

STUDIES ON WEED CONTROL IN POTATO IN PAKHAL PLAINS OF MANSEHRA

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ABSTRACT

Three pre-emergence herbicides i.e. Sencor, Stomp and Tribunil were tested and compared with hand weeding and control (no weeding) on a farmer's field in the Pakhal plains of Mansehra for assessing weed control in spring potato crop. None of the herbicides showed any deleterious effect on germination. The hand weeding and the herbicide Sencor significantly controlled the weeds better than the other herbicides. The hand weeding practice significantly increased the average tuber yield but was found the most expensive. Sencor controlled weeds and increased potato yield significantly and was found to be the least expensive giving the highest marginal rate of return (14.17%) compared to other weed control measures.

Key words: Potato weed control herbicides hand weeding Sencor Marginal Rate of Return

INTRODUCTION

Weeds compete with potato crop for light, nutrients and water. They can reduce tuber yields by 36% to 80% (Neild and Proctor, 1962; Nelson and Thoreson, 1981). Weed competition may increase the percentage of smaller tubers (Nelson and Thoreson, 1981) and can affect the tuber specific gravity, thus altering their suitability for processing (Saghir and Markoulis, 1974). Grass weeds could be left in potatoes for 6-8 weeks after planting but must be controlled thereafter (Vitolo and Ilnicki, 1985). Weeds are one of the major problems of the potato crop in the Pakhal area (district Mansehra) in spring season (Jan *et al.*, 1992). No trial on weed control in potatoes has ever been conducted before at this location. However, several studies have been conducted elsewhere to determine the most effective weed control method compared to hand weeding (Shah *et al.*, 2003; Hashim *et al.*, 2003).

In a study at Peshawar (Anonymous, 1991), the hand weeding gave the highest average yield of 18.7 t ha⁻¹ followed by application of Sencor @ 820 g ha⁻¹ with yield of 10.9 t ha⁻¹ compared to 8.7 t ha⁻¹ from the control. The hand weeding and weedicide Sencor significantly increased the tuber yield over control. In another study, Sencor @ 1 kg in 500 l/ha gave the most effective weed control and the highest potato yield as compared to hand weeding (Susilowirjono, 1976). Hawton (1977) reported that cultivation, under dry condition, was more effective than chemicals in controlling weeds in potatoes while the reverse was true under wet conditions.

The main objectives of this study were: i) to figure out the effect of chemicals and hand weeding on the control of weeds and yield in potatoes in Pakhal area of Mansehra, and ii) to evaluate the economic benefits of different weed control measures in potato.

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MATERIALS AND METHODS

This study was conducted on a farmer's field in village Bajna in Pakhal plains of Mansehra during spring, 1992. The treatments were weedy check (no weeding), hand weeding, Sencor @ 820 g/500 l/ha (pre-em), Stomp (pendemethalin) @ 1.5 kg ha⁻¹ and Tribunil (methabenzthiazuran) @ 2 kg ha⁻¹. The experiment was sown on clay loam soil in the 1st week of January. For each treatment, four rows of potato variety Cardinal, each 4 m long and spaced 75 cm apart with 25 cm plant to plant distance, were planted in a randomized complete block (RCB) design with four replications. Fertilizers urea triple super phosphate and sulphate of potash were applied @ 120 kg N, 120 kg P₂O₅, and 180 kg K₂O ha⁻¹, respectively at the time of planting, except half of the nitrogen which was applied at the time of earthing-up. Earthing up was done as farmers' normal practice in the 1st week of April at the start of tuber initiation.

Herbicides were sprayed during the end of January before emergence of the crop, but was delayed due to heavy rains received after planting. Weeding was done three times in the hand weeding treatment depending upon the emergence of weeds. Late blight was controlled by spraying fungicide Dithane M-45 and army worms by insecticide Tamaron. Data on percent germination, weed counts per plot (6 m²) before earthing up, number and weight of marketable (>30 g) sized tubers at the time of harvest were recorded on the two central rows (6 m² area).

The crop was harvested in the 1st week of June. The data were subjected to ANOVA and means were separated by using Fisher's LSD test (Little and Hills, 1978). The economic evaluation of each treatment of the trial was done by using the partial budget method. Net benefits of the different treatments, costs that vary and marginal rates of return were calculated (Delobel and Bajwa, 1994).

RESULTS AND DISCUSSION

Weed control and yield

The weed population in the experimental field consisted of bermuda grass (*Cynodon dactylon*), indian clover (*Melilotus indica*), curly dock (*Rumex crispus*), common lambsquarters (*Chenopodium album*), wild oats (*Avona fatua*), purple nutsedge (*Cyperus rotundus*), large crab grass (*Digitaria sanguinalis*), shepherd's purse (*Capsella bursa-pastoris*), common purslane (*Portulaca oleracca*) and persian speed well (*Veronica persica*). Among these, the most predominant weed species were *Cynodon dactylon*, *Melilotus indica*, *Rumex crispus*, and *Chenopodium album*.

The study revealed that percent germination of potato was not affected by any of the treatments. However, the treatment with hand weeding, Sencor and Tribunil significantly controlled weeds before the earthing-up was done (Table 1). Regarding tuber yield, the hand weeding, weedicides Tribunil and Sencor significantly increased the yield over control. The hand weeding treatment gave the highest tuber yield of 13.3 t ha⁻¹ followed by weedicides Tribunil (12.5 t ha⁻¹) and Sencor (12.0 t ha⁻¹), respectively as compared to weedy check (9.0 t ha⁻¹). The yield was enhanced by all the weed control treatments and the increase in yield ranged from 14.4 to 47.8% (Table-1). The highest increase was recorded in hand weeding.

Similar trend was also observed in respect to number of tubers. The treatment with hand weeding, weedicides Tribunil and Sencor contained significantly higher number of tubers per 6 m² as compared to weedy check. However, the application of Stomp @ 1.5 kg ha⁻¹ expressed the lower tuber yield as well as the lowest number of tubers (Table 1). The un-weeded control and the herbicide Stomp, because of heavy weed infestation,

were significantly inferior to all other treatments and therefore, resulted in low yield. The weedicides Sencor, Tribunil and hand weeding practice had significant effect on the weed population which consequently seemed to influence the tuber number and yield. Our results are in conformity with the findings of Susilowirjono (1976), Anonymous (1991), Shah *et al.*, (2003) and Hashim *et al.*, (2003) who isolated chemicals for weed management in potato crop.

Socio-economic evaluation

The weedicides were introduced as new intervention into the farming system of the area. The farmers liked the effect of weedicides controlling weeds. In context of increasing labor wages, use of weedicides has a wider scope of adoption in the area in future. However, the weedicides may displace labor required for hand weeding which consequently may increase un-employment.

The net benefits of the treatment Sencor and Tribunil were higher than the weedy check (Table-2). Stomp and hand weeding also have higher net benefits than the weedy check, but the dominant treatments were Sencor and Tribunil. Whereas, the hand weeding despite the highest yielding, was the most expensive treatment. Sencor with a marginal rate of return (MROR) of 1414% as compared to the weedy check seems to be the best choice weedicide. A second option would be Tribunil having a MROR of 682.9%, if Sencor is not available in the market. Both the herbicides have a considerably higher economic gain as compared to the Hand weeding- a common practice in the area.

Table-1. Average yield and other characters of potatoes as affected by weedicides and hand weeding in Pakhal plains of Mansehra during spring, 1992

S. No.	Treatment	Germination (%)	No. of weeds before earthing up m ²	No. of marketable size tuber per 6 m ²	No. of marketable size tuber (t ha ⁻¹)	Increase in tuber yield over control (%)
1.	Control (no weeding)	63.4 a	25.0 b	97.0 b	9.0 b	0.0
2.	Hand weeding	72.2 a	5.0 a	108.8 a	13.3 a	47.8
3.	Pre-emergence spray with Sencor @ 820 g ha ⁻¹	67.2 a	6.0 a	108.0 a	12.0 a	33.3
4.	Pre-emergence spray with Stomp @ 1.5 kg ha ⁻¹	63.8 a	22.5 b	89.0 b	10.3 b	14.4
5.	Pre-emergence spray with Tribunil @ 2 kg ha ⁻¹	69.7a	10.5 a	108.2 a	12.5 a	38.9

Note: All prices are that of 1992. The treatments are placed in order of increasing costs. (a). Average sale price of potato produce @ Rs.170/- per 100 kg bag. (b). Cost of weedicide Sencor ha⁻¹ @ Rs.410/- per kg in treatment Sencor. Cost of weedicide Stomp and Tribunil ha⁻¹ each @ Rs.380/- kg⁻¹ in Stomp and Tribunil (c): Labour charges for hand weeding ha⁻¹ @ Rs.150/- kanal⁻¹ (6 persons/season) in Hand Weeding.

Table-2. Economic evaluation (Partial budget) of potato weed control trial in Pakhal plains of Mansehra during Spring, 1992

	Week Check	Sencor	Stomp	Tribunil	Hand Weeding
Average yield (t ha ⁻¹)	9.0	12.0	10.3	12.5	13.3
Price of produce (Rs kg ⁻¹) (a)	1.7	1.7	1.7	1.7	1.7
Gross benefit in Rs. (1)	15,300	20,400	17,510	21,250	22,610
Costs that vary (2)					
Weedicide costs (b)	0.0	336.2	570.0	760.0	0.0
Hand weeding cost (c)	0.0	0.0	0.0	0.0	3,000
Net benefit (3)=(1)-(2)	5,300	20,064	6,940	20,490	19,910
Marginal Rate of Return% (MroR)	-	1414	287.7	682.9	243.7

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