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Evaluation of Selected Herbicides on Several Pulses[1,2]

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Abstract. A longarithmic sprayer was used to determine the responses of 12 pulse species to pre- and postemergence treatments with 20 selected herbicides on a Codorus-Elkton silt loam. Herbicides were 3-amino-2,5-dichlorobenzoic acid [amiben], 3-nitro-2,5-dichlorobenzoic acid [dinoben], 2,6-dichlorobenzonitrile [dichlobenil], dimethyl-2,3,5,6-tetrachloroterephthalate [DCPA], 3-(3,4-dichlorophenyl)-1-methoxy-1-methylurea [linuron], *alpha,alpha,alpha*-trifluoro-2,6-dinitro-*N,N*-dipropyl-*p*-toluidine [trifluralin], *N,N*-dimethyl-2,2-diphenylacetamide [diphenamid], *S*-propyl dipropylthiocarbamate [vernolate], *S*-propyl butylethylthiocarbamate [pebulate], *S*-ethyl hexahydro-1-*H*-azepine-1-carbothioate [molinate], ethyl *N,N*-diisobutylthiolcarbamate [R-1910], ethyl *N*-cyclohexylthiolcarbamate [R-2063], ethyl *N,N*-dipropylthiolcarbamate [EPTC], 1-(2-methylcyclohexyl)-3-phenylurea [siduron], 2-chloro-*N,N*-diallylacetamide [CDAA], *N*-4-(*p*-chlorophenoxy)-phenyl-*N',N'*-dimethylurea [CPD], *N*-isopropyl-*alpha*-chloroacetanilide [CP 31393], 1-dimethylamino-thioxanobenzene [RP 2929], isopropyl *N*-(3-chlorophenyl)-carbamate [CIPC], and 4,6-dinitro-o-sec-butylphenol [DNBP]. Outstanding preemergence treatments were with trifluralin, diphenamid, pebulate, siduron, CDAA, CPD, CP 31393, RP 2929, CIPC, and DNBP. Most selective postemergence treatments were amiben, dinoben, dichlobenil, DCPA, trifluralin, diphenamid, vernolate, pebulate, molinate, R-1910, R-2063, EPTC, siduron, CDAA, CP 31393, and CIPC. A number of these herbicides used separately or in combination should be highly effective in controlling a broad range of weed species in pulse crops.

INTRODUCTION

SIGNIFICANT quantities of several species of pulses are grown for food in the USA and its territories. Certain of these and several other species are major food crops in the Near East, Far East, South Asia, and Africa. Weed control is a major problem in many production areas and is a critical problem in the maintenance of experimental plots concerned with breeding, fertilization, irrigation, soils, and cultural practices. This investigation was designed to evaluate the responses of 12 pulse species to 20 herbicides as a basis for more advanced studies to develop practical weed control methods for these crops.

MATERIALS AND METHODS

Test species, variety names, and planting and treatment data are listed in Table 1. The 20 herbicides applied were selected from among those used in earlier general herbicide evaluation experiments. Common names or letter and number designations of herbicides are used here for convenience.

Research was conducted on a Codorous-Elkton silt loam at Beltsville, Maryland. In preparing the seed bed, a broadcast application of 1,200 lb/A of a 5-10-5 fertilizer was disked into the soil to a depth

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Table 1.—Test species and treatment data.

Name	Variety	Seeding rate no/ft	Depth of planting, inches	Height at time of postemergence treatment, inches
Broadbean (*Vicia faba* L.)	Mixed	6	2	3-4
Chickpea (*Cicer arietinum* L.)	CP 94	6	2	2-3
Twinflower Dolichos (*Dolichos bifloru*)	SP-162	6	1	3-4
Garden bean (*Phaseolus vulgaris* L.)	Topcrop	6	2	6-8
Garden pea (*Pisum sativum* L.)	Thomas Laxton	6	2	8-10
Hyacinth bean (*Dolichos lablab* L.)	3588 Tall Mixed	8	2	4-5
Lentil (*Lens culinaris* Medic.)	Mixed	14	1	2-3
Mung bean (*P. aureus* Roxb.)	Kiloga	6	1	2
Pigeon pea (*Cajanus cajan* (L.) Millsp.)	Kaki	6	2	4
Southern pea (*Vigna sinensis* (Torner) Savi.)	Blackeye 1239	8	2	4-6
Soybean (*Glycine max* (L.) Merr.)	Clark	6	2	4-6
Urd bean (*P. mungo* L.)	M-750	4	1	2
Pigweed (*Amaranthus retroflexus* L.)	None	–	½	2
Ryegrass (*Lolium multiflorum* Lam.)	Annual	–	½	2

of 6 inches. Plots consisted of 3 beds 4 feet wide and 80 feet long containing 4 crops per bed. Seeds were planted with a tractor-mounted gang planter. Annual ryegrass and redroot pigweed were planted in rows on the lateral margins of each plot.

Herbicides were applied with a logarithmic sprayer. Each plot contained an untreated area, and an exponential rate-range of the herbicide from the selected maximum to ⅛ of the maximum. A portion of each untreated area was hand-weeded. Crops were planted on June 4, 1964 and preemergence treatments were applied the following day. Postemergence treatments were applied on June 26, when plant heights were as listed in Table 1. Insects were controlled by spraying with a mixture of *O,O,*-dimethyl phosphorodithioate of diethyl mercaptosuccinate [malathion] and 2,2-bis(*p*-methoxyphenyl)-1,1,1-trimethoxy chloroethane [methoxychlor]. Optimum moisture conditions were maintained by sprinkler irrigation.

Pre- and postemergence treatments were rated on June 26 and July 13, respectively. Results were determined by: (a) crop and

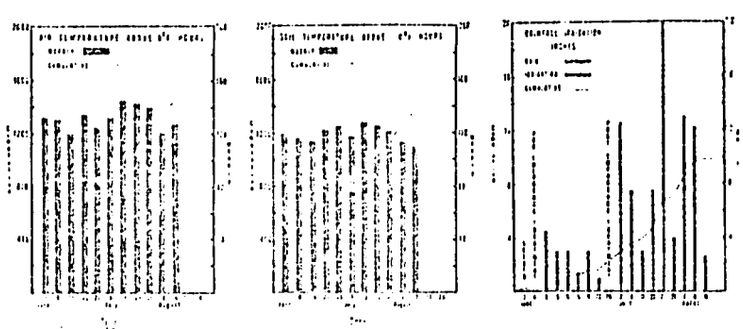

Fig. 1. Individual readings and cumulative records on air and soil temperature and on rainfall and irrigation are shown graphically.

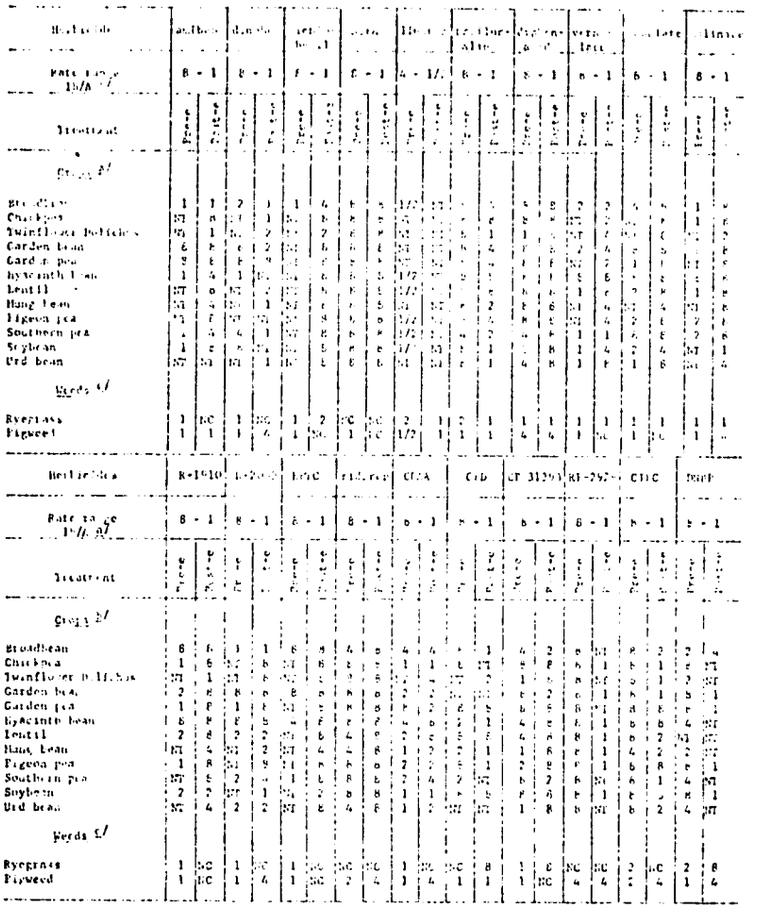

Fig. 2. Summary of pre- and postemergence logarithmic rate plots showing maximum application in lb/acre causing injury score of 30 or less to crops and score of 70 or more to weeds.

weed injury scores (where 0 = no injury and 100= kill of all plants); (b) height reduction percent; and (c) root injury score (0 to 100). These data were taken at 100, 50, 25, and 12.5% of the maximum rate of herbicide application. Only crop and weed injury scores were considered in compiling the data reported, because these data truly reflect weed control and are not confounded by morphological and anatomical characteristics that may be expressed as reduction in height or root injury. A crop-injury score of 30 or less was con-

sidered acceptable tolerance. A weed-injury score of 70 or more was considered acceptable control.

Climatological data including rainfall, air, and soil temperatures are shown in Fig. 1.

Results and Discussion

The results are summarized in Fig. 2. All preemergence herbicide treatments were successful in controlling some germinating broadleaved weeds or weed grasses. Some herbicides controlled both kinds of weeds. Certain of the herbicides were tolerated by a greater number of crops than others. Outstanding preemergence treatments from the standpoint of weed control and number of tolerant crops were trifluralin, diphenamid, pebulate, siduron, CDAA, CPD, CP 31393, RP-2929, CIPC, and DNBP.

None of the postemergence treatments effectively controlled established broadleaved weeds or weed grasses. Many of the crops were tolerant of a large majority of the herbicides used as postemergence treatments. Outstanding postemergence treatments from the standpoint of number of tolerant crops were amiben dinoben, dichlobenil, DCPA, trifluralin, diphenamid, vernolate, pebulate, molinate, R-1910, R 2063, EPTC, siduron, CDAA, CP 31393, and CIPC. The high crop tolerance to postemergence treatments of these herbicides and their effectiveness in controlling germinating weeds in preemergence treatments suggest further studies to evaluate their use following clean cultivation of established pulse crops.

The results of these experiments indicate that a number of the herbicides are worthy of advanced evaluation to determine their effects on yield and quality of the crops.