Two grass herbicides for pineapple fields[1]

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ABSTRACT

Two field experiments (plant and ratoon crops) were conducted at Vega Baja and Barceloneta Land Authority pineapple farms in 1990 and 1991 to evaluate two grass herbicides. Fluazifop-p-butyl at 0.28 and 0.56 kg ai/ha and quizalofop at 0.224 and 0.448 ai/ha were applied post-emergence twice to the 12-month-old plant crop and twice to 30-month-old ratoon pineapple plants. Two methods of application (over the top and directed spray) were used. Both herbicides gave excellent control of all grasses with no apparent crop injury. In the plant crop experiment, the highest fruit yield was obtained with quizalofop at 0.224 kg ai/ha applied over the top (69,289 kg/ha). This treatment differed significantly in yield with three of the other herbicide treatments. In the ratoon crop experiment, the highest pineapple yield was obtained with fluazifop-p-butyl at 0.56 kg ai/ha applied as directed spray (51,585 kg/ha). This treatment did not differ significantly with all other treatments.

RESUMEN

Dos graminicidas para piñales

En fincas de la Autoridad de Tierras en Vega Baja y Barceloneta se realizaron dos experimentos con herbicidas contra gramíneas en plantilla y retoño de piña de 1990 a 1991. Se evaluó el fluazifop-p-butyl a razón de 0.28 y 0.56 kg ia/ha y el quizalofop a razón de 0.224 y 0.448 kg p/ha en aspersiones sobre el follaje y dirigidas. Se realizaron dos aplicaciones posemergentes a una plantilla de 12 meses y dos aplicaciones a un retoño de 30 meses. Ambos herbicidas controlaron excelentemente las gramíneas sin que se observaran síntomas de fitotoxicidad. El rendimiento más alto de piñas en el experimento de plantilla se obtuvo con el quizalofop aplicado sobre el follaje a razón de 0.224 kg ia/ha (69,289 kg/ha). Hubo diferencias significativas (P = 0.05) con tres de los otros tratamientos. En el experimento de retoño, el rendimiento mayor se obtuvo con el fluazifop-p-butyl en aplicación dirigida a razón de 0.56 pa/ha (51,585 kg/ha). No hubo diferencias significativas (P = 0.05) con los demás tratamientos.

INTRODUCTION

In 1990-91, 59,610 tons of pineapple fruits was produced in Puerto Rico with a farm value of $13.8 million (2). High production costs have been one of the major factors limiting local pineapple production, and one

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of the principal factors contributing to high production costs is the expense of weed control by manual labor (13). Early attempts to control weeds with eight oil fractions were made by Craft and Emmanueli (5). They found that light fraction stove naphtha could be used safely under greenhouse conditions. However, the stove naphtha injured mature pineapple plants under actual field conditions in Puerto Rico. They also tested a dinitro herbicide with little success because of crop injury (5). Cibes-Viade (3) reported that CMU (monuron) at 2, 4, and 6 lb/A (2.24, 4.48 and 6.7 kg/ha) effectively controlled weeds in two field experiments in Manatí for a 3-month period. Subsequent trials found good selectivity of ametryn and diuron on pineapple plants (4). Paraquat and glyphosate were evaluated by González-Ibáñez (8), but registration of glyphosate for use in pineapple in Puerto Rico is still pending. Glyphosate was also reported by Deuse and Lavabre (6) to be highly effective against hard-to-kill grasses in pineapple fields. Other good pineapple herbicides, such as bromacil and hexazinone, have also been evaluated (6, 7, 12), but these herbicides are not as selective as ametryn and thus cause occasional crop injuries. Jordan and Omara (10) suggested that postemergence application of herbicides be avoided during the flower induction-to-harvest cycle of the pineapple plants because it could cause yield reduction.

The effectiveness of fluazifop has been reported by Horrelou (9). Fluazifop has been evaluated locally and found effective for grass control in tomatoes and peppers (11), also in coffee, sweet cherry peppers, yams, taniers and onions (unpublished results). Since grasses are the predominant weed species in local pineapple plantations, the registration of fluazifop-p-butyl or similar action herbicides (1) for pineapple will be beneficial to local growers. This paper reports efficacy, phytotoxicity and yield data from the evaluation of fluazifop-p-butyl [+] 2[4-(6-chloro-2-quinoxaliniyl) oxyl phenoxyl propanoic acid in pineapple plant and ratoon crop.

MATERIALS AND METHODS

Plant crop experiment

The experiment was established October 1990 in a Bayamón silty clay (Clayey, oxidic isohyperthermic, Typic Haplorthox) on a Land Authority farm in Vega Baja, Puerto Rico. The top 15 cm of soil contained 0.8% organic matter with a pH of 4.9. A 12-month-old plant corp Red Spanish variety was chosen to determine efficacy, phytotoxicity and residue levels of fluazifop and quizalofop in pineapple. The individual plots consisted of approximately 100 pineapple plants in two beds (2.85 m wide and 7.62 m long) separated by a 1.4-m alley. Each bed contained two 0.6 m-spaced double rows with 0.3 m between pineapple plants. Bromacil at 4.48 kg/ha was applied pre-plant, followed by diuron at 4.48 kg/ha one

month after planting, and at 3.36 kg/ha three months later. Eight different fluazifop and quizalofop treatments were replicated four times in a complete randomized block design. Two rates each of fluazifop and quizalofop were applied both over the top and directed spray. Fluazifop (FUSILADE)[4] at 0.28 and 0.58 kg ai/ha and quizalofop (ASSURE) at 0.224 and 0.448 kg ai/ha were applied twice (15 October and 30 October 1990) with a portable CO_2 pressurized sprayer fitted with a four-nozzle broom at a spray volume of 367 L/ha for the over-the-top application. A conventional knapsack sprayer fitted with a Teejet 8002 nozzle tip was used for the directed spray at a spray volume of 734 L/ha. (More water was necessary to obtain better coverage.) A surfactant X-77 was added to the final solution at 0.25% concentration. All agronomic and pest management followed recommended practices for pineapple cultivation in Puerto Rico. Weed control and phytotoxicity evaluations were made periodically. The mature pineapple fruits were harvested 7 April 1991 and the data analyzed statistically.

Ratoon Crop Experiment

The experiment was established on a farm located in Barceloneta, Puerto Rico, with the same soil type as that of the plant crop experiment. The top 15 cm of soil contained 1.3% organic matter with a pH of 5.5. The first ratoon crop of a Red Spanish variety 30-month-old plantation was chosen. The field received two diuron applications: at 4.48 kg/ha 1 month after ratooning, and a second postemergence at 3.36 kg/ha 3 months afterward. No pre-plant application of bromacil was made for this ratoon crop. The same plot size and experimental design as in the plant crop experiment were used. Fluazifop and quizalofop at the same rates were applied on two occasions (17 June and 2 July 1991). All agronomic and pest management followed the recommended practices for growing pineapple in Puerto Rico. Weed control and phytotoxicity evaluations were also made periodically. The mature pineapple fruits were harvested 17 December 1991.

RESULTS AND DISCUSSION

The predominant weed species at both experimental sites were Alexander grass (*Brachiaria plantaginea*), large crabgrass (*Digitaria sanguinalis*), radiate finger grass (*Chloris radiata*), sour grass (*Trichachne insularis*), guinea grass (*Panicum maxium*), jungle rice (*Echinochloa*

[4]Trade names in this publication are used only to provide specific information. Mention of a trade name does not constitute a warranty of equipment or materials by the Agricultural Experiment Station of the University of Puerto Rico, nor is this mention a statement of preference over other equipment or materials.

colona), garden spurge (*Euphorbia heterophylla*), morning glory (*Ipomoea tiliacaae*), pigweed (*Amaranthus dubius*), red tassel flower (*Emilia sonchifolia*), and purple nutsedge (*Cyperus rotundus*). Table 1 shows that an initial 90% control of practically all grasses was obtained

TABLE 1.—*Weed control, phytotoxicity and fruit yield of pineapple as affected by two grass herbicides at Vega Baja farm.*

Treatment	Control at		Phytotoxicity at		Fruit yield	
	12.5 mo	13.5 mo	12.5 mo	13.5 mo		
	%	%			*no/ha*	*kg/ha*
Fluazifop 0.28 kg ai/ha Over the top	90	100	0	0	48,738a	64,797ab
Fluzaifop 0.28 kg ai/ha Directed spray	90	100	0	0	46,659a	66,794ab
Fluazifop 0.56 kg ai/ha OT	90	100	0	0	48,738a	60,363b
Fluazifop 0.56 kg ai/ha DS	90	100	0	0	48,969a	63,507ab
Quizalofop 0.224kg ai/ha OT	90	100	0	0	47,352a	69,289a
Quizalofop 0.224 kg ai/ha DS	90	100	0	0	46,659a	62,026b
Quizalofop 0.448 kg ai/ha OT	90	100	0	0	48,276a	62,197b
Quizalofop 0.448 kg ai/ha DS	90	100	0	0	47,538a	64,627ab
Control	80	80	0	0	46,197a	63,997ab

[1]Weed control rating is based on a 0-100 scale; 0 = no control 100 = perfect control.
[2]Phytotoxicity evaluation is based on a 0-5 scale; 0 = no crop injury, 5 = completely killed.
[3]Means followed by the same letters do not differ signifiantly at P = 0.05.

with both herbicides at all rates and methods of application. The control treatment, even though treated with neither fluazifop nor with quizalofop, did receive a pre-plant application of bromacil and two post-

TABLE 2.—*Weed control, phytotoxicity and fruit yield of ratoon crop of pineapple as affected by two grass herbicides at Barceloneta.*

Treatment	Control at		Phytotoxicity at		Fruit yield	
	31 mo	33 mo	31 mo	33 mo		
	%	%			*no/ha*	*kg/ha*
Fluazifop 0.28 kg ai/ha Over the top	100	95	0	0	32,694a	43,497a
Fluzaifop 0.28 kg ai/ha Directed spray	100	95	0	0	31,380a	45,292a
Fluazifop 0.56 kg ai/ha OT	100	95	0	0	33,226a	42,536a
Fluazifop 0.56 kg ai/ha DS	100	95	0	0	34,149a	51,585a
Quizalofop 0.224 kg ai/ha OT	100	100	0	0	36,457a	49,677a
Quizalofop 0.224 kg ai/ha DS	100	100	0	0	28,958a	40,313a
Quizalofop 0.448 kg ai/ha OT	100	100	0	0	29,881a	39,523a
Quizalofop 0.448 kg ai/ha DS	100	100	0	0	34,034a	49,611a
Control	85	80	0	0	33,342a	48,375a

[1]Weed control rating is based on a 0-100 scale; 0 = no control 100 = perfect control.
[2]Phytotoxicity evaluation is based on a 0-5 scale; 0 = no crop injury, 5 = completely killed.
[3]Means followed by the same letters do not differ significantly at P = 0.05.

emergence applications of diuron as indicated in the materials and methods section. As a result of these applications, grass infestation at the time of the experimental herbicide treatments was not considered heavy. Neither herbicide caused any apparent pineapple injury, irrespective of the rate or method of application.

The highest plant crop fruit weight was obtained with quizalofop at 0.224 kg ai/ha over the top treatment (69,289 kg/ha). This treatment did not differ significantly in yield with five other herbicide treatments (table 1) but was significantly higher than fluazifop at 0.56 kg ai/ha over the top, quizalofop at 0.224 kg ai/ha directed spray, and quizalofop at 0.448 kg ai/ha over the top treatment. Fluazifop at 0.56 kg ai/ha over the top treatment produced the lowest fruit yield (60,363 kg/ha). There was no significant difference among different treatments with respect to the number of the fruits produced.

Table 2 shows the excellent weed control in the ratoon crop achieved by both herbicides, irrespective of the rate and method of application. There was no significant difference between all treatments in fruit number and weight (table 2). The highest ratoon crop yield was obtained with fluazifop at 0.56 kg ai/ha directed spray treatment (51,585 kg/ha), and the lowest yield with quizalofop at 0.448 kg ai/ha over the top (39,523 kg/ha).

Neither fluazifop nor quizalofop has been registered with the Environmental Protection Agency (EPA) for use in pineapple in Puerto Rico. Until such registration is obtained, the use of either herbicide will constitute a violation of Federal and Puerto Rican law. Research continues, and data will be submitted to EPA through the IR-4 project for future registration of these products. One advantage of registering these highly selective herbicides is that their application could be made over the top of pineapple plants without any risk of crop injury. This will offer a viable alternative for postemergence and post treatment of problem weeds in pineapple fields.

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