

Efficacy of cultural and chemical weed-control methods in potato (*Solanum tuberosum*)

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Received: July 1993

ABSTRACT

A field experiment conducted during 1991–92 and 1992–93 showed that weeds reduced the tuber yield by 42%. All the weed-control treatments significantly reduced the weed infestation and increased the tuber yield. The weed-control efficiency ranged from 8 to 100%. The treatment mulching + earthing up was found most effective and gave highest tuber yield. Treatments 1 hand-weeding + 1 earthing up, oxyfluorfen and oxyfluorfen + 1 hand-hoeing caused similar increase. The dry weight of weeds was significantly and negatively correlated with tuber yield.

Potato (*Solanum tuberosum* L.) is major vegetable crop in India. However, the weeds prevalent in and around the crop hampers the potato cultivation thereby resulting in substantial reduction in yield (Singh *et al.*, 1984.). Since information is meagre on cultural operation and combination of herbicides with chemicals the present study was undertaken to develop a suitable and economical method of weed control for potato in plains.

MATERIALS AND METHODS

The field experiment was conducted in randomized block design having 8 treatments including weed-free and replicated 4 times at CPRS, CPRI, Jalandhar, during the winter (*rabi*) seasons of 1991–92 and 1992–93. The soil was sandy loam in texture, having pH 7.8. Potato cv. 'Kufri. Jyoti' was planted at 60 x 20 cm spacing on 3 October 1991 and 12 October 1992. The crop

was harvested on 16 January and 22 January during 1992 and 1993 respectively. The crop was fertilized with 180 kg N/ha, 80 kg P₂O₅/ha and 120 kg K₂O/ha through calcium ammonium nitrate, or urea, single superphosphate and muriate of potash, respectively. The half dose of N and full P and K were given at planting and rest half N were applied at 30 days after planting. Full earthing up was done just after planting and plots were irrigated immediately. Herbicide was applied 2–3 days after planting at proper moisture through knapsack sprayer using 1,000 liter water/ha. Weeding and earthing up were done as per treatments at 30 days after planting. The paddy straw were used as mulch material to cover the ridges and it was removed from the plot after 20–22 days after planting. The gross plot size was 4.8 m x 2.4 m (11.52 m²). From a quadrat of 0.25 m² recorded weed density and dry weight at 30 and 60 days

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after planting and at harvest. Data on number (weeds/m²) of weeds were analysed by square-root and logarithmic transformations, respectively. Weed control efficiency (WCE) and weed index were calculated.

RESULTS AND DISCUSSION

The weeds that infested the crop were *Trianthema portulacastrum* L., *Chenopodium album* L., *Rumex* sp., *Coronopus didymus*, *Cyperus rotundus* L. and *Poa annua* L. *Trianthema portulacastrum* (dicot) was the major weed up to 50 days after planting whereas *Chenopodium album* (dicot) and *Poa annua* (monocot) were the dominant weeds at later stages. Weed intensity was high in 1991–92 than in 1992–93. Pooled results showed that all weed-control treatments except unweeded control + 25% extra of recom-

mended nitrogen reduced the weed density and dry weight compared with the unweeded control at 60 days (Table 1). Control + 25% N treatment increased the weed dry weight by 22 at 60 days compared with the control. Chemical + cultural treatment (oxy-flourfen + 1 hand-hoeing) had the lowest weed density at 60 days. The weed-control efficiency among the treatments ranged between –8 and 100%. The highest weed-control efficiency were recorded in the weed-free plot, followed by chemical + cultural and mulching + earthing up (Table 1). Unweeded control + 25% N treatment recorded the lowest weed-control efficiency (–8) and had highest weed dry weight than the unweeded control. The dry weight of weeds at 60 days ($r = 0.765$) was significantly and negatively correlated with tuber

Table 1. Effect of weed-control methods on density, dry weight of weeds (at 60 days after planting) and tuber yield of potato

Treatment	Weed density (pooled)	Weed dry weight (pooled)	Weed-control efficiency (%)	Weed index (%)	Tuber Yield (q/ha)		
					1991	1992	Pooled
Control (weedy)	30.5 (930)	2.16 (142.2)		41.9	176	154	165
Control + 25% extra dose of rec. N	31.3 (976)	2.24 (173.7)	(–)8	31.3	214	176	195
1 hand-weeding + 1 earthing up at 30 days	21.8 (475)	1.30 (17.8)	67	13.7	278	211	245
1 hand-weeding at 30 days	23.7 (560)	1.51 (30.3)	66	24.3	246	183	225
Mulching + earthing up	22.3 (488)	1.62 (39.7)	82	(–) 5.6	350	249	300
Oxyfluorfen @ 0.15 kg/ha (pre-emergence)	18.9 (357)	1.67 (44.5)	74	17.6	261	207	234
Oxyfluorfen @ 0.15 kg/ha + 1 hand-weeding at 30 days	13.1 (170)	1.31 (18.3)	87	9.2	3.08	208	258
Weed-free	1 (0)	0.30 (0)	100		331	237	284
CD (P = 0.05)	6.8	0.70			41.0	35.0	28.4

* Weed density and dry weight of weeds were transformed by $\sqrt{X+1}$ and $\log(x+2)$ respectively. Actual values are given in parentheses

yield of potato.

Pooled results showed that weedy condition resulted in 42% reduction in the tuber yield (Table 2). Unweeded control treatment recorded lowest tuber yield, followed by control + 25% N in both the years. The treatment mulching + earthing up recorded significantly higher tuber yield than the other treatments. Weed-free treatment recorded 100% weed-control efficiency, lower than mulching + earthing up. It was due to mechanical injury to the plants during weeding at advance stage of crop growth; however, the yield differences were statistically at par. On an average, mulching + earthing up, chemical + cultural and 1 hand-weeding + earthing up gave respectively 82, 56 and 48% more yield than the unweeded control. The higher yield in mulching + earthing up may be due to smothering effect of mulch on

weeds and also effective barrier to weed emergence. Mulching also conserves soil moisture which results in quick emergence of potato, as reported by Lal and Grewal (1991). This treatment recorded minimum weed-index and high weed-control efficiency. One hand-weeding + 1 earthing up consistently gave lower yield by 55 q/ha compared with mulching + earthing up.

This was due to weed infestation in early stages of crop growth till weeding was done before earthing up.

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