THE RESPONSE OF 3 NATIVE HAWAIIAN GRASSES TO 2 SEQUENTIAL APPLICATIONS OF SELECTIVE POSTEMERGENCE GRASS HERBICIDES.

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Introduction

Grassy weeds represent a challenging control problem in grass seed crops. Three native Hawaiian grasses were selected as seed crops to determine their response to spray applications of herbicides that are designed to kill only grasses. In this experiment, 4 grass killing herbicides are applied twice to determine if the native grasses are susceptible to these materials. If adequate safety is identified, one of these herbicides could be a very useful tool for removing grassy weeds from seed crops of native Hawaiian grasses.

Materials and Methods

Vegetatively propagated stems of akiaki (*Sporobolus virginicus*, NRCS accession # 9079745), seeds of both emoloa (*Eragrostis variabilis*, NRCS accession # 9079729*)* and pili grass (*Heteropogon contortus*, NRCS accession # 9079683) were planted to 72-cell trays on 04/15/02, 03/12/02 and 03/14/02, respectively. Grass seedlings were planted to experimental field plots on 08/05/02. A single row of each grass type was planted with a 2 ft. spacing within the row and a 2-ft. spacing between the row. Each treatment plot contained 3 rows of grass and was 6 ft. X 15 ft. in size. Grass seedling were planted on 08/05/02 and irrigated for 1 day to settle the soil around the roots. On 08/06/02 Ronstar 50 WP was sprayed over the entire experiment to control weeds germinating from seed. This spray application was made with an electric powered diaphragm pump calibrated to deliver 40 gallons per acre (GPA). Ronstar was applied at a rate of 4 pounds of formulated product per acre.

Table 1 contains the description of the herbicide treatments that were applied to grass transplants. These treatments were applied at 39 and 53 days after planting (DAP). Herbicides were applied with electric powered diaphragm pump calibrated to deliver 40 GPA. All spray treatments contained Bond surfactant (Loveland Industries) at .25% v/v. A visual rating of grass response to herbicide sprays was obtained 11/01/02, 35 days after the second spray (35 DAS-02) and 49 days after the first spray (49 DAS-01). On 11/19/02 (106 DAP, 53 DAS-02 and 67 DAS01) 3 representative plants of akiaki, 3 of emoloa and 2 of pili grass were cut at the soil surface and placed in paper bags and dried in a forced air oven.

All treatments were replicated 4 times. Data for vigor ratings and dry weight accumulation were analyzed as a completely randomized block design for herbicide treatments, designated as Factor A in the analysis of variance. The 3 grasses (Factor B) were a split plot on the herbicide treatments (Factor A). When appropriate, means were separated using Duncan's Multiple Range Test. All statistical analyses were conducted using the MSTAT computer program.

Results

Vigor ratings for the response of the 3 native Hawaiian grasses to 2 sequential herbicide applications are provided in Table 2. For akiaki grass, Fusilade DX caused the only significant reduction in vigor 35 DAS-02. Assure and Fusilade DX significantly reduced vigor of emoloa. In pili grass, Fusilade DX and Prism significantly reduced vigor.

In the analysis of dry weight accumulation in response to herbicide applications there was not significant interaction between Factor A (herbicide treatments) and Factor B (grass types), see Table 3. The lack of a significant interaction means that all three grasses responded in a similar way to herbicide applications. When the means of the tree grasses are pooled a significant effect of herbicides treatments is obtained. The pooled mean for Fusilade DX was significantly lower than the untreated plants. All other herbicides caused numerically lower dry weight accumulations but they were not significantly lower than untreated plants.

Discussion

Emoloa was the weakest growing plant in this experiment. It appeared that mortality and poor growth was more related to improper planting and not chemical application. emoloa, planted too deeply or with bent stems, had very poor growth regardless of herbicide treatment. Fusilade was most suppressive on all grasses and pili seed head development was a good indication of stunting. Prism appeared to increase the number of stems on pili grass.

It was surprising that none of these grass herbicides were able to impose more of a detrimental effect on any of these native Hawaiian grasses. Although it is difficult to make conclusions about emoloa due to general poor growth, no outright kill of all plants was recorded. The rates of application for all herbicides were based on their respective product labels and all were considered kill rates for susceptible plants. Clearly, the potential to develop one of these grass herbicides as a selective herbicide in all three Hawaiian grasses is promising. Additional research needs to be conducted that seeks to determine the maximum amount of selective grass herbicides that each Hawaiian grass can tolerate without significant loss of seed producing potential.

Summary

Fusilade DX was the most inhibitory herbicide to grass growth evaluated in this experiment. emoloa had very weak growth that was more associated with improper planting (i.e. too deep and bent stems) than with herbicide applications. All herbicides appear to show promise as selective grass killers in seed crops of these Hawaiian grasses. Additional research should include a larger range of herbicide rates at a specific stage of growth to more fully determine the usefulness of these grass herbicides in a seed production system with these three grasses, akiaki, emoloa and pili grass.

Acknowledgements and Disclaimer

Trade names are used in this report for the convenience of readers and does not constitute and exclusive endorsement of the University of Hawaii, the Cooperative Extension Service, the USDA nor the Natural Resources Conservation Service. The information contained here is not a recommendation for use. It is a violation of state and federal law to use any pesticide in manner inconsistent with it's labeling.

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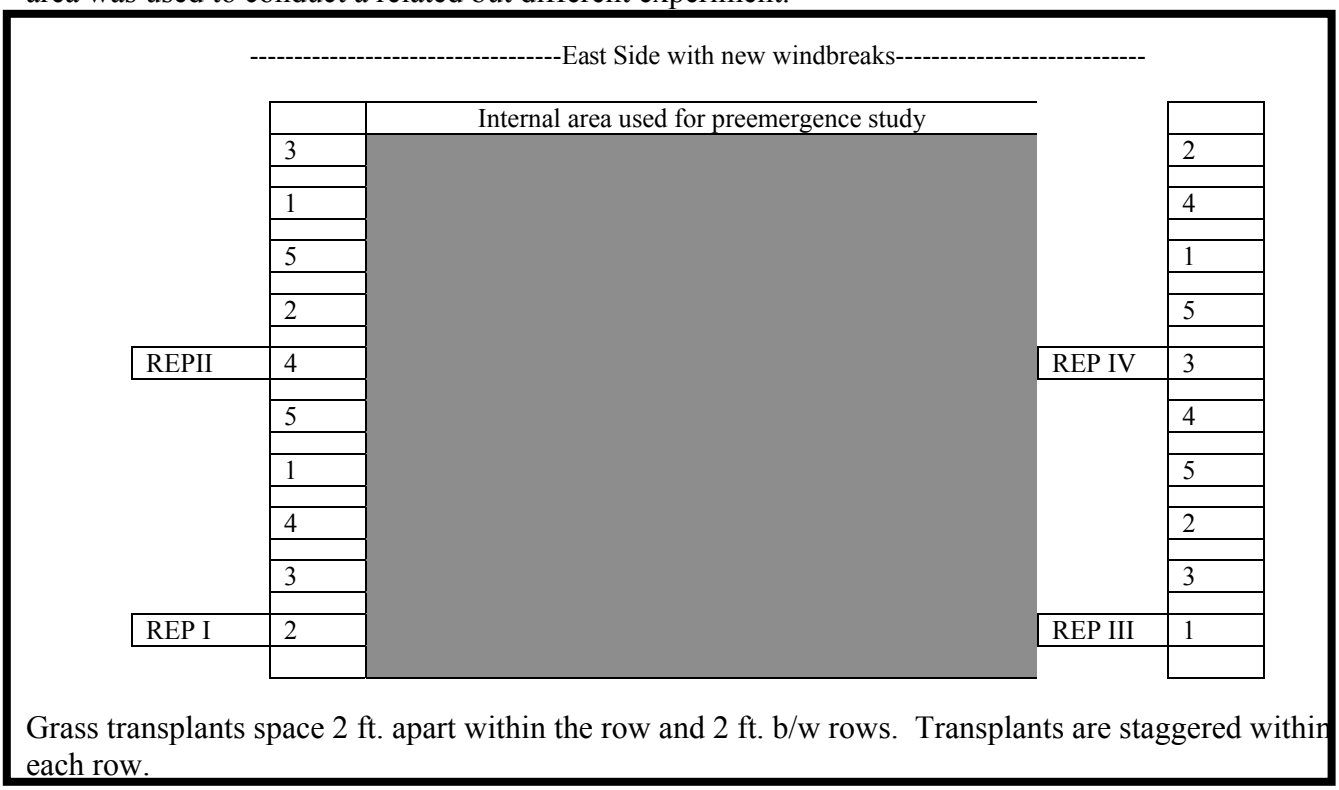
Figure 1. Map of field plots, each treatment contained 3 rows of each of 3 grasses. Numbered cells correspond to treatment descriptions found in Table 1 below. The internal section of the experimental area was used to conduct a related but different experiment.



Grass transplants space 2 ft. apart within the row and 2 ft. b/w rows. Transplants are staggered within each row.

Table 1. Postemergence herbicide treatments applied to grass transplants. Finished spray solutions were applied from 3-liter containers. Herbicides were applied with a backpack sprayer mounted with a 12-volt electric pump. Herbicides were applied at 22 PSI with a carrier volume of 40 gallons per acre, using a 3 nozzle boom containing 8004 LP TeeJet spray tips. Treatments were replicated 4 times.

Herbicides	Amount per acre	lb. ai/a	Amount ml/3liter
1 Assure (quizalofop)	5.0 oz.	0.034	3.0
2 Fusilade DX (fluazifop)	6.0 oz	0.094	3.5
3 Vantage (sethoxydim)	32.0 oz	0.1250	18.8
4 Prism (clethodim)	8.0 oz	0.066	5.7
5 Untreated	-	-	-

Table 2. Vigor rating of 3 native Hawaiian grasses to 2 sequential applications of selective post emergence grass herbicides. Ratings made on a scale of 0 to 100 percent. Maximum vigor attainable at this stage of growth is 100. The ratings were recorded on 11/01/02, 35 DAS-02 and 49 DAS-01. Mean separation for these data is supported by statistical analysis (i.e. the interaction between herbicide treatment and grass type was significant at the 5% level)

		Vigor rating of 3 grasses		
Herbicides	Amount per acre	akiaki	emoloa	pili grass
1 Assure	5.0 oz.	58.8 cde	21.5 f	88.8 ab
2 Fusilade DX	6.0 oz.	53.7 de	25.3 f	52.5 de
3 Vantage	32.0 oz	76.3 abcd	67.5 bcde	80.0 abc
4 Prism	8.0 oz	73.7 abcd	48.8 e	71.3 bcde
5 Untreated	-	81.3 abc	66.3 bcde	96.3 a

Means in columns and rows followed by the same letter are not significantly different according to Duncan's Multiple Range Test at the 5% level.

Table 3. Dry weight accumulation in response to 2 sequential applications of preemergence herbicides. Two pili grass 3 emoloa and 3 akiaki clumps were selected from each plot and dried to determine biomass accumulation in response to herbicide application. Samples were collect 67 days after the first spray and 53 days after the second spray application. Mean separation for individual grasses is not supported by statistical analysis (i.e. the interaction between herbicide treatment and grass type was not significant at the 5% level).

		Dry weight of grasses (g)			
Herbicides	Amount per acre	akiaki 3 plants	emoloa 3-plants	pili grass 2 plants	Pooled mean of all 3 grasses
1 Assure	5.0 oz.	112.2	29.1	441.1	194.1 ab
2 Fusilade DX	6.0 oz.	83.0	32.8	334.5	150.1 b
3 Vantage	32.0 oz	141.0	111.3	437.5	229.9 a
4 Prism	8.0 oz	128.7	66.3	366.8	187.2 ab
5 Untreated	-	139.7	109.0	519.5	256.0 a

Pooled means for 3 grasses followed by the same letter are not significantly different according to Duncan's Multiple Range Test at the 5% level.