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PRIMARY SCREENING OF NEW UNREGISTERED PREEMERGE VEGETABLE HERBICIDES II

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INTRODUCTION

New herbicides and improved registered materials are becoming available with increasing frequency for the tropical weed researcher. In order to evaluate the weed control activity, the necessity arises for a simultaneous screening of a number of candidates on a wide spectrum of vegetable crops in the shortest time possible. The method described by Furtick and Romanowski (1967) has been used successfully by Jackson and Sierra (1973). It consists of planting on the flat, one row each of the crop to be tested, and then applying the herbicides at right angles over the crop. Herbicides are applied at the recommended concentration, and may or may not be replicated with the inclusion of as many check plots as considered necessary. Such an experiment was established at the Fortuna Sub-station, Juana Diaz, Puerto Rico on March 19, 1974, evaluating twelve candidate chemicals at three levels on twenty-eight crop species. Only the level recommended by the manufacturer is reported in this paper.

MATERIALS AND METHODS

The planting was made on a well prepared field of Paso Seco Sandy Loam (Sand 41.2%, Loam 30.0% and Clay 28.8%). Soil pH was 7.12, with 2.57% organic matter and a base exchange capacity of 25.3 meq. per 100 grams.

Seeding was done with a Stanhay Mk II precision seed spacing drill, using the correct size belt for each crop planted and depth depending on the species. Seeding was extra heavy to assure a good stand of crop, with an inter-row spacing of 0.45m. (1.5 ft.).

One row each of the following crops was included in the test: C-17 sorghum, Hawaii-68 sweet corn, Sinaloa rice, Texas Grano 502 onion, Winter Bloomsdale spinach, Georgia collard, Market Prize cabbage, Waltham 29 broccoli, Purpletop White Globe turnip, Milichihi Chinese cabbage, Cherry Belle radish, Romano bush bean, Kanrich soybean, Kaki pigeon pea, Dwarf Long Green Pod okra, Line 8-65 papaya, Scarlet Nantes carrot, Florida Market eggplant, Walter tomato, Yolo Wonder Y Sweet pepper, Boriquen pumpkin, Charleston Gray watermelon, Gemini 7 Hybrid cucumber, Perlita cantaloupe, Curly Leaved Batavian endive, Great Lakes 659 head lettuce, Black Seeded Simpson Leaf lettuce and Mammoth Grey Stripe sunflower.

All herbicides were tested for preemerge activity at manufacturers' recommended rate. Materials are expressed as active ingredient per acre, and the rates were: Tolban (CGA-10832) at 0.45 kg. (1.0 lb.), Furloe-124 (Chloropropham plus PPG-124) at 1.81 kg. (4.0 lbs.), Destun (MBR-8251) at 1.36 kg. (3.0 lbs.), Dioxane (NIA-25213) at 0.91 kg. (2.0 lbs.), HCS-3438 75WP at 0.45 kg. (1.0 lb.), RH-2512 at 0.34 kg. (0.75 lb.), HR-2915 at 0.11 kg. (0.25 lb.), HP-15018 at 1.81 kg. (4.0 lbs.), HP-20810 at 0.23 kg. (0.50 lb.), S-6851 at 1.36 kg. (3.0 lbs.), U-27267 at 0.45 kg. (1.0 lb.) and UNI-N-252 at 0.45 kg. (1.0 lb.).

Materials were applied using a Chem-Farm Sprayer with PTO pump powered and transported by a Ford 3000 tractor. Four NW-5 nozzles adjusted to spray a band 1.8 m. (6 ft.) were used, with each nozzle delivering 1395 cc/min at 10 psi. Pressure was maintained using a tachometer setting of 1500 rpm and a forward speed of 2.4 km/hr (1.5 mi/hr). Plots were sprayed at right angles to crop rows. Each plot was 17.2 x 1.8 metres (57 x 6 ft.). The sprayer was washed out thoroughly between applications using a water-ammonia-detergent solution.

The day was clear with wind east south east at 4.9 km/hr. (3.0 mi/h.). Air temperature 30.6°C. (87°F.). Relative humidity 45%, soil temperature at 5.1 cm (2 in.) 32.2°C. (90°F.).

All irrigation was applied overhead. First irrigation was sufficient to saturate field to puddling and then turned off. All irrigations were applied as required but to the point of run-off only. Total rainfall for the four weeks duration of the experiment was 0.23 mm. (0.91 in.), highest temperature 31.7°C. (89°F.) and lowest being 12.8°C. (55°F.).

The crop and weed responses to the candidate herbicides were evaluated using the following subjective rating system:

Crop Tolerance Rating	Weed Control Rating
1 = No injury	S = Susceptible
2 = Slight injury	I = Intermediate
3 = Moderate injury	T = Tolerant
4 = Severe injury	
5 = Dead	

The procedure for subjective rating was to study all the control plots before making the ratings; subsequently, the plots were rated without knowledge of treatments applied. This unbiased method often resulted in ratings greater than "S" because of variable weed stand and crop growth. When more data were thought necessary, stand counts were made to measure degree of weed control activity.

RESULTS

Results obtained were encouraging for the performance of some of the candidate materials tested with most vegetables. The trial clearly indicated that many of the herbicides were phytotoxic under the test conditions. Table I summarises the crop test results. Weed control rating was largely to compare the herbicide treatments when considering crop tolerance and to compare with the control when interpreting weed response. Data presented in Table 2 indicates weed response to the candidate herbicides. Due to the variation in common plant names throughout the Caribbean, Latin names are used for the weed species encountered. For English or Spanish description of species recorded, common names and illustrations, the reader is referred to Adams, et al (1968) and Cardenas, et al (1972).

RECOMMENDATIONS

Jackson, et al (1972) have tested registered preemerge herbicides for use on thirteen vegetable crops grown in Puerto Rico. Further experimental activity is recommended for the selected candidate herbicides to be tested in secondary formal replicated trials, utilizing the presently recommended registered herbicides as control or check for that specific crop. Reference is made to Table 3.

REFERENCES

ADAMS, C.D., L. KASASIAN AND J. SEEYAVE. (1968). Common Weeds of the West Indies. U.W.I., St. Augustine, Trinidad.

CARDENAS, J., C.E. REYES, and J.D. DOLL (1972). Tropical Weeds-Malezas Tropicales. IPPC, OSU, Corvallis, U.S.A.

FURTICK, W.R. and R.R. ROMANOWSKI, JR. (1971). Weed Research Methods Manual. IPPC, OSU, Corvallis, U.S.A.

JACKSON, G.C., L.A. ALMODOVAR, C. SIERRA, G. MANGUAL, C. RAMOS AND J. JULIA (1972). Preemerge Vegetable Herbicide Field Work in Puerto Rico, 1970-72. Proc. Carib. Food Crops Soc. 10:116.

JACKSON, G.C. AND C. SIERRA. (1973). Primary Screening of New Unregistered Preemerge Vegetable Herbicides. Proc. Carib. Food Crops Soc. II (in press).

TABLE I. Effect of Chemical on Crop Germination and Early Growth

Crop \ Chemical	CGA-10832 (Tolban)	Chloropropham Plus PPG-124 Furloe-124	HDS-3438	MBR-8251 (Destun)	NIA-25213 (Clorane)	HR-2512	HR-2915	HP-15018	HP-20810	S-6851	U-27267	UNI-N-252
Sorghum	1*	3	2	5	4	4	4	5	4	3	2	2
Sweet Corn	1	1	1	3	4	4	2	3	4	3	1	2
Rice	1	2	5	5	4	3	2	1	2	4	3	3
Onion	1	2	3	5	1	5	5	3	5	5	1	1
Spinach	1	1	5	5	4	5	5	5	5	2	1	3
Collard	1	1	5	5	4	5	5	5	5	5	2	5
Cabbage	1	3	5	5	4	5	5	5	5	5	2	3
Broccoli	1	2	5	5	4	3	5	3	5	5	2	5
Turnip	1	2	5	5	4	3	5	3	4	5	1	5
Chinese Cabbage	1	2	5	5	4	3	5	4	4	5	1	5
Radish	1	1	5	3	3	3	5	3	4	1	1	5
Bush Bean	2	2	5	3	1	4	4	5	3	1	1	2
Soya	1	1	5	1	2	4	3	1	1	1	1	2
Pigeon Pea	1	1	1	5	3	5	3	1	2	1	1	1
Okra	1	2	5	3	2	4	5	5	5	1	1	2
Papaya	1	5	2	5	5	5	5	5	5	1	5	5
Carrot	1	3	5	5	5	1	2	1	2	1	5	1
Egg Plant	1	4	5	5	2	5	5	4	5	3	1	4
Tomato	2	4	5	5	1	5	5	4	5	5	1	2
Sweet Pepper	1	2	1	2	1	3	4	4	5	2	1	1
Pumpkin	1	1	4	3	2	3	2	4	3	1	1	3
Watermelon	2	4	4	3	3	4	3	5	5	2	2	3
Cucumber	1	4	5	3	3	4	5	5	4	1	2	3
Cantaloupe	1	3	5	2	2	5	5	5	5	1	2	3
Endive	1	2	5	5	4	5	5	5	5	5	3	3
Head Lettuce	2	2	5	5	5	5	5	5	5	5	4	3
Leaf Lettuce	2	2	5	5	5	5	5	4	5	5	1	3
Sun Flower	1	1	4	4	1	1	3	2	1	[illegible]	1	2

* Crop Rating: 1 = No injury
2 = Slight injury
3 = Moderate injury
4 = Severe injury
5 = Dead.

TABLE 2. Control of Prevalent Weed Species Encountered.

Weed Species \ Chemical	Tolban	Furloe-124	Furloe -124	Destun	Diorane	HR-2512	HR-2915	HP-15018	HP-20810	S-6851	U-27267	UNI-N-252
Digitaria sanguin												
Digitaria sanguinalis	T*	I	T	S	S	S	S	S	S	S	I	I
Echinochloa colonum	T	T	T	S	S	S	S	I	S	S	T	T
Eleusine indica	I	I	S	S	S	S	S	S	I	S	T	I
Trianthema portulacastrum	I	T	I	S	S	S	S	T	I	S	I	S
Amaranthus dubius	T	T	S	I	S	S	S	S	S	S	T	I
Cleome spinosa	T	S	S	S	S	S	I	S	S	S	T	S
Ipomoea tiliacea	I	I	S	S	T	I	S	S	I	S	S	I
Phyllanthus niruri	T	S	I	S	S	I	S	S	S	S	T	S
Sida rhombifolia	I	S	T	S	I	I	I	S	I	I	S	S
Boerhaavia decumbens	S	S	I	S	S	I	T	I	S	S	I	S
Argemone mexicana	S	S	S	I	T	I	S	S	S	I	I	I
Portulaca oleracea	I	T	S	I	S	S	S	S	S	S	S	S
Datura stramonium	I	S	S	S	S	T	I	S	I	S	S	I
Kallstromia maxima	I	I	S	S	I	S	S	I	S	S	T	S

* Weed tolerance: T - Tolerant to the herbicides
I - Intermediate
S - Susceptible

TABLE 3. Suggested Recommendations for Selected Crops.

CROP	HERBICIDE lb a.i./ac		Tolban*	U-27267*	S-6851*	Dioxane*	Furloe*	HCS-3438*	UNI-N-252*	RP-15018*
Sweet Corn	Propachlor	6.0	1.0	1.0			4.0	1.0		
Onion	Chlorthal-dimethyl	10.5	1.0	1.0		2.0			1.0	
Cabbage	Chlorthal-dimethyl	10.5	1.0							
Bush Bean	Chlorthal-dimethyl	10.5		1.0	3.0	2.0				
Pigeon Pea	Chloramben*	4.0	1.0	1.0	3.0		4.0	1.0	1.0	4.0
Okra	Trifluralin	1.0	1.0	1.0	3.0					
Eggplant	Chlorthal-dimethyl	10.5	1.0	1.0						
Tomato	Diphenamid	6.0		1.0		2.0				
Sweet Pepper	Diphenamid	5.0	1.0	1.0		2.0		1.0	1.0	
Pumpkin	Chloramben	4.0	1.0	1.0	3.0		4.0			
Cucumber	Naptalam	6.0	1.0		3.0					
Cantaloupe	Naptalam	6.0	1.0							
Leaf Lettuce	Pronamide*	4.0		1.0						

Note: Materials marked (*) are not registered for commercial use on crops indicated. Produce must be destroyed, and cannot be used for human or animal consumption: this includes, seed, foliage, fruits, roots or other parts. Keep materials out of reach of children. Do not store with feed or food stuffs. Consider materials lethal to all wild life, do not contaminate streams, lakes or potable water sources. These suggested experimental recommendations are for use of authorized and qualified research stations only. This is not a commercial recommendation.

All materials are expressed as lb. ai/ac., to convert kg multiply by 0.4536.

MATERIAL SOURCES

CGA-10832 (Tolban): CIBA-Geigy Corp., Suite 307, 500 East Morhead Street, Charlotte, NC 28202, U.S.A. Attn: Dr. T.R. Dill

Furloe-124: PPG Industries Inc., One Gateway Center, Pittsburgh, PA 15222, USA: Attn: Dr. Warren H. Zick

HCS-3438: Velsicol Chemical Corporation, 341 East Ohio St. Chicago, IL 60611 USA. Attn: Dr. Bert Eddins.

MBR-8251: (Destun): Three M. Company, 3M Center, Saint Paul, MN 55101 USA. Attn: Dr. Eldon S. Radcliffe

NIA-25213 (Dioxane): FMC Corp., Apartado 2847, San Jose, Costa Rica. Attn: M.S. Nakayama

RH-2512 and RH-2915: Rohm & Hass Co., Box 2019, San Juan, P.R. 00919, USA. Attn: Mr. Eduardo G. Kimenez

RP-15018 and RP-20810: Rhodia Inc., Chipman Division, 120 Jersey Ave., New Brunswick, NJ 08903 USA. Attn: Mr. J.R. Bone

S-6851: Gulf Oil Chemicals Co., Industrial & Speciality Chemicals Div., Research & Development Dept., 9009 West 67th Marriam, KS 66202 USA. Attn: Dr. R.A. Schwartzbeck

U-27267: Upjohn International Inc., Research & Development Dept., 320 Portage St. Kalamazoo, MI 49001 USA. Attn: Dr. George Swank.

UNI-N-252: Uniroyal Chemical Div., of Uniroyal Inc., Research & Development Dept., Bethany, Ct 06525 USA. Attn: Dr. Allyn R. Bell.