the trays was not necessarily due to the efficacy of the various herbicide treatments, as germination and growth were also significantly reduced at the 10 cm depth within the untreated control (Table 3).

Table 3—Effects of herbicide treatments 6 WAS on the emergence of *I. triloba* (expressed as detransformed data for dry mass) sown at 2, 6 and 10 cm depths. Values in parentheses represent transformed data.

Herbicide treatments	kg a.i. ha^{-1}	Mean dry mass (g)			
		2	6	10	*Mean herbicide treatments*
Atrazine	4.0	0.00 (0.71)	0.00 (0.71)	0.01 (0.72)	*0.00 (0.71)*
Atrazine + hexazinone	2.4 + 0.6	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	*0.00 (0.710*
Sulfentrazone	1.5	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	*0.00(0.71)*
Amicarbazone	1.05	0.13 (0.80)	0.11 (0.78)	0.05 (0.74)	*0.10 (0.77)*
Trifloxysulfuron + ametryn	0.037 + 1.463	0.02 (0.72)	0.02 (0.72)	0.03 (0.73)	*0.02 (0.72)*
Diclosulam	0.09	0.14 (0.80)	0.03 (0.73)	0.06 (0.75)	*0.08 (0.76)*
Control (untreated)	–	2.27 (1.66)	1.39 (1.38)	0.50 (1.00)	*1.31(1.35)*
Mean sowing depths		*0.26 (0.87)*	*0.17 (0.82)*	*0.08 (0.76)*	

Values are means of three replications. Standard error of difference (s.e.d.) (transformed data) of means for main plot – herbicide treatments (d.f. = 12) = 0.069 and s.e.d. (transformed data) of means for subplot treatments – depth of sowing (d.f.= 28)= 0.053. S.e.d. of means (transformed data) for the interaction between herbicide treatment × sowing depth = 0.135 (d.f.= 40).

Efficacy of herbicides 12 WAS

For the second batch of seeds sown 6 WAS and harvested six weeks later, no significant differences were observed among the main-plot treatments (herbicide treatments), but a reduction in the dry weight of the seedlings emerging from a depth of 10 cm was observed (Table 4).

The interaction between herbicide treatments and sowing depth was also positive. The efficacy of the various herbicide treatments varied for seeds sown at 2 and 6 cm deep; at these depths the tank-mix hexazinone+atrazine and sulfentrazone provided the best control.

Diclosulam also showed some control of *I. triloba*; the level of control was significantly superior to the untreated control at the 6 cm depth (Table 4). At 12 WAS, the residual activity of atrazine alone and the tank-mix trifloxysulfuron+ametryn had elapsed, thus providing poor control of *I. triloba*. The emergence of *I. triloba* seeds was again suppressed when they were sown 10 cm deep in the trays.

Table 4—Effects of herbicide treatments 12 WAS on the emergence of *I. triloba* (expressed as detransformed data for dry mass) sown at 2, 6 and 10 cm depths. Values in parentheses represent transformed data.

Herbicide treatments	kg a.i./ha	Mean dry mass (g)			
		2	6	10	*Mean herbicide treatments*
Atrazine	4.0	1.97 (1.57)	1.64 (1.46)	0.95 (1.20)	*1.50 (1.41)*
Atrazine + hexazinone	2.4 + 0.6	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	*0.00 (0.71)*
Sulfentrazone	1.5	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	*0.00* (0.71)
Amicarbazone	1.05	0.86 (1.17)	0.51 (1.10)	0.29 (0.89)	*0.54 (1.02)*
Trifloxysulfuron + ametryn	0.037 + 1.463	0.87 (1.17)	2.20 (1.64)	0.18 (0.82)	*0.97(1.21)*
Diclosulam	0.09	1.71 (1.49)	0.00 (0.71)	0.06 (0.75)	*0.46 (0.98)*
Control (untreated)	–	2.21 (1.65)	1.47 (1.40)	0.00 (0.71)	*1.07 (1.25)*
Mean sowing depths		*0,96 (1.21)*	*0.69 (1.09)*	*0.18 (0.83)*	

Values are means of three replications. Standard error of difference (s.e.d.) of transformed data for means for main plot – herbicide treatments (d.f. = 12) = 0.255 and s.e.d. (transformed data) of means for sub-plot treatments – depth of sowing (d.f.= 28)= 0.086. S.ed. (transformed data) of means for the interaction between herbicide treatment × sowing depth = 0.316 (d.f.= 25).

Efficacy of herbicides 18 WAS

The residual activity of the various herbicide treatments tested over a period of 18 weeks revealed that only sulfentrazone was effective against *I. triloba*; sulfentrazone was found to be significantly superior to the control for seed sown at a depth of 2 cm (Table 5). At 18 WAS, all seeds sown deeper than 6 cm showed no response to the herbicide treatments.

Table 5—Effects of herbicide treatments 18 WAS on the emergence of *I. triloba* (expressed as detransformed data for dry mass) sown at 2, 6 and 10 cm depths. Values in parentheses represent transformed data.

Herbicide treatments	kg a.i./ha	Mean dry mass (g)			
		2	6	10	*Mean herbicide treatments*
Atrazine	4.0	1.04 (1.24)	0.65 (1.07)	0.23 (0.86)	*0.61 (1.06)*
Atrazine + hexazinone	2.4 + 0.6	0.22 (0.85)	0.45 (0.98)	0.01 (0.72)	*0.22 (0.85)*
Sulfentrazone	1.5	0.00 (0.71)	0.07 (0.75)	0.00 (0.71)	*0.02 (0.72)*
Amicarbazone	1.05	0.66 (1.08)	0.38 (0.94)	0.02 (0.72)	*0.33 (0.91)*
Trifloxysulfuron + ametryn	0.037 + 1.463	0.49 (0.99)	0.59 (1.44)	0.08 (0.76)	*0.37 (.093)*
Diclosulam	0.09	0.28 (0.88)	0.16 (0.81)	0.03 (0.72)	*0.15 (0.81)*
Control (untreated)	–	0.60 (1.05)	0.27 (0.88)	0.14 (0.80)	*0.32 (0.91)*
Mean sowing depths		*0,44 (0.97)*	*0.36 (0.93)*	*0.07 (0.76)*	

Values are means of three replications. Standard error of difference (s.e.d.) (transformed data) of means for main plot – herbicide treatments (d.f. = 12) = 0.069 and s.e.d. (transformed data) of means for subplot treatments – depth of sowing (d.f.= 28)= 0.060. S.ed. (transformed data) of means for the interaction between herbicide treatment × sowing depth = 0.148 (d.f.= 39).

Discussions and conclusions

This study has revealed that vine species growing in sugarcane fields have the ability to emerge from depths of up to 12 cm although this was found to decrease relative to 8 cm. The three vine species displayed the same capacity for producing longer hypocotyls at depth beyond 4 cm. Roberts (1982) reported that most annual weeds, with seed weights between 0.1 and 5.0 mg, usually emerge from depths of less than 5 cm, although seedlings of larger-seeded species such as

Polygonum convolvulus may do so from 10 cm or more. The seeds of *I. nil, I. obscura and I. triloba* form part of the latter category with mean seed weight of 18.6, 22.2 and 10.6 mg respectively (unpublished data). Futhermore, the bigger size of the *Ipomoea* seeds is associated with a greater food reserve enabling the seedlings to reach the surface by producing longer hypocotyl than small-seeded weed species (Roberts, 1982). Although *I. nil* produces bigger seeds than *I. triloba*, it was found to have a lower ability to germinate and emerge than the two other vine species in both Trials I and II. A recent study comparing germination and development of three vine species under three agroclimatic conditions of Mauritius has shown an interaction between species and climatic conditions (Chummun, 2009). The climatic conditions prevailing at Réduit may have been more conducive for the development of *I. obscura* and *I. triloba* as compared to *I. nil*.

The presence of a trash layer thicker than 5 cm had an adverse effect on the emergence of the vine species. This result concurs with that obtained in Brazil by Manechini *et al.* (2005) where trash cover equivalent to the 5 cm layer was ineffective in controlling *Ipomoea* species (*I. quamoclit, I. purpurea, I. grandifolia, I. hederifolia,* and *I. nil*).

The interaction between thickness of trash layer and sowing depth clearly indicates that vine control in sugarcane fields may be addressed by managing the thickness of the trash cover. Cane trash at 20 t/ha, representing approximately a 10 cm layer, has been found to reduce presence of *I. quamoclit, I. purpurea, I. grandifolia, I. hederifolia, I. nil* and *M. cissoides* by 82, 65, 62, 70, 60, and 88%, respectively (Azania *et al*., 2002).

From our study, very effective control of vines may be achieved by uniform trash layers of approximately 15 cm or more; in fields where lower cane yields will result in less trash and thinner trash layers, trash windrowing may be an alternative. The latter was a common practice in Mauritius where trash was raked and aligned on alternate interrows in layers reaching 20 cm or more after green cane harvesting. This may explain partly the good control of vines obtained previously in Mauritius.

Satisfactory control of *I. triloba* was achieved by all the herbicide treatments tested only within the first six weeks. Atrazine was already ineffective at the second assessment (12 WAS) as compared to sulfentrazone and the tank-mix atrazine+hexazinone. This rapid decline in the efficacy of atrazine against vine weeds has previously been reported by Jones (2006). For a longer residual activity to control *I. triloba*, only sulfentrazone was found to be effective 18 WAS; sulfentrazone is already recommended in Mauritius for its long pre-emergence control of a broad spectrum of weeds (Seeruttun *et al.*, 2001). Although this better efficacy of sulfentrazone was restricted for seeds germinating at 2 cm depth, the option of using this herbicide for managing vine weeds may be considered, as emergence of seeds from greater depths is less important.

Although the findings of this study need to be confirmed at the field level, there is an indication that both the thickness of the trash layer and choice of the herbicide treatment are important parameters that should be taken into consideration in the development of strategies to control vines in sugarcane.

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INTERACTIONS ENTRE LA PROFONDEUR DES GRAINES, L'ÉPAISSEUR DU PAILLIS ET LES TRAITEMENTS HERBICIDES SUR LES LIANESEN CANNE À SUCRE

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**MOTS-CLÉS : *Ipomée* spp., Sulfentrazone,
Diclosulam, Contrôle de Pré Émergence.**

Résumé

LES LIANES apparaissent de plus en plus fréquemment dans les parcelles de canne à sucre, en particulier depuis l'adoption croissante de paillis de canne (GCTB). Les mesures actuelles de contrôle ne sont pas efficaces sur ces lianes. Un projet ayant pour but de développer des stratégies de contrôle des lianes a été initié. Il inclut trois expérimentations étudiant les facteurs influençant l'apparition de trois espèces d'*Ipomoea* semée en barquettes. Dans le premier essai, des graines de *I. triloba* et de *I. obscura* ont germé pour des profondeurs supérieure à 8 cm tandis que la germination de *I. nil* était réduite à des profondeurs supérieures à 4 cm. Dans le deuxième essai, l'émergence des trois espèces de lianes fut gênée par un paillis de 5 cm tandis qu'une réduction significative de l'émergence fut observée avec des paillis de 10 cm. Une interaction entre la profondeur des graines de lianes et l'épaisseur du paillis a également été notée ; ainsi. l'émergence de graines aux profondeurs entre 2 et 4 cm fut réduite de plus de 75% avec un paillis de 10 cm d'épaisseur. Dans le troisième essai, six traitements herbicides de pré émergence comprenant l'atrazine, l'atrazine + hexazinone, sulfentrazone, amicarbazone, trifloxysulfuron + ametryn, et diclosulam ont été testés pour leur efficacité contre le *I.trilobad* semé à des profondeurs 2, 6 et 10 centimètres. Six semaines après pulvérisation, indépendamment de la profondeur de la graine, tous les traitements herbicides ont montré un contrôle satisfaisant des lianes. L'interaction entre le traitement herbicide et la profondeur de semis fut significative 12 semaines après pulvérisation, indépendamment des profondeurs de semis. Une germination inférieure à 5% ne fut observée qu'avec le sulfentrazone après 18 semaines. Ces résultats indiquent que l'épaisseur du paillis et le choix du traitement herbicide devraient être pris en compte dans le développement de stratégies de maîtrise des lianes en canne à sucre sous GCTB.

INTERACCIONES ENTRE PROFUNDIDAD DE SEMILLA, ESPESOR DE LA CAPA DE RESIDUOS DE COSECHA Y TRATAMIENTOS DE HERBICIDAS SOBRE LA EMERGENCIA DE MALEZAS DE ENREDADERA EN CAÑA DE AZÚCAR

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PALABRAS CLAVE: Ipomoea spp, Sulfentrazone, Diclosulam, Control De Pre-Emergencia.

Resumen

LAS MALEZAS de enredadera están apareciendo con más frecuencia en los campos de caña de azúcar, en particular con el incremento en la adopción de la cobertura con residuos del corte de la caña en verde (GCTB). Las medidas de control regulares no están controlando efectivamente estas malezas. Se inició un proyecto para desarrollar estrategias para el manejo de las malezas de enredadera que incluyó tres ensayos para estudiar los factores que influyen en la emergencia de tres especies de *Ipomoea* sembrada en bandejas. En el primer ensayo, se encontró que las semillas de *I. triloba*. e *I. obscura* emergen desde profundidades superiores a 8 cm, mientras que la germinación de *I. nil* se redujo con una profundidad de siembra de más de 4 cm. En el segundo ensayo, se encontró que la emergencia de las tres especies de enredadera no era afectada por una capa de residuos de 5 cm pero se observó reducción significativa cuando el grosor de la capa se incrementó a 10 cm. También se observó interacción entre la profundidad de la semilla de la enredadera y el espesor de la capa de residuos, es decir, la emergencia de las semillas a profundidades entre 2 y 4 cm, se redujo en más del 75% cuando estaban cubiertas por una capa de residuos de 10 cm. En el tercer ensayo, seis tratamientos de herbicidas en pre-emergencia, atrazina, atrazina + hexazinone, sulfentrazone, amicarbazona, trifloxysulfuron + ametryn y diclosulam fueron probados para determinar su eficacia contra *I. triloba* sembrada a profundidades de 2, 6 y 10 cm. A las 6 semanas después de la aspersión (SDA), independientemente de la profundidad de siembra, todos los tratamientos de herbicidas proporcionaron control satisfactorio. La interacción entre el tratamiento con herbicida y la profundidad de siembra fue significativa a las 12 SDA; independientemente de la profundidad de siembra, sólo sulfentrazone redujo a menos del 5% la germinación en un período de 18 SDA. Estos resultados indican que tanto el espesor de la capa de basura como la elección del tratamiento con herbicidas deben tenerse en cuenta en la elaboración de estrategias para el control de las enredaderas en la caña de azúcar bajo GCTB.