

Grass weed management in transplanted eggplant¹

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ABSTRACT

Two field weed control experiments with transplanted eggplant (*Solanum melongena* L.) were conducted at the agricultural substation in Lajas in 1984-85 and one in Juana Díaz (1985). In Lajas (1984) a single postemergence application of either fluazifop-P (R)-2- {4-[5-(trifluoromethyl)-2-pyridinyl] oxy phenoxy} propanoic acid sethoxydim [2-(1-ethoxyimino) butyl] -5-[2-(ethylthio) propyl-3 hydroxy-2-cyclohexen-1-one or quizalofop (\pm 2- {4- [(6-chloro-2-quinoxaliny] oxy - phenoxy) - propanoic acid} gave excellent (90% or more) control of grasses for 10 weeks after transplanting eggplant. Eggplant yields increased substantially with manual cultivation after the herbicide applications. In a second experiment in Lajas in 1985 excellent 10-week control of grasses was provided by the combination of preemergence DCPA (dimethyl 2,3,5,6-tetrachloro-1, 4- benzenedicarboxylate) at 8.4 kg ai/ha followed by manual weeding, or the postemergence applications of either fluazifop-P (0.28 kg ai/ha), sethoxydim (0.27 kg ai/ha) or quizalofop (0.28 kg ai/ha) 2 weeks after a hand weeding. The highest yield (27,117 kg/ha) was obtained in plots with DCPA application plus 3 manual weeding.

In a similar experiment at Juana Díaz (1985) the combination of a manual weeding at 3 weeks plus the postemergence fluazifop-P application at 5 weeks was the only treatment that really controlled grasses during the first 10 weeks. Although the highest crop yield (29,474 kg/ha) at Juana Díaz was obtained in plots with 3 manual weeding without herbicides, statistically comparable yields were obtained in plots with DCPA plus manual weeding at 3 and 5 weeks, with sethoxydim plus one weeding, and with fluazifop plus one weeding.

RESUMEN

Combate de malezas gramíneas en berenjena trasplantada

En las subestaciones experimentales de Lajas (1984 y 1985) y Juana Díaz (1985) se hicieron tres experimentos de campo con herbicidas en siembras de berenjena var. Rosita trasplantada. En el primer experimento en Lajas en 1984, una sola aplicación de los posemergentes fluazifop-P, setoxydim o quazilofop combatió excelentemente las malezas gramíneas en las primeras 10 semanas después del trasplante. El rendimiento aumentó substancialmente con cultivos manuales después de aplicar los herbicidas. En un segundo experimento en Lajas en 1985 con la aplicación de DCPA después del primer desyerbo o de fluazifop-P, setoxydim o quazilofop, cada uno aplicado individualmente 2 semanas después de un cultivo manual, se logró un combate excelente de las malezas gramíneas durante 10 semanas. El mayor rendimiento de berenjenas (27,117 kg./ha.) se obtuvo en parcelas tratadas con DCPA más tres desyerbos manuales.

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Un tercer experimento en Juana Díaz en 1985 fue similar al realizado en Lajas el mismo año. En este experimento la combinación de un desyerbo manual a las 3 semanas con la aplicación de fluazifop-P a las 5 semanas fue el único tratamiento que reprimió excelentemente las malezas gramíneas durante 10 semanas. El mayor rendimiento de berenjenas (29,474 kg./ha.) en Lajas se obtuvo con tres desyerbos manuales. Cuando se combinó el DCPA con 2 ó 3 desyerbos manuales y setoxydim o fluazifop-P con desyerbo se obtuvieron rendimientos comparables.

INTRODUCTION

Eggplant (*Solanum melongena* L.) a minor vegetable crop, contributed \$500,000 to Puerto Rico's agricultural gross income in 1985-86 (4). Local eggplant production should be increased. More than 700 metric tons of fresh fruits were imported the same year from the Dominican Republic to satisfy local demand. Weed interference is a constraint to eggplant production; weeds compete with crops for essential nutrients and water, and also may cause allelopathic effects (2). DCPA is the only registered herbicide for weed control in eggplant (1). To control weeds, mechanical cultivation must be performed before applying DCPA in commercial plantings.

At the present time fluazifop-P, setoxydim, quizalofop and other new chemicals are being evaluated in a wide variety of broadleaf crops (7,8,9). These herbicides are selective for grass control with low herbicidal activity and persistence in the soil (5). Johnsongrass (*Sorghum halepense* L.) was controlled effectively in soybean reduced-tillage systems when fluazifop-P was applied (6). The present study was conducted to evaluate postemergence applications of fluazifop-P, setoxydim and quizalofop in an effort to integrate the herbicides into the eggplant weed-management system where grass weeds are a problem.

MATERIALS AND METHODS

Three field experiments with transplanted eggplant cv. Rosita were established at Lajas (1984 and 1985) and Juana Díaz (1985) substations. The soil at Lajas is a Fraternidad clay (Vertic Udic Chromusterts, very fine montmorillonitic isohyperthermic, 25.5% sand, 21.9% silt, 53.9% clay, 3.0% organic matter and pH 6.5). At Juana Díaz the soil is a San Antón clay loam (Cumulic Haplustolls, fine-loamy, mixed, isohyperthermic, pH 7.3 and 2.1% organic matter).

In the first experiment at Lajas, eggplant seedlings were transplanted 15 March 1984. Cultural and pest control practices recommended by the Agricultural Experiment Station were followed (3). Plots were 3.6 m x 6.1 m with four rows 0.9 m apart and a planting distance of 0.5 m within the row. A complete randomized block design with four replications was used. Pendimethalin (N-(1-ethylpropyl)-3, 4-dimethyl-2,6-dinitrobenzamine) at rates of 1.68 and 3.36 kg ai/ha was applied and incorporated into the soil the day before transplanting. Fluazifop-P (0.28, 0.56

and 1.12 kg ai/ha), sethoxydim (0.56, 1.12 and 2.24 kg ai/ha) and quizalofop (0.28 and 0.56 kg ai/ha) were sprayed on the crop and weeds after transplanting. After the initial weeding, all plots were split in half for cultivating two rows and leaving the other two rows unweeded. Yields from plots that were later treated with herbicides were compared to yields from plots receiving in addition three hand weedings at 3, 7 and 11 weeks. Crop oil (20% surfactant) at 0.5% v/v was added to fluazifop-P and Quizalofop and at 1% v/v to the sethoxydim treatments. For estimating commercial yield, eggplants were harvested in six pickings from 16 May to 9 July 1984.

On 26 February 1985 two experiments with cv. Rosita were established at the same time at Juana Díaz and Lajas substations. The experiments were similar in plot size, planting methods, and experimental design in 1984. Eggplants were picked from 29 April to 20 June 1985. Fertilizer 10-10-8 (N, P, K) at the rate of 746 kg/ha per application was used three times: at planting, at blooming stage and after the second picking. Furrows were irrigated as needed at both localities.

RESULTS AND DISCUSSION

In 1984, a single application of either fluazifop-P, sethoxydim or quizalofop at three rates excellently controlled grasses for up to 10 weeks after transplanting eggplant (table 1), at which time no phytotoxicity to the crop was recorded. Eggplant yields in herbicide-treated plots were

TABLE 1.—*Grass weed control at 5 and 10 weeks after transplanting eggplant in 1984*

Treatment ¹	Rate kg ai/ha	Number of grasses in 0.5 m ²		Percent grass control	
		5 weeks	10 weeks	5 weeks	10 weeks
Fluazifop-P	0.28	3.0 cd ³	0.7 d	93	96
Fluazifop-P	0.56	1.6 cd	0.0 d	96	100
Fluazifop-P	1.12	0.2 d	0.2 d	99	99
Sethoxydim	0.56	0.7 cd	0.5 d	98	97
Sethoxydim	1.12	0.0 d	0.0 d	100	100
Sethoxydim	2.24	0.5 d	0.2 d	99	99
Quizalofop	0.28	0.0 d	0.5 d	100	97
Quizalofop	0.56	0.0 d	0.2	100	100
Pendimethalin	1.68	10.4 b	7.7 b	75	51
Pendimethalin	3.36	7.2 bc	4.0 c	83	75
Hand-weeded check	—	10.4 b	6.0 bc	73	61
Non-weeded check	—	41.4 a	15.7 a	0	0

¹Herbicide treatments were applied postemergence 3 weeks after transplanting, except pendimethalin applied pre-transplant.

²Means followed by the same letter do not differ significantly at P=0.05 using Duncan's multiple range test.

³Predominant grass weeds were Johnsongrass, junglerice, crabgrass and goosegrass.

TABLE 2.—Fruit yield of eggplant as affected by herbicides and manual weeding at Lajas in 1984

Treatment	Rate kg ai/ha	Fruit yield (kg/ha)	
		Non-weeded	Weeded ¹
Fluazifop-P	0.28	3,704 bc ²	22,572 b
Fluazifop-P	0.56	6,325 abc	27,293 ab
Fluazifop-P	1.12	6,789 abc	24,303 b
Sethoxydim	0.56	6,980 abc	25,329 b
Sethoxydim	1.12	5,905 abc	27,195 ab
Sethoxydim	2.24	3,433 bc	21,299 b
Quizalofop	0.28	8,628 ab	29,543 ab
Quizalofop	0.56	8,040 ab	27,104 ab
Pendimethalin	1.68	6,483 abc	31,403 ab
Pendimethalin	3.36	9,848 a	21,096 b
Hand-weeding 4X	—	—	42,382 a
Hand-weeding 3X	—	2,270 c	24,620 b

¹All treatments were weeded by hoeing at 5, 7, and 11 weeks after transplanting, except check 4X that was also weeded at 3 weeks.

²Means followed by the same letter do not differ significantly at $P = 0.05$ using Duncan's multiple range test.

substantially increased with hand-weeding 5, 7, and 11 weeks after transplanting (table 2). In herbicide-treated plots without weeding, crop yields were drastically reduced. The highest eggplant yield (42,382 kg/ha) was obtained in check plots weeded four times at 3, 5, 7, and 11 weeks. Plots weeded 3 times only, starting at 5 weeks, were significantly ($P = 0.05$) lower yielders (24,620 kg/ha). Apparently, as reflected by increased yields, the first weeding performed at 3 weeks was essential for reducing early weed interference. The yield obtained in the treatment weeded 4 times was nearly twice that of the treatment with 3 hand weeding. Results of this experiment suggest that herbicide applications alone did not significantly increase eggplant yields. Low yields may be attributed to early weed interference during the first 5 weeks in plots that were later treated with postemergence herbicides. The critical period of weed interference in eggplant occurred 4 weeks after transplanting.⁵

Predominant grass weeds at Lajas were Johnsongrass (*Sorghum halepense* L.), junglerice (*Echinochloa colona* L.) (Link) and goosegrass (*Eleusine indica* L.). At Juana Díaz the predominant grasses were junglerice and crabgrass (*Digitaria sanguinalis* L.).

Table 3 shows the different weed control treatments applied in 1985. All treatments excellently controlled grasses at Lajas after 10 weeks (table 4). At Juana Díaz only, the hand-weeding and fluazifop-P treatments controlled grasses excellently. Highest eggplant yields at Lajas

⁵Dr. L. Almodóvar. Personal communication.

TABLE 3.—*Weed control treatments on transplanted eggplant at Lajas and Juana Díaz in 1985*

Treatment	Rate kg a/ha	Weeding dates (weeks)	Herbicide application (weeks)
Weeded	—	3, 5, 9	—
DCPA	8.4	3, 5, 9	3
DCPA	8.4	3, 5	3
DCPA	8.4	4, 5	4
Sethoxydim	0.27	3	5
Fluazifop-P	0.28	3	5
Quizalofop	0.28	3	5
Non-weeded	—	0	—

were obtained with DCPA (8.4 kg a.i./ha) plus two and three hand weedings. At Juana Díaz the lower yielders were the non-weeded, quizalofop and DCPA (late weeding) treatments. With standard recommended herbicide DCPA treatment, significantly ($P=0.05$) lower yields were obtained at both places. Two to 3 handweedings plus DCPA are more costly than single weeding plus one application of either sethoxydim or fluazifop-P. Eggplant yields at Juana Díaz with either sethoxydim or fluazifop treatments were comparable to the highest yields obtained in other treatments; these two herbicide treatments may cost farmers less.

TABLE 4.—*Effect of weed control treatments on grasses and eggplant fruit yield at two sites in 1985¹*

Treatment	Times weeded	Weed control %		Fruit yield ² (kg/ha)	
		Lajas	Juana Díaz	Lajas	Juana Díaz
Weeded	3	95	90	25,146 ab	29,474 a
DCPA ³	3	96	78	27,117 a	26,101 ab
DCPA ⁴	2	95	85	24,162 ab	24,515 ab
DCPA	1	93	72	18,742 bc	20,816 b
Sethoxydim	1	91	74	14,961 c	24,069 ab
Fluazifop-P	1	91	91	16,628 bc	22,767 ab
Quizalofop	1	96	75	16,010 c	21,547 b
Non-weeded	0	0	0	1,252 d	366 c

¹Data taken 10 weeks after transplanting eggplant.

²Means followed by the same letter do not differ significantly at $P=0.05$ using Duncan's multiple range test.

³First manual weeding performed 3 weeks after transplanting.

⁴First manual weeding performed 4 weeks after transplanting.

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