SCREENING OF TWO POSTEMERGENCE HERBICIDES FOR SELECTIVE WEED CONTROL IN THREE DIFFERENT AGE CLASSES OF *FIMBRISTYLIS CYMOSA*

The use of native plant species for revegetation efforts in conservation zones, highway right-of-way and in commercial and government landscapes has received increased interest across the United States In Hawaii, Acts 73 and 236 are laws which encourage landscape architects to use “indigenous” and “Polynesian introduced” plants in State funded projects. Weed control is an important component of any successful crop production system and the establishment and production of native Hawaiian species is no different. Control of weeds in production sites and newly established landscapes where native grasses are present is a challenging management issue. Herbicides that control weeds while minimizing detrimental impact to stands of native Hawaiian plant species would be a powerful and important tool for plant producers and landscape managers.

Herbicides that can selectively control grassy weeds in broadleaf crops have been commercially available for 15-20 years. The same is true of herbicides that can control broadleaf weeds in grassy crops. These herbicides can elicit a wide range of effects from complete kill to varying levels of growth suppression. However there is no literature describing the response of native Hawaiian sedges to commercially available post-emergence grass herbicides.

With the help of Dr.Joseph Defrank, Weed Science Specialist at the University of Hawaii at Manoa a study was conducted on the response of two post- emergence herbicides on a native sedge, Fimbristylis cymosa, or commonly called Mau`u aki aki.  The following study including the testing of two post-herbicides, Fusilade Turf and Ornamental and Garlon 4. on Mau`u aki aki.   For further information or questions you may email Dr. Defrank at defrenk@hawaii.edu or visit his website at http://www2.hawaii.edu/~defrenk/

SCREENING OF TWO POSTEMERGENCE HERBICIDES FOR SELECTIVE WEED CONTROL IN THREE DIFFERENT AGE CLASSES OF *FIMBRISTYLIS CYMOSA*

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In
Partnership with the USDA Natural Resource Conservation Service

Introduction

Weed control is an essential component for successful native groundcover establishment. Providing a weed-free environment from the time of planting up to canopy closing strengthens the competitive ability of a native cover crop from weed invasions. Crucial to the use of native Hawaiian plants for roadside re-vegetation is the development of weed management protocols for specific native species. For *Fimbristylis cymosa*, screening of post-emergence herbicides is essential to selectively kill broadleaf and grassy weeds in plantings. This study characterized the response of *Fimbristylis cymosa*, at three different stages of development, to spray applications of fluazifop-p-butyl and triclopy.

Materials and Methods

Fimbristylis cymosa seedlings (43 days and 98 days old) and mature flowering plants (224 days old) were sown and transplanted in styrofoam multi-cell trays one month prior to treatment application. Each age class was allotted a single row of six plants in each tray. An empty row was added between age classes to prevent shading and competition. Maximum and minimum label rates of fluazifop-p-butyl (0.28 and 0.42 kg a.i./ha) and triclopyr (4.48 and 8.97 kg ae/ha) were prepared with a wetting agent (0.25% vol. crop oil). The two herbicide formulations were applied at a rate of 20 ml per tray using a Meter Jet spray gun attached to a backpack sprayer (Birchmeier). To ensure that there was no contamination between treatments, the Meter Jet spray gun was thoroughly rinsed after each treatment application. The different treatments were also physically separated so that spray drift was eliminated. Once the treatments were applied, the trays were allowed to dry for a couple of hours and then laid out in a randomized complete block design. Visual injury ratings (0 = no visual injury; 100 = complete plant death) and above ground biomass were collected 28 days after spraying. Prior to statistical analysis, data collected were transformed. Visual injury ratings were arc sine transformed while aboveground data were log transformed. Transformed data were subjected to ANOVA using Statistix 9.0 and means were separated using Tukey HSD at 0.01 level of probability.

Results

One week after application, all triclopyr treated plants had already noticeable injuries (visual injury rating ≥ 48%) characterized by severe leaf bronzing/browning. The youngest plants were the most severely affected (60-65% visual injury) followed by 224 day old plants (48-50% visual injury) and 98 day old plants (51-55% visual injury). By the fourth week after application, all triclopyr treated plants regardless of rate and age were dead (≥ 98% visual injury). Figure 1 shows the condition of the triclopyr treated plants in relation to other treatments 28 days after herbicide application. No significant differences were observed in the final visual injury ratings between age and rate of triclopyr treated plants (Table 2). Within each age level, dry mass of plants treated with triclopyr were significantly lower than that of the control or of the fluazifop-p-butyl treatments ($P = 0.0015$).

In contrast, fluazifop-p-butyl treatments did not show any visual injury (0%) nor exhibit any inhibition in growth within the four week observation period (Table 3). Visual injury ratings of fluazifop-p-butyl treated plants, regardless of age and rate, did not significantly differ with that of the untreated plants. Aboveground biomass of fluazifop-p-butyl treated plants was also comparable to that of untreated plants. No visual injuries were detected in the crop oil spray at all ages. Aboveground biomass also did not significantly differ with that of the untreated plants.

Discussion

Final visual injury ratings and aboveground biomass show that triclopyr was not safe for the age classes tested. Both rates of triclopyr caused severe injury that led to the death of plants. On the other hand, the application of fluazifop-p-butyl at high and low rates was not detrimental to the three age classes of *Fimbristylis cymosa*. Crop oil treatments also had a visual injury rating of 0% and a final dry mass that did not significantly differ with that of the untreated plants. This indicates that if applied alone, crop oil treatments do not negatively impact *Fimbristylis* plants.

Results of the study show that fluazifop-p-butyl is safe for controlling grassy weeds in *Fimbristylis cymosa* plantings. It can be applied as an over the top spray in as early as 43 days after sowing.

Conclusion

The results of the study indicate that fluazifop-p-butyl can be used to manage grassy weeds in a wide age class of *Fimbristylis cymosa*. On the other hand, triclopyr cannot be used to selectively control broadleaf weeds in this situation. Further screening of post emergent broadleaf herbicides for right-of-way use is recommended to determine which broadleaf herbicides are safe to use on *Fimbristylis cymosa*.

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Table 1. Post emergence herbicides and rates of application to *Fimbristylis cymosa*.

Herbicides	Amount per hectare	kg ai/ha	Amount ml/3 liters
1 Fusilade Turf and Ornamental (Fluazifop-p-butyl)	1.17	0.28	4.05
2 Fusilade Turf and Ornamental (Fluazifop-p-butyl)	1.75	0.42	6.15
3 Garlon 4 (Triclopyr)	9.35	4.48	30
4 Garlon 4 (Triclopyr)	18.70	8.97	60
5 Crop oil	n/a	n/a	7.5 (0.25% vol)
6 Untreated	n/a	n/a	n/a

Table 2. Mean percent visual injury of three different *Fimbristylis cymosa* age classes 28 days after spraying the herbicide treatments.

		Fimbristylis cymosa injury (%)		
Herbicide	Rate	224 DAS	98 DAS	43 DAS
Fluazifop-p-butyl	0.28 kg a.i./ha	0b	0b	0b
	0.42 kg a.i./ha	0b	0b	0b
Triclopyr	4.48 kg ae/ha	99.50a	99.50a	99.75a
	8.97 kg ae/ha	98.75a	100.00a	99.75a
Crop oil	0.25% vol	0b	0b	0b
Non treated	n/a	0b	0b	0b

Mean separation by Tukey HSD at 1% level.

Table 3. Effect of post-emergence herbicides on mean aboveground biomass of three different age classes of *Fimbristylis cymosa.*

Herbicide	Rate	*Fimbristylis cymosa* aboveground biomass (g)		
		224 DAS	98 DAS	43 DAS
Fluazifop-p-butyl	0.28 kg a.i./ha	7.30a	2.30cd	0.74ef
	0.42 kg a.i./ha	6.23a	1.95d	0.76ef
Triclopyr	4.48 kg ae/ha	3.25bc	0.40efg	0.04g
	8.97 kg ae/ha	4.03b	0.28fg	0.05g
Crop oil	0.25% vol	6.10a	1.95d	0.86e
Non treated	n/a	7.15a	1.80d	0.67ef

Mean separation by Tukey HSD at 1% level.

Figure 1. *Fimbristylis cymosa* plants 28 days after spraying different the different herbicide treatments.