

Research Note

SEQUENTIAL HERBICIDE APPLICATION IN YAMS¹

Yam (*Dioscorea spp.*) is the most important starchy root crop in Puerto Rico. In 1990-91, local production reached 10,546 metric tons with a farm value of \$8.7 million.² One of the major factors limiting yam production has been the high production cost associated with manual labor for controlling weeds. Recently, chemical weed control has gained acceptance in root crops in Puerto Rico. In recent years research efforts^{3,4} have been intensified in an attempt to provide root crop farmers with efficient and inexpensive weed control options.

Since yam has a relatively long growing cycle, a single preemergence treatment would not provide the required long-term weed control. Therefore, a sequential postemergence herbicide treatment is needed. This paper reports our research findings concerning the use of three preemergence herbicides: imazethapyr [2 - [4,5 - dihydro - 4 - methyl - 4 - (1 - methyl-ethyl - 5 - oxo - 1H - imidazol - 2 - yl) - 5 - ethyl - 3 - pyridicarboxylic acid]; linuron [N⁺ - (3,4 - dichlorophenyl) - N - methoxy - N - methylure] and lactofen [(+) - 2 - ethoxy - 1 - methyl, - 2 - oxoethyl - 5 - [2 - chloro - 4 - (trifluoromethyl) phe-noxy] - 2 - nitrobenzoate]. These herbicides were used in sequential application with a postemergence herbicide, paraquat (1,1' - dimethyl - 4,4' - bipyridinium ion).

The experiment was conducted at the UPR-Mayagüez Finca Montaña in Aguadilla, P.R. Seed pieces of cv. Habanero yam (*Dioscorea rotundata* Poir. in Lam) were planted 2 April 1993 in a Coto clay (Oxisol). Soil is pH 7.4; organic matter content, 2.1% and clay content, 41%. The monthly rainfall in the nearby Isabela area was 22.8 cm, 15.3 cm, 6.9 cm, 6.2 cm, 10.6 cm, 9.9 cm, 10.6 cm, 10.7 cm for April, May, June, July, August, September, October and November 1993, respectively. Preemergence herbicides used were imazethapyr (Persuit 2AS) at 0.224 and 0.448 kg ai/ha, lactofen (Cobra 240EC) at 0.224, 0.448 kg ai/ha and linuron (Lorox 50W) at 3.36 and 6.72 kg ai/ha. A hand weeded control and a non-weeded control were included. The preemergence was applied 5 April 1993 with a CO₂ pressurized portable sprayer attached to a four-nozzle boom. The sprayer was calibrated to deliver 108 L/ha of herbicide spray. Postemergence applications of paraquat (Gramoxone super) at 0.56 kg ai/ha were applied twice (10 May and 21 June 1993) with a standard knapsack sprayer at 936 L/ha herbicide spray.

Four rows of yams were planted 0.6 m apart in 6.1 x 6.1 m plots provided with drip irrigation. Six weeks after the planting, yam plants were trellised to wooden posts 2 m above ground level. Weeds from

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²Anonymous, 1990. Ingreso Agrícola de Puerto Rico, 1990-1991. Departamento de Agricultura, Oficina de Estadísticas Agrícolas, Santurce, P.R.

³Caro-Costas, R.C., E. Boneta, y S. Silva, 1968. Effects of various cultural practices on yield of yams in Puerto Rico. *J. Agric. Univ. P.R.* 52 (4):356-361.

⁴Liu, L.C., J.J. Green and E. Acevedo, 1981. Herbicide screening trials in yams (*Dioscorea spp.*) *J. Agric. Univ. P.R.* 65 (4):355-360.

⁵Liu, L.C., M. Santiago-Córdova and A. González, 1990. Further evaluation of herbicides in yams (*Dioscorea spp.*) *J. Agric. Univ. P.R.* 74 (3):221-228.

the hand weeded treatment were removed 10 May and 15 July 1993. Weed control and phytotoxicity were recorded periodically. A randomized complete block design with four replications was used. The agronomic practices⁶ recommended by the Agricultural Experiment Station for growing yams were followed. Marketable tuber yield was recorded at harvest (19 October 1993). Analysis of variance determined yield differences among treatments. Means were separated with Duncan's multiple range test at the 0.05 level of probability.

The predominant weed species present in non-weeded control plots were wild poinsettia (*Euphorbia heterophylla*

L.), cow-itch [*Mucuna pruriens* (L) DC], pigweed (*Amaranthus dubius* Mart. ex Thell.), morningglory [*Ipomoea tiliacea* (Willd) Choisy], large crabgrass [*Digitaria sanguinalis* (L) Scop.], junglerice (*Echinochloa colona* (L) Link), goosegrass [*Eleusine indica* (L) Gaertn], johnsongrass [*Sorghum halepense* (L) Pers.] and purple nutsedge (*Cyperus rotundus* L.).

Table 1 shows first weed control rating (10 May 1993) for preemergence control of weeds achieved by imazethapyr, lactofen and linuron. Imazethapyr at either rate controlled most of the above-mentioned weeds excellently. Lactofen and linuron did poorly or satisfactorily (40-75%). None of the herbicides tested effec-

TABLE 1.—Effect of preemergence and postemergence herbicide treatments on weed control and tuber yield of yams, 1993.

Treatment	Overall weed control ¹		Phytotoxicity ²		Yield ³
	5WAP ⁴	9WAP ⁴	5WAP ⁴	9WAP ⁴	
Rate kg ai/ha			%		kg/ha
Imazethapyr 0.224 PRE + paraquat 0.56 POE	90	85	0	0	24,708 a
Imazethapyr 0.448 PRE + paraquat 0.56 POE	95	90	0	0	21,833 a
Lactofen 0.224 PRE + paraquat 0.56 POE	40	80	0	0	26,481 a
Lactofen 0.448 PRE + paraquat 0.56 POE	50	75	0	0	25,931 a
Linuron 3.36 PRE + paraquat 0.56 POE	60	75	0	0	22,628 a
Linuron 6.72 PRE + paraquat 0.56 POE	75	80	0	0	23,974 a
Weeded control	100	60	0	0	21,772 a
Non-weeded control	0	0	0	0	11,498 b

¹Weed control rating is based on a 0-100 scale, where 0=no effect, 100=perfect control.

²Phytotoxicity evaluation is based on a 0-100 scale, where 0=no effect, 100=complete effect.

³WAP=Weeks after planting.

⁴Means in a column followed by the same letter are not significantly different at P=0.05 according to DMRT.

⁶Estación Experimental Agrícola, 1984. Conjunto Tecnológico para la Producción de Farináceas. Pub. 101.

tively controlled the purple nutsedge. Nevertheless, the purple nutsedge was not considered a major population. None of the herbicides tested caused crop injury. The second weed control rating (1 June 1993) indicates chiefly the postemergence activity of paraquat. Paraquat was the only herbicide contributing to good control of both broadleaves and grasses at this stage of yam growth.

None of the treatments differed significantly in tuber yield with the exception of the non-weeded control, which was significantly lower than the rest of the treatments (table 1). The initial excellent preemergence weed control provided by imathezapyr did not reflect in yield. This could be attributed to the fact that weeds were not controlled by a preemergence herbicide alone. The contribution of a postemergence herbicide was important

during the critical period of weed competition in yams which extended from three to four months after planting.^{7,8,9,10} Weeds should be kept under control during this critical period. Under tropical climatic conditions preemergence herbicides can provide weed control up to two months. Thus, the sequential application of a preemergence herbicide with a postemergence herbicide is needed to prevent yield reduction.

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⁷Cortés, J.A. y A.J. Beale, 1984. Efecto de la competencia de las malezas en el rendimiento final del ñame Habanero (*Dioscorea rotundata* Poir) Proc. 19th Annual Meeting Caribbean Food Crops Society. San Juan, P.R. 146-154.

⁸Kasasian, L., 1967. Chemical weed control in tropical root crops. *Trop. Agric. Trinidad*, W.I. 44 (2):143-150.

⁹Kasasian, L. and J. Seeyave, 1969. Critical period for weed competition, *PANS* 15 (2):208-212.

¹⁰Moody, K. and H.C. Ezuman, 1974. Weed control in major tropical root crops, A Review. *PANS* 20:292-294.