THE USE OF MINIMUM TILLAGE PLUS HERBICIDES
IN POTATO PRODUCTION
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ABSTRACT

There has been a marked increase in the use of herbicides in potato production. In many cases growers have simply added herbicides to their existing weed control program with little or no reduction in tillage. On Long Island six or more separate mechanical operations may be used by growers to control weeds.

The current paper summarizes 3 years' results with various tillage — herbicide combinations carried out under widely varying levels of weed infestation. Under conditions of low to moderate infestation good results were obtained with one to two tillage passes plus the use of an herbicide. The use of an incorporated herbicide such as EPTC plus a single hilling operation as early as ground-crack was satisfactory. Greening of tubers was not appreciably increased by this or other early hilling practices. Fields with severe weed infestations required two to three tillage treatments plus an herbicide application. No yield reduction occurred from these treatments, with some indication of a trend in the opposite direction.

INTRODUCTION

The primary role of cultivation has long been accepted as that of weed control and the matter of how much is needed has been the objective of numerous investigations (1-3, 5, 6, 11-15, 18-21, 24). Pre-harvest tillage in excess of this requirement is usually of no benefit and often detrimental (1, 4, 5, 8-10, 17, 22, 23).

In recent years herbicides have been widely accepted for helping control weeds in potatoes; it is estimated 243,000 ha (600,000 acres) were treated in 1969 (7). In many cases growers have simply added herbicides to existing programs with little or no reduction in tillage.

On Long Island, for example, six or more mechanical operations often accompany the use of these chemicals. The land is plowed, using a two-way plow with some type of clod-busting implement towed behind it; planting follows immediately. Subsequent operations usually include: (i) a cultivation and harrowing to knock off the planting ridges (locally referred to as drag-off), (ii) two cultivations and weedings (with a flexible tined weeder attached behind the cultivator) up to the 10-15 cm (4-6 inch) stage, (iii) three or four additional cultivations or hilling treatments. There has been a long term program at this station on improvement of weed control methods in potato production. The current paper summarizes reduced tillage experiments conducted from 1968-70.

MATERIALS AND METHODS

The tests reported here were conducted each year at two locations — one on the Long Island Research Station where the weed infestation was moderate, and the other in a commercial field selected for very heavy infestation. The location of the commercial field varied from year to year. In 1968 many of the treatments at the two locations were directly comparable, and data from the commercial fields are therefore limited to that season. Results from all 3 years were consistent and in order to conserve space and at the same time permit reasonable detail on procedures, the description is primarily of the 1970 work on the station.

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The Katahdin variety was planted April 28, 1970, on a Riverhead medium sandy loam. Spacing in the row was approximately 23 cm (9 in) with 86 cm (34 in) between rows. Fertilizer was banded at planting at the rate of 202-176-167 kg/ha N-P-K (2250 lb/acre 8-16-8); nitrogen at 45 kg/ha (40 lb/acre) had been topdressed on the rye cover crop the previous fall. Planting was 5 cm (2 in) below the surface of the soil and the peak of the covering ridge 5 cm above it.

There were eight treatments involved, varying from our normal tillage program to a herbicide plus a single hilling operation.

1) Tillage only. Dragoff May 14; cultivator plus weeder May 28 and June 9; partial hilling with cultivator June 15, final hilling June 19.

2) Tillage, EPTC. Same as #1 above plus S — ethyl dipropylthiocarbamate (EPTC), 4.48 kg ai*/ha (4 lb/acre) granular, incorporated with first cultivation May 28, 5-cm plant stage.

3) Reduced tillage, EPTC. The herbicide at 4.48 kg ai/ha incorporated May 11 at dragoff with cultivator plus weeder. One cultivation June 9 at 15-20 cm (6-8 in) stage, and hilled June 18 at 25-30 cm (10-12 in) stage.

4) Minimum tillage, EPTC. Same as #3 above, with the June 9 cultivation deleted.

5) Early hill, EPTC. EPTC incorporated as in #3; hilled just prior to emergence — "ground-crack," on May 22; no further tillage.

6) Reduced tillage, EPTC. Same as #3 except EPTC incorporated with two passes of the weeder alone.

7) No dragoff, linuron. 3-(3,4-dichlorophenyl)-1-methoxy-1-methylurea (linuron) 1.4 kg ai/ha (1.25 lb/acre) pre-emergence on planting ridge May 22. Hilled at 25-30 cm stage on June 18.

8) No dragoff, linuron + EPTC. Linuron 1.4 kg ai/ha pre-emergence on planting ridge on May 22 plus EPTC 4.48 kg ai/ha at hilling on June 9, 15-20 stage.

Granular EPTC (5%) was broadcast with a 2-row Gandy machine and incorporated immediately. Linuron (50% wp) was applied with a 4-row tractor-mounted boom operated at a pressure of 25 psi and delivering 374 liter/ha (40 gal/acre). May 11, when most of the EPTC treatments were applied was very warm with a maximum of 31.6 C (89 F) and the soil surface dry.

Plots were four rows wide by 91 m (300 ft) long, replicated three times in a randomized block arrangement. Data were taken on the center pair of rows from four 9.1 m (30 ft) subplots per plot.

Stand counts were made May 25 and 28, June 2, 5, and 10. Weed control ratings were made June 1, Sept. 1 just before vine killing, and Sept. 25 prior to harvest. These ratings were primarily visual though number and size of weeds were considered. The commercially acceptable level of 3.5 indicated, in the judgment of the authors, that numbers were relatively low and size insufficient to provide competition to the crop. Weeds which came through the herbicide treatment early enough to produce seed before vine killing were considered to be much more serious that late germinating ones. Commercial acceptance, 3.5, in the heavily infested fields undoubtedly contained somewhat, though not substantially, larger numbers of weeds than on the Research Station. The vines were killed Sept. 2 and the crop harvested Sept. 27-28. Random samples of 100 tubers were taken from each subplot making a total of 1200 tubers per treatment that were washed, and examined for greening.

Procedures and treatments in 1968 and '69 were comparable, though specific dates involved were somewhat different.

*ai = active ingredient