Herbicidal Control of Weeds in Potato

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Potato is cultivated on about 1.4 million acres and ranks first in India among the subsidiary food crops by virtue of its being wholesome and dependable food. The crop is invaded by a wide spectrum of weeds which emerge and establish earlier than the potato seedlings. and in case of severe Infestation, they cause considerable loss of yield. A number of herbicides have been used for weed control in potato with with varying degree of success. Thus, Saweyer *et al* (1960) and Pande and Ghosh (1966) found that Eptam incorporated in the soil at a rate 6 kg. per hectare before planting controlled *Cyperus* species and other weeds and gave higher tuber yield. According to Awasthi *et al* (1960) and Chaudhary *et al* (1964), pre-emergence application of 2, 4-D controlled *Chenopodium album* almost completely and appreciably reduced the population of *Cyperus rotundus*. The reduction in weed population and growth after treatment was reflected in potato yields which increased to the same extent as hand weeding. Burghausen (1963) and Schnee (1963) reported that pre-emergence application of Simazine 1-2 kg. per hectare gave effective control of weeds on light soils. However, it was considered advisable to use it only potato for industry, because of imputed effects on taste. Post-emergence application of Propanil at the rate of 2 kg per hectare has been advocated by Waywell (1967) for effective weed control and higher yield.

The present investigations were undertake to assess the efficacy of eight different herbicides *Viz.*, Eptam, Tafazine 50 w, Sodium 2, 4-D, MCPA, BV 201, Tok E-25 Prometryne and Stam F-34 for the control of weeds in potato on light soil and the results are reported herein.

MATERIAL AND METHODS

The experiments were connected on light loam soil of moderate fertility at Institute of Agricultural Science, Kanpur on potato variety Kufri Shakti in antumn (rabi) season for years of 1967-68 and 1968-69. The design adopted was randomised block with 10 treatments and 3 replications. The crop was fertilized with 200 kg. of nitrogen, half as basal and the rest as top drssing, 150 kg phosphate and 100 kg potash/ha as a basal dose. Two sprayings of Dithane Z-78

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were given as a prophylactic measure against early and late blight of potato. The treatments were as follows :—

1. Unweeded control.
2. Hand Weeding.
3. Eptam, 3.5 kg. a. i./ha pre-planting.
4. Tafazine 50 W, 0.5 kg a. i./ha pre-emergence.
5. Sodium 2,4-D 0.5 kg. a. i./ha, pre-emergence.
6. MCPA. 0 5 kg a. i./ha pre-emergence.
7. BV 201, 2.0 kg a. i./ha, pre-emergence.
8. Tok E-25, 1.5 kg a. i./ha, pre-emergence.
9. Prometryne, 1.0 kg a. i./ha, pre-emergence.
10. Stam F-34, 1.0 kg a. i./ha, post-emergence.

The pre-emergence weedicides were sprayed before peeping stage of the crop while post-emergence application was carried out 4-weeks after sowing & before earthing.

The herbicides were sprayed as an eqeous solution by Knapsack sprayer on same plots of land in both the seasons. Water used for dilution was 560 litres per hectare. Weed count data was recorded before and after spraying of herbicides by employing one metre quadrats. The percentage control of different weeds was transformed into angle=$\text{Sin}^{-1}\sqrt{\text{Percentage control of weeds}}$ and then statistically analysed; LSD (CD) was calculated at 5% level of P. The figures obtained after transformations are given in Table 1.

RESULTS AND DISCUSSION

1. WEED STUDY

(a) Extent of infestation : During 1967-68, weed population recorded before earthing indicated that the field was highly infested with *Cyperus rotundans*; other weees found were *Chenopodium album*, *Asphodelus tenuifolius* and *Melilotus species*. The percentage infestation of weeds was 78.7%, 18 0%, 2.2% and 1% respectively. In the following year, percsntage infestation was *Cyprus rotundus* 63.9%, *Chenopodium album* 2.3%, *Asphodelvs tenuifolus* 17 4%, *Spergula arvensis* 3.9%, *Melilotus species* 6.2%, *Convolvulus arvensis* 2 3% and *Anagallis arvensis* 2.1% respectively.

(b) Percentage reduction : In both the years, weeds were controlled by the herbicides tried. Eptam was particularly effective in controlling the most dominant weed, *Cyperus rotundus*. The average result of two years, however, showed that the maximum overall weed mortality was obtained by Eptam (90.1%), followed by Sodium 2, 4-D (66.7%), TOK E-25 (61.9%), Prometryne (61.9%), BV 201 (57.4%),

Table 1

Effect of Weedicides on Percentage Control of Different Weeds

Sl. No.	Treatments										S. E.	C.D. at 5% P
	Control	Hand weeded	Eptam	Tafazine	2, 4-D (Sod)	MCPA	B.V 201	TOK E 25	Prometryne	Stam F 34		
Weed population/m²												
1967-68	275.3	140.0	20.7	157.3	172.3	161.3	118.7	236.3	119.7	155.7		
1968-69	162.7	120.0	31.7	96.7	90.0	91.7	103.0	104.0	98 0	108.3		
Mean	219.0	130.0	26.2	127.0	131.2	126.5	110.9	170.2	108.9	132.0		
Overall percentage control												
1967-68	—	58.9	94.8	30.1	66.3	61.7	47.1	60.2	78.4	82.0		
1968-69	—	20.0	85.3	44.1	67.1	18.8	67.6	63.5	45.3	3.6		
Mean	—	39.5	90.1	37.1	66.7	40.3	57.4	61.9	61.9	42.8		
Cyperus rotundus												
1967-68	—	60.1	85.7	27.7	27.6	29.0	30.6	13.3	30.5	22.3	11.6	34.46
1968-69	—	27.4	72.5	47.0	30.6	31.8	31.2	35.9	25.8	45.5	13.0	
Mean	—	43.8	79.1	37.4	29.1	30.4	30.9	24.6	28.2	33.9		

Contd.

Sl. No.	Treatments									S. E.	C.D. at 5% P
	Control	Hand weeded	Eptam	Tafazine	2, 4-D (Sod)	MCPA	B.V. 201	TOK E 25	Prometryne	Stam F 34	
Chenopodium album											
1967-68	—	24.9	66.0	64.7	50.9	52.7	54 9	53.0	67.4	60.8	3.105	9 23
1968-69	—	76.9	75.0	75.0	75.0	45.0	65.0	75.0	66.1	25.0	15 3	45.46
Mean	—	50 9	70.5	69,9	63.0	48.9	60.0	64.0	66.8	42 9		
Asphodelus tenuifolius												
1967-68	—	60.0	90.0	30.0	30.0	90.0	60.0	60.3	90.0	90.0	19.75	
1968-69	—	30.2	51 0	13.5	59.3	57.0	36.8	66.7	57.8	27.6	15.1	
Mean	—	45.1	70.5	21.8	44.7	73.5	48.4	63.4	73.9	58.8		
Melilotus species												
1967-68	—	90.0	90.0	60.0	90.0	60.0	30.0	90.0	90.0	60.0	18.18	54.01
1968-69	—	47.8	65.8	48.7	72.4	18.3	37.4	34 6	58.5	24.2	16.8	—
Mean	—	68.9	77.9	54.4	81.2	39.2	33 7	62 3	74.3	42 1		
Spergula arvensis												
1968-69	—	38.8	78.3	90.0	81.9	60.0	90.0	60 0	60,0	36.5	15.8	46.94
Anagalis arvensis												
1968-69	—	13.1	60.0	75.0	60.0	60.0	90.0	41.8	60.0	11.8	20.7	—
Convolvulus arvensis												
1968-69	—	30.0	48.3	40.5	69.4	41.8	11.8	65.2	8,9	—	17.1	—

Stam F 34 (42.8%), MCPA (40.3%), Hand weeding (39.5%) and Tafazine (37.1%) respectively.

As regards individual weeds, *Cyperus rotundus*, was controlled to the extent of 79 1% by Eptam. This herbicide was also effective in controlling *Chenopodium album* (70 5%). *Asphodelus tenuifolius* (70 5%), *Melilotus species* (77.9%). *Spergula arvensis* (78.3%), *Anagallis arvensis* (48.3%). Tok E-25 controlled *Chenopodium album* (64.0%), *Asphodelus tenuifolius* (63.4%), *Melilotus species* (62.3%), *Spergula arvensis* (60.0%), *Anagallis arvensis* (41 1%) and *Cyperus rotundus* (24.6%). 2, 4-D (Sodium) suppressed the growth of *Chenopodium album* (63.0%) *Melilotus species* (81.2%) *Spergula arvensis* (81.9%) and *Asphodelus tenuifolius* (60.0%), While Tafazine 50W and BV 201 were most successful in controlling *Spergula arvensis* respectively, each by 90.0%.

II. Crop Tolerance

Slight deformity i. e., twisting of leaves was noticed in both the years in plants treated with Eptam. This abnormality, however, disappeared completely later on. Similar deformity of leaves was also observed in sodium 2, 4-D sprayed plants in early stages of growth, which soon disappeared and seedlings became normal, except, that in few plants fusion of leaves persisted till harvest. Stam F-34 induced formation of aerial tubers, which was noticed in both the years, but these abnormalities did not depress the yield in anyway.

III. Effect on yield

Application of Tok E-25, Stam F-34 and Eptam significantly increased tuber yield, the average for 2 years being 420.4, 370.8 and 330.4 q/ha respectively (Table 2). In the individual years, maximum yield was obtained by Tok E-25. followed by Stam F-34 and Eptam. The two years mean value further indicate that, Tok E-25, Stam F-34 and Eptam gave 39.1, 16,4 and 9.0 percent increases in yield respectively.

IV. Economics of the Treatments

The average results of two years given in Table 2 show that highest additional income of Rs. 2936.00 per hectare was obtained by treatment with Tok E-25, followed by Stam F-34 (Rs. 2006.50), Eptam (Rs. 723.10) and hand weeding (Rs. 301.68); conversely MCPA Sodium, 2, 4-D and BV 201 gave only nominal profits.

SUMMARY

An experiment was carried out at Kanpur for two seasons, 1967-68 and 1968-69 to determine the comparative efficiency of some pre and post emergence

Table 2

Effect of Treatments on Yield and Comparative Economics in Potato

	Treatments										C.D. at 5% P
	Control	Hand weeded	Eptam	Tafazine	2, 4-D (Sod)	MCPA	B.V. 201	TOK E 25	Prometryne	Stam F-34	
Cost of herbicides Rs.	—	—	60.00	42.87	8.00	11.00	Free	Free	Free	21.00	
Dose in kg/ha	—	—	3.5	0.5	0.5	0.5	2.0	1.5	1.0	1.0	
Active ingredient in percent	—	—	60	50	80	40	18	24	50	35	
Actual requirements of herbicides per hectare kg.	—	—	5.833	1.000	0.625	1.250	11.111	6.250	2.000	2.857	
Cost of herbicides in Rs.	—	—	349.98	42.87	5.00	13.75	—	—	—	60.00	
Cost of spraying in Rs.	—	—	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	
Cost of treatment in Rs.	—	56.25	361.98	54.87	17.00	25.75	12.00	12.00	12.00	72.00	
Cost of cultivation in Rs.	1879.33	1935.58	2241.33	1934.20	1896.33	1905.08	1891.33	1991.33	1891.33	1963.33	

Contd.

	Treatments										C.D. at 5% P
	Control	Hand weeded	Eptam	Tafazine	2, 4-D (Sod)	MCPA	B.V 201	TOK E 25	Prometryne	Stam F-34	
Yield in Quintals/hectare											
1967-68	265 56	223.33	231 11	222.22	266,67	215.58	260.00	307.78	233.33	280.00	49 46
1968-69	338.68	371.66	429.59	287.88	313 73	344 03	339 57	532.98	295.90	461.68	5.38
Mean	302.1	297.5	330.4	255.1	290.2	279.8	299.8	420.4	264 6	370.8	
Percentage increase over control	—	—	9.0	—	—	—	—	39.1	—	16.4	
Gross income in Rs.											
1967-68	13278.00	11166 50	11555 50	11111.00	13333 50	10778 00	13000 00	15389 00	11666.50	14000 00	
1968-69	6773 60	7433.20	8591 80	5757.60	6274.60	6880.60	6 91.40	10659.60	5918.00	9233.60	
Net income in Rs.											
1967-68 @ Rs. 50/- per quintal	11399.67	9230.92	9314.19	9176.80	11437.27	8872.92	11108 67	13497.67	9775.17	13036.67	
1968-69 @ Rs. 20/- per quintal	4894.27	5497.62	6350.47	3823.40	4378.27	4975.52	4900.07	8668.27	4026.67	7270.27	
Income over control											
1967-68	—	—	—	—	37.60	—	—	2098.00	—	1637.00	
1968-69	—	603.35	1456.20	—	—	81.25	5.80	3774.00	—	2376.00	
Average of 2 years											
1967-68 & 1968-69	—	301.68	728.10	—	18.80	40.63	2.90	2936.00	—	2006.50	

herbicides sprayed in aqueous solution by a knapsack sprayer, for the contro of weeds in potato variety kufri shakti.

Application of Tok E-25 at the rate of 1.5 kg a. i./ha as pre-emergence treatment gave the highest tuber yield of potato (420.4 quintals/ha); this was followed by Stam F-34 (370.8) and Eptam (330.4). Tok E-25, gave 39.1% higher tuber yield and when compared with control and other treatments the differences were significant.

Weeds were controlled to the extent of 61.9% by Tok E-25. Eptam as a pre-planting treatment, gave an overall 90.1% weed control and was found most effective in controlling *Cyperus rotundus*. Stam F-34 showed only 42.8 percent control of the weeds.

Tok E-25 and Stam F-34 appeared promising and most economical herbicides for controlling weeds in potato. They not only gave significantly higher yield, but also effectively controlled majority of the weeds. However, where *Cyperus rotundus* is the problem, Eptam seems better.

The highest income of Rs. 2936.00 per hectare was obtained with Tok E-25, followed by Stam F-34 (Rs. 2006.50) and Eptam (Rs. 728.10)

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