Weed Control in Field Potatoes

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Weed Control in Field Potatoes[1]

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Weed competition can reduce yield (2, 6) and potato quality (2), affecting tuber size, weight, and quantity (4,7). Weeds interfere with harvest, causing more potatoes to be left in the field and increasing mechanical injury (2). If a mixed population of annual weeds is allowed to compete with potatoes all season, each 10% increase in dry weed biomass causes a 12% decrease in tuber yield (4). One redroot pigweed (*Amaranthus retroflexus* L.) or barnyardgrass [*Echinochloa crusgalli* (L.) Beauv.] per meter of row reduced marketable tuber yield 19 to 33% (6).

The critical period for weed removal in potatoes is about 4 to 6 weeks after planting (2, 5). Weeds emerging 4 weeks after planting are suppressed by crop growth (5). These weeds may not reduce tuber yield through competition, but can interfere with harvest operations (2).

Mechanical cultivation does not remove weeds within the row and may damage potato plants (2) and reduce yields (3). Herbicides can reduce the number of cultivations required and enhance weed control (1, 3), particularly during the early season before hilling.

Many herbicides are approved for use on potatoes grown on medium- and fine-textured, high-organic soils. Relatively little information is available regarding the effectiveness and safety of herbicides for potatoes grown in low-organic matter, coarse-textured soils.

The objectives of this research were to compare the efficacy of 10 herbicide treatments for controlling prostrate pigweed, kochia, and Russian thistle in a low-organic, coarse-textured soil and to determine their effect on marketable potato yields.

MATERIALS AND METHODS

Field trials were conducted over a three-year period from 1986 to 1988 at the New Mexico State University Agricultural Science Center at Farmington, New Mexico. The soil was a Wall sandy loam (Typic Camborthid, of the coarse, loamy, mixed calcareous, mesic family) with 0.47% organic matter and pH of 8.0. Soils were fertilized according to New Mexico State University recommendations based on soil tests (225 lb N, 50 lb P2O5, and 50 lb K2O per acre). Fields were plowed, disked, leveled, and hilled prior to planting.

A randomized complete block design with three replications was used. Individual plots consisted of four 34 inch rows, 30 ft long.

Potato pieces were planted 6 inches apart within the row on April 14, 1986 (cv. 'Sangre'); April 20, 1987 (cv. 'Centennial'); and April 19, 1988 (cv. 'Centennial'). Prostrate pigweed, kochia, and Russian thistle were broadcast seeded at a rate of 1.0 lb/acre each and harrow incorporated prior to planting.

Herbicide treatments were applied with a compressed air backpack sprayer calibrated to deliver 30 gal/acre at 30 psi with 8004 fan-type nozzles. The chemical designations for the proprietary herbicides evaluated were:

Common name	Trade name
metolachlor	Dual
EPTC	Eptam
fluorochloridone	Racer (proposed)
metribuzin	Sencor/Lexone
pendimethalin	Prowl
trifluralin	Treflan

Preplant incorporated (PPI) treatments were applied April 14, 1986; April 16, 1987; and April 19, 1988 and immediately incorporated to a depth of 2 to 4 inches with a tractor-driven rotary tiller. Preemergence (PRE) treatments were applied April 30, 1986; April 24, 1987; and April 22, 1988 and immediately incorporated with 0.75 inches of sprinkler-applied water.

Visual evaluations of crop injury and weed control were made July 17, 1986; July 21, 1987; and June 23, 1988. Weed control was based on a 0-to-100% scale, where 0 = no control and 100 = no living weeds. Infestations were light throughout the experimental

[1]Mention of a proprietary herbicide does not imply registration under FIFRA as amended, or endorsement by New Mexico State University.

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area for all three weeds. Weeds were hoed from the weed-free controls as needed, beginning one month after planting and continuing through August.

Potatoes were mechanically harvested with a tractor-driven potato digger on October 2, 1986; September 22, 1987; and September 19, 1988 from 5 ft of the center two rows of each plot. The harvested potatoes were graded to separate marketable tubers (1 7/8 to 3 inches in diameter). Tubers that were diseased, less than 1 7/8 inches or more than 3 inches diameter were discarded. Previous research (4, 6) indicates that specific gravity is independent of weed density, so specific gravity was not measured. Values for weed control and marketable yield were subjected to analysis of variance, and treatment means were separated by Fisher's LSD test at the 5% significance level. There was no significant year-by-treatment interaction, so data were combined for all three years.

RESULTS AND DISCUSSION

Fluorochloridone was the only treatment that injured potato plants during all three years (data not shown). At both rates, potato plants exhibited chlorosis along leaf veins, and plants were slightly reduced in size. As the season progressed, injury symptoms diminished, and there appeared to be no difference in foliar growth among all treatments at harvest.

All herbicide treatments controlled 100% of prostrate pigweed (table 1). Trifluralin, in combination with metolachlor or with EPTC, controlled less than 95% of kochia (an average of 89% and 88%, respectively). Adding metribuzin to trifluralin plus EPTC increased control to 100%. Pendimethalin alone or in combination with EPTC controlled less than 75% of Russian thistle. Adding metribuzin to pendimethalin increased Russian thistle control to 95%. All other treatments controlled 90% or more of Russian thistle.

The unweeded control yielded the least marketable potatoes of all treatments (table 1) and produced 61% less than the weed-free control. The greatest potato tuber yields were noted in plots treated with metribuzin alone or in combination with metolachlor or pendimethalin. Pendimethalin alone and in combination with EPTC failed to control Russian thistle, and marketable potato yields were lowest among treated plots. Adding metribuzin to pendimethalin increased Russian thistle control to 95%, and increased marketable tuber yields by 54% over pendimethalin alone. Previous research has indicated that pendimethalin may have a beneficial effect on potato yields beyond that of weed control, possibly by inducing deeper rooting (3). Combining pendimethalin and metribuzin did not significantly change marketable tuber yield as compared with metribuzin alone or the weed-free control in these experiments.

Though fluorochloridone at 0.5 lb ai/acre controlled all weeds in this study, marketable tuber yields from this treatment were lower than the weed-free control. The early injury appeared to have a deleterious effect on the crop, at least at the higher rate.

Controlling prostrate pigweed, kochia, and Russian thistle at the beginning of the season increased marketable potato yields more than 100% compared with the

Table 1. Prostrate pigweed, kochia, and Russian thistle control, and potato yields, averaged over three years (1986–1988).

Treatments	Timing	Rate	Weed control[a] AMABL	KCHSC	SASKR	Marketable[b] potato yield
		lb ai/A	%	%	%	cwt/A
trifluralin + metolachlor	PPI	0.75+1.5	100	89	95	406
trifluralin + EPTC[c]	PPI	0.75+3.0	100	88	95	409
trifluralin + EPTC[c] + metribuzin	PPI	0.75+3.0+0.25	100	100	100	425
fluorochloridone	PRE	0.25	100	100	90	420
fluorochloridone	PRE	0.5	100	100	99	385
pendimethalin	PRE	1.0	100	99	69	289
pendimethalin + EPTC[c]	PRE	1.0+3.0	100	100	70	338
pendimethalin + metribuzin	PRE	1.0+0.25	100	100	95	445
metolachlor + metribuzin	PRE	2.0+0.25	100	100	96	433
metribuzin	PRE	0.5	100	100	100	454
weed-free control			100	100	100	432
unweeded control			0	0	0	167
LSD (0.05)			1	5	6	30

[a]AMABL = prostrate pigweed, KCHSC = kochia, SASKR = Russian thistle.

[b]Tubers 1 7/8 inch to 3 inch in diameter.

[c]In a packaged mix containing R-33865, an inert herbicide safener.

unweeded control. Yields were greatest where weeds were controlled with no injury to the crop. All herbicide treatments in this research with the best broadleaf weed control and no crop injury contained metribuzin.

CONCLUSIONS

Study results emphasize the need for good weed control for optimum potato yields. Metribuzin applied alone or in combination with metolachlor, pendimethalin, or trifluralin plus EPTC gave excellent broadleaf weed control and the highest marketable potato yields.

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