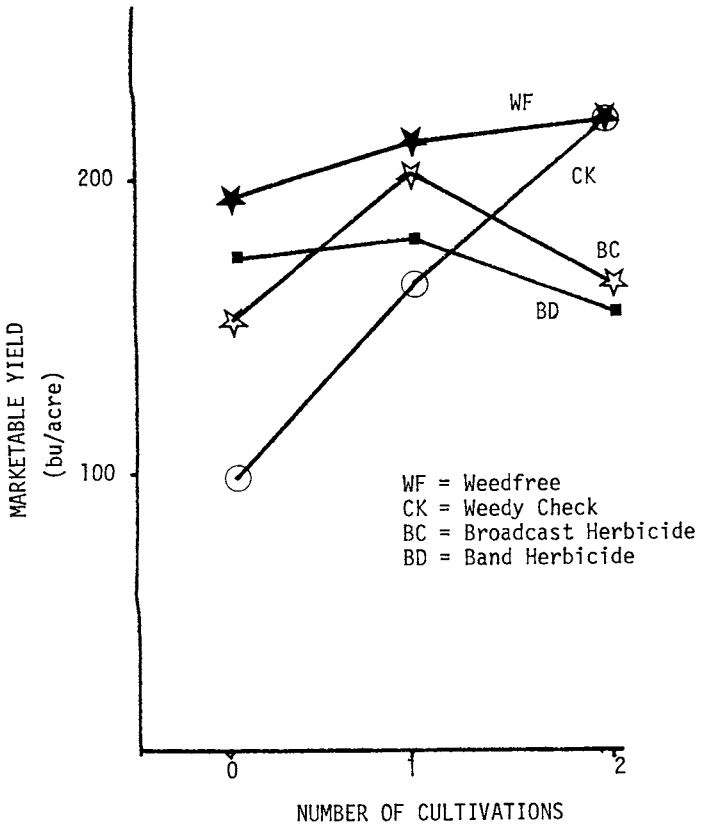

Fig. 3. The combined effects of cultivation number and weed control treatments on the marketable yield of 'Sprite' bush bean in the spring season 1981.

with the 2 DCPA treatments and lowest with the weedy check. The weed control treatments and cultivation number interactions were not significant, however, their effect on bean yield is shown in (Fig. 3). Yield increased with each cultivation only with the weedy check. Cultivation number had very little effect on the weed free treatment. With the 2 DCPA treatments, cultivation increased yield over 0 cultivations but a second cultivation decreased yield. The three way interactions were not significant.

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EVALUATION OF HERBICIDES FOR WEED CONTROL IN TOMATO[1]

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Abstract. **Various herbicidal treatments were applied in an unmulched planting of transplanted 'Hayslip' tomato** (Lycopersicon esculentum **Mill.) in the spring of 1981. Herbicides evaluated were acifluorfen, bifenox, diphenamid, metribuzin, napropamide, pebulate, pendimethalin, sethoxydim, thiobencarb, trifluralin, Hoe 00661, and MC 10108. Good season-long grass control was provided by napropamide (1.0 lb. ai/acre pretransplant) in combination with metribuzin (0.25 lb. ai/acre post directed). Post directed applications of metribuzin (0.25 lb. ai/acre) alone and in combinations with napropamide (1.0 lb. ai/acre pretransplant) and with Hoe 00661 (0.50 and 0.75 lb. ai/acre) post directed resulted in acceptable broadleaf weed control and the highest total yields of fruit. No herbicide provided adequate control of purple nutsedge** (Cyperus rotundus **L.). Tomato plant vigor was good to excellent with all treatments, except acifluorfen post transplant which was very phytotoxic. The best overall herbicide treatments based on weed control and total yield were metribuzin (0.25 lb. ai/acre) post directed + napropamide (1.0 lb. ai/acre) pretransplant and metribuzin (0.25 lb. ai/acre) + Hoe 00661 (0.50 and 0.75 lb. ai/acre) post directed.**

Weed control is a major problem in tomato production on sandy soils in Florida. The long growing season and production under different environmental conditions during spring and fall result in considerable diversity of weed species present and their severity of infestation. Lack of weed control increases harvest costs, while reducing yield and grade of marketable fruit and effectiveness of pesticides. A number of effective herbicides are available; however, need continues to exist for testing of new compounds due to problems with some existing compounds and lack of adequate season-long weed control with any single compound. Trifluralin provides erratic grass control on low organic matter sands (2). Metribuzin, although providing good to excellent weed control, can be phytotoxic under certain environmental conditions (1). Failure of any single

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herbicide to provide season-long weed control indicates a need for more emphasis on acceptable postemergence materials. Recently, new compounds have been developed by the chemical industry which hold promise for vegetable weed control. Research reported here was conducted to evaluate efficacy and phytotoxicity of a number of compounds, both labeled and nonregistered, on transplanted tomatoes.

Materials and Methods

Six week old 'Hayslip' tomato plants were transplanted on March 31, 1981, into Myakka fine sand (1.2% organic matter, pH 6.6), fumigated with ethylene dibromide (6.0 lb. ai/acre), and grown on unmulched raised beds with seepage irrigation. Unmulched culture was used to facilitate evaluation of compounds for weed control. Some materials may not perform the same under plastic mulch. Initial fertilization was 1000 lb./acre of both 6-6-6 with FTE 503 and dolomitic lime. Subsequent nutrition was supplied by sidedressing with 6-6-6 and 18-0-5 as needed to supply a total quantity of 111 lb. N, 90 lb. P_2O_5, and 178 lb. K_2O per acre. Plot size was 4.5 ft. x 22 ft. with 10 plants per plot spaced 2 ft. apart. Experimental design was randomized complete block with 4 replications.

Preplant incorporated (ppi), pretransplant (pre) (March 31), post transplant (post) (April 2) and layby (April 18) herbicide treatments (Table 1) were applied in a 26.6 gal./acre preparation with a CO_2 backpack plot sprayer at 29 psi pressure with two 11004 teejet nozzles. Ppi treatments were incorporated with a rolling incorporator by traveling down each plot twice in opposite directions. Pre- and post-treatments were incorporated with 0.5 inch water applied overhead on April 6. Post directed spray (post d) treatments were applied in a 42.9 gal./acre preparation April 18 when weeds were approximately 2 inches in height with a CO_2 plot sprayer at 20 psi pressure with a TK-4 flood jet nozzle.

Weed control ratings were made April 20, May 12 and July 2. Crop vigor ratings were made April 20 and May 12, and fruit were harvested June 8, 19 and 30 as pinks or more mature and total weight recorded. Predominant grass species were crabgrass (*Digitaria ciliaris* (Retz.) Koel) and goosegrass (*Eleusine indica* (L.) Gaertn.). Principal broadleaf weeds were yerba-de-tago (*Eclipta alba* (L.) Hassk.), pigweed species, mainly slender pigweed (*Amaranthus viridis* L.), smooth ground cherry (*Physalis subglabrata* Mackenzie and Bush) and hemp sesbania (*Sesbania macrocarpa* Muhl. (S. exaltata (Raf.) A.W. Hill)).

Results and Discussion

Approximately one-half of the ppi, pre- and posttreatments provided acceptable early grass control. Low early grass control ratings for the post directed treatments were because the herbicides had not yet been applied. By mid-season only those treatments employing metribuzin as a post directed spray and pendimethalin ppi provided acceptable grass control. Napropamide pre in combination with metribuzin post directed was the only herbicide treatment to provide good season-long grass control.

Acceptable early broadleaf weed control was obtained with metribuzin ppi, napropamide pre + metribuzin post directed, MC 10108 ppi, and pendimethalin ppi. Post directed applications of metribuzin alone and in combination with napropamide pre and Hoe 00661 post directed provided fair to good season-long broadleaf weed control. None of the herbicides used in this experiment resulted in adequate control of purple nutsedge. Failure of napropamide and several other preemergence herbicides (e.g. diphenamid and thiobencarb) to perform satisfactorily in this experiment was believed to be due to inadequate moisture in the upper several inches of the soil.

Tomato plant vigor was good to excellent for all treatments (Table 2), except acifluorfen post which was ex-

Table 1. Influence of herbicide treatments upon weed control in spring planted tomatoes.[z] Bradenton, FL. 1981.

Treatment	Rate (lb. ai/acre)	Method of application[y]	Grass Early	Grass Mid	Grass Late	Broadleaf Early	Broadleaf Mid	Broadleaf Late	Purple nusedge Early	Purple nusedge Late
Weedy check	—	—	0 g[w]	0 j	0 g	0 e	0 g	0.6f	0 e	0 c
Hoed check	—	—	8.2ab	10.0a	9.2a	9.5a	10.0a	9.1a	7.0a	9.0a
Bifenox	2.0	ppi	4.6cde	1.8hij	3.5de	5.6bc	0.8fg	6.2bc	0.8cde	0 c
Bifenox	4.0	ppi	5.7 cd	2.0hi	0.2fg	6.4abc	2.5cdef	6.0bc	0 e	0 c
MC 10108	0.50	ppi	9.2ab	6.2def	2.5ef	8.8ab	4.0bc	6.8abc	2.5bc	0.5c
Pendimethalin	0.75	ppi	9.6a	8.8abc	7.5ab	7.0abc	1.5defg	3.1def	1.8bcde	0.8bc
Trifluralin	0.75	ppi	8.9ab	6.5def	5.5bcd	4.4cd	2.5cdef	0.8f	0 e	0 c
Metribuzin	0.25	ppi	9.0ab	5.0fg	0 g	8.4ab	3.0cde	3.1def	2.0bcd	0 c
Pebulate	4.0	ppi								
+ Napropamide	1.0	+ post	9.4ab	5.7ef	3.5de	6.5abc	2.2cdef	2.9ef	3.5b	1.0bc
Thiobencarb	4.0	pre	9.0ab	3.2gh	4.0cde	3.5cde	0.5fg	2.9ef	0 e	0 c
Napropamide	1.0	pre								
+ Metribuzin	0.25	post d	9.5ab	9.5ab	9.1a	7.1abc	9.5a	9.2a	1.5cde	0 c
Napropamide	1.0 + 1.0	post & layby	3.0ef	3.2gh	3.8de	1.2de	1.0efg	0.9f	0.5de	0 c
Napropamide	2.0	post	6.9bc	4.9fg	4.8cde	4.1cd	0.5fg	2.9ef	0 e	0 c
Sethoxydim	0.30	post	0.2g	0.5ij	1.0fg	0.2e	0 g	2.0ef	1.0cde	0 c
Diphenamid	4.0	post	4.0def	1.8hij	0 g	3.5cde	0 g	1.4f	0.2de	0 c
Acifluorfen	0.38	post	1.8fg	0.2ij	0 g	1.8de	0.5fg	2.5ef	0 e	0 c
Metribuzin	0.25	post d	4.2def	8.0bcd	4.2cde	2.0de	9.4a	7.4ab	0 e	
Hoe 00661	0.50	post d	0 g	6.5def	0.8fg	0 e	3.2bcd	4.8cde	0 e	1.0bc
Hoe 00661	0.75	post d	0 g	7.0cde	4.5cde	0 e	5.2b	5.8bcd	0 e	2.2b
Hoe 00661	0.50									
+ Metribuzin	0.25	post d	1.8fg	9.3ab	5.8bcd	1.0de	9.0a	8.2ab	0 e	1.0bc
Hoe 00661	0.75									
+ Metribuzin	0.25	post d	0 g	9.6ab	6.2bc	0 e	9.5a	8.2ab	0 e	0.5c

[z]Weed control rating of 10 = complete control, 0 = no control.
[y]Herbicides were applied pretransplant (pre), preplant incorporated (ppi), post transplant (post), post transplant directed spray (post d), or at layby over the top (layby).
[x]Ratings were made early, mid and late in the cropping season.
[w]*Means within a column* followed by the same letter are not significantly different at the 5% level, as determined by Duncan's new multiple range test.

Table 2. Effect of herbicide treatments upon tomato plant vigor and yield in spring planted tomatoes. Bradenton, FL. 1981.

Treatment	Rate (lb. ai/acre)	Method of application[z]	Vigor[y] Early	Vigor[y] Mid	Yield (1000 lb/acre) Picking First	Picking Second	Picking Third	Total
Weedy check			9.5a[x]	8.0e	6.3b	12.3ef	17.0f	35.6f
Hoed check			10.0a	10.0a	8.8a	22.9abcd	45.4a	77.2a
Bifenox	2.0	ppi	9.2a	9.0bcd	7.2ab	19.1cde	21.1ef	47.4def
Bifenox	4.0	ppi	7.0b	8.5de	7.6ab	18.9 de	16.8f	43.3ef
MC 10108	0.50	ppi	9.8a	9.2abcd	6.9abcd	23.1abcd	28.8cde	58.8bcd
Pendimethalin	0.75	ppi	9.5a	9.0bcd	6.5ab	26.2abcd	25.9def	58.7bcd
Trifluralin	0.75	ppi	9.2a	8.5de	6.2b	19.6bcde	19.9ef	45.7ef
Metribuzin	0.25	ppi	9.8a	9.8a	7.7ab	27.8ab	24.0def	59.5bcd
Pebulate	4.0	ppi						
+ Napropamide	1.0	+ post	10.0a	9.5abc	7.4ab	25.3abcd	30.3cd	63.0b
Thiobencarb	4.0	pre	9.5a	9.0bcd	7.3ab	19.0cde	23.7def	50.0cde
Napropamide	1.0	pre						
+ Metribuzin	0.25	+ post d	9.5a	10.0a	7.4ab	24.8abcd	42.9ab	75.1a
Napropamide	1.0 + 1.0	post & layby	10.0a	8.4de	7.3ab	18.6de	18.2f	44.2ef
Napropamide	2.0	post	9.5a	9.0bcd	7.2ab	21.1abcd	21.2ef	49.6cde
Sethoxydim	0.30	post	9.8a	8.5de	7.0ab	12.1ef	19.0f	38.2ef
Diphenamid	4.0	post	9.8a	8.8cde	7.4ab	18.0de	18.7f	44.3ef
Acifluorfen	0.38	post	4.0c	4.8f	0.1c	5.1f	8.6g	13.7g
Metribuzin	0.25	post d	9.8a	10.0a	7.2ab	22.7abcd	32.1cd	62.1bc
Hoe 00661	0.50	post d	9.8a	10.0a	7.7ab	28.4a	24.4def	60.5bc
Hoe 00661	0.75	post d	10.0a	9.5abc	7.9ab	22.3abcd	31.5cd	61.7bc
Hoe 00661	0.50							
+ Metribuzin	0.25	post d	10.0a	9.8ab	8.4ab	25.2abcd	35.9bc	69.3ab
Hoe 00661	0.75							
+ Metribuzin	0.25	post d	9.8a	10.0a	7.1ab	27.6abc	40.5ab	75.3a

[z]Herbicides were applied pretransplant (pre), preplant incorporated (ppi), post transplant (post), post transplant directed spray (post d), or at layby over the top (layby).
[y]Vigor rating of 10 = no injury, 0 = dead, with ratings made early and in the middle of the cropping season.
[x]Means within a column followed by the same letter are not significantly different at the 5% level, as determined by Duncan's new multiple range test.

tremely phytotoxic. Significant differences in yield were generally not evident until the second picking when sethoxydim and acifluorfen yielded significantly less than the hoed check. The remaining treatments were not significantly different in yield from the hoed check at the second picking. Thus, most herbicide treatments did not significantly affect early fruit set and development. By the third picking, only napropamide + metribuzin and 0.75 lb. ai/acre of Hoe 00661 + metribuzin provided yields comparable to the hoed check. On the basis of total yield the best herbicide treatments were napropamide + metribuzin, and both rates of Hoe 00661 + metribuzin. These treatments were not significantly different from the hoed check. Acceptable yields (greater than 26 tons/acre) were obtained also with metribuzin ppi and post directed MC 10108, pebulate + napropamide, pendimethalin, and Hoe 00661 (0.50 and 0.75 lb. ai/acre). The acceptable yields provided by Hoe 00661 (0.50 and 0.75 lb. ai/acre) suggest weed competition with tomato plants was not a significant problem until midseason because it is a contact herbicide which provides no residual activity. Evaluation of Hoe 00661 is continuing, but industry has chosen to cease development of MC 10108 for at least the present time.

In this test several labeled and non-registered compounds were effective in controlling weeds without reducing tomato yields. The best overall herbicide treatments based on grass and broadleaf weed control and total yield under the conditions of this experiment were metribuzin + napropamide and metribuzin + Hoe 00661 (0.50 and 0.75 lb. ai/acre).

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