Journal of crop and weed 2(1) : 23-25 (2006)

Chemical weed control on Potato in the new alluvial zone of eastern India

M. CHETTRI, PINTOO BANDHOPADHYAY AND S. K. MUKHOPADHYAY

Department of Agronomy, Bidhan Chandra Krishi Viswavidyalaya
Mohanpur-741252, Nadia, West Bengal

ABSTRACT

A field experiment on chemical control of weeds in cv. Kufri Jyoti was conducted at Block Seed Farm, Hooghly, West Bengal during winter season of 2000-01 and 2001-02. Six herbicides (Prometryn 50 WP @ 1kg a.i. ha^{-1}, Pedimethalin 30 EC @ 750 gha^{-1}, Clomazone 15 EC @ 750 gha^{-1}, premix formulations of Pendimethalin + Clomazone (30 + 15) EC @ 450 + 225 gha^{-1}, Pendimethalin 30 EC @ 0.750 lha^{-1} and Alachlor 50 EC @ 1.0 lha^{-1}) were tested against weed free treatment (two hand weedings at 15 and 45 days after planting in conjunction with earthing up at 30 days after planting) and weedy check. Monocot weeds accounted for 77.87 % of the total weed population across all treatments. In the weedy check, monocots accounted for 79.18 % of the total. The density of monocot weeds was lowest (40.33 m^{-2}) in the plots receiving treatments of two hand weedings + earthing up followed by Pendimethalin + Clomazone (30 + 15) EC @ 450 + 225 gha^{-1}(83.80 m^{-2}). The effect of Prometryn, Pendimethalin(both granule and liquid formulations), Colmazone and Alachlor was at par. Two hand weedings with one earthing up (weed free treatment) was found to be the best in controlling dicot weeds (28.30 m^{-2}). The same treatment recorded lowest dry matter of monocot and dicot weeds (10.00 and 7.20 m^{-2}) followed by Pendimethalin + Clomazone application and gave the highest tuber yield of 310.93 q ha^{-1}. The highest weed control efficiency of 77.75 % was observed by combined operations of hand weddings and earthing up followed by Pendimethalin + Clomazone (58.09 %) treatments. Minimum weed index of 10.33 % was recorded under premix formulation of Pendimethalin + Clomazone (30 + 15 EC) @ 450 + 225 gha^{-1}.

Key words : Potato, Weed management, Chemical weed control.

Potato (*Solanum tuberosum* L.) is a wholesome and world's most nutritious plant sources of food for human consumption. Weeds grow luxuriantly and pose a serious problem in potato cultivation competing for nutrients, moisture, space and light and often serve as alternate hosts for several insect and diseases which causes 40-65 % yield losses (Lal and Dua, 2003). The traditional method of hand weeding followed by earthing up in potato is effective but tedious and time consuming practice which also causes root injury. The implied cost coupled with non-availability of labourers at peak seasons calls for need of herbicide use (Yadav *et al*, 1999). Information is limited of weed control as regard to the major potato growing areas of West Bengal. Keeping this in view, the present investigation was undertaken to study the efficacy of suitable herbicide for controlling weeds in potato crop against the traditional practice.

MATERIALS AND METHODS

The field experiment was conducted during winter season of 2000-01 and 2001-02 at Adisaptagram Block Seed Farm, Hooghly, West Bengal. The soil of the experimental field was sandy loam in texture having pH 5.9, organic carbon 0.48 %, total N 0.052 %, available P 18.8 kg ha^{-1}, available K 209.8 kg ha^{-1}. Six herbicides, viz. (Prometryn 50 WP @ 1kg a.i. ha^{-1}, Pedimethalin 30 EC @ 750 gha^{-1}, Clomazone 15 EC @ 750 gha^{-1}, Pendimethalin + Clomazone (30 + 15 EC) @ 450 +225 gha^{-1}, Pendimethalin 30 EC @ 0.750 lha^{-1} and Alachlor 50 EC @ 1.0 lha^{-1}) were tested against two hand weedings at 15 and 45 days after planting (DAP) in conjunction with earthing up at 30 DAP (weed free treatment) and weedy check in Randomized Block design with three replications. A uniform basal dose of 90 kg N, 150 kg P_2O_5 and 150 kg K_2O ha^{-1} was applied during planting and another 90 kg N ha^{-1} was top dressed at 30 DAP. Well sprouted seed tubers of potato variety Kufri Jyoti were planted during 3rd week of November of both the years at a spacing 60 x 20 cm with a plot size of 4.8 m x 4.0 m. Herbicides were applied 3 DAP as pre- emergence treatments with the help of Knapsack sprayer fitted with flat jet deflector nozzle using spray volume of 500 litres ha^{-1} of water. The crop was raised under irrigated condition with standard recommended package of practices (other than weed control). The weeds were

counted randomly placing a 0.50m x 0.50m quadrate in two spots in each plot at 60 DAP. Weeds were sun dried after washing of the roots and then oven-dried at 70° C for 24 hours and weighed. Weed control efficiency (WCE) and weed index (WI) were calculated as follows:

$$WCE\ (\%) = \frac{X - Y}{X} \times 100$$

Where X = Weed dry weight in weedy check plots
Where Y = Weed dry weight in treated plots

$$WI\ (\%) = \frac{A - B}{A} \times 100$$

Where A = yield in weed free plots

Where B = yield under treated plots for which 'WI' is to be worked out

RESULTS AND DISCUSSION

Weed species

The major weed species observed in potato field were *Chenopodium album, Croton sparciflora, Fumaria parviflora, Lathyrus apaca, Medicago sativa, Melilotus alba* and *physalis minima* among dicot and *Cyperus rotundus, Cynodon dactylon, Eleusine indica,* and *echinochloa colonum* among monocot weeds. Monocot weeds dominated the weed flora and accounted for 79.18 % of the total weed population in the weedy check plot.

Weed growth

Different weed control measures significantly influenced the weed density and weed biomass of both monocot and dicot weeds (Table 1). Hand weeding followed by earthing up significantly reduced the weed density and biomass of monocot weeds as compared to all other treatments having lowest values of 40.33 no. m^{-2} and 10.00 g m^{-2}, respectively. As for dicot weeds hand weedings + earthing up and Pendimethalin + Clomazone (30 + 15 EC) @ 450 +225 gha^{-1} application gave significantly superior results over other treatments. Though the minimum weed density (28.30 m^{-2}) and biomass (7.20 g m^{-2}) were observed in hand weeding + earthing up but statistically at par with the Pendimethalin + Clomazone (30 + 15 EC) @ 450 +225 gha^{-1} treatment. Amongst different herbicides and their rate of application, premix formulation of Pendimethalin + Clomazone (30 + 15 EC) @ 450 +225 gha^{-1} proved more effective on both monocot and dicot weeds which significantly reduced the weed density as compared to other herbicidal treatments except Prometryn . The combined effect of pendimethalin and Clomazone might have proved to be more effective in creating weed free situation for long time. This is an agreement with Sharma *et al* (2004).

Tuber yield

Weed control treatment exhibited pronounced effect of the tuber yield of potato (Table 1). The performance of traditional system of hand weeding

Table 1 Weed density, weed biomass, tuber yield, weed control efficiency and weed index of potato under different weed control measures

Treatments	Weed density at 60 DAP		Weed dry matter at 60 DAP		Tuber yield	Weed control efficiency	Weed index
	Monocot (No. m^{-2})	Dicot (No. m^{-2})	Monocot (gm^{-2})	Dicot (gm^{-2})	(q ha^{-1})	(%)	(%)
Prometryn 50WP @ 1kg a.i. ha^{-1}	102.60	39.70	28.40	11.00	272.43	49.03	12.38
Pedimethalin 30EC @ 750 gha^{-1}	107.40	46.80	31.00	15.30	266.80	40.10	14.19
Clomazone 15 EC @ 750 gha^{-1}	120.00	48.00	32.40	16.40	251.20	36.87	19.21
Pendimethalin + Clomazone (30+15 EC) @ 450+225 gha^{-1}	83.80	30.40	23.40	9.00	278.80	58.09	10.33
Pendimethalin 30EC @ 0.750 lha^{-1}	128.30	51.00	34.56	16.50	245.30	33.95	21.11
Alachlor 50 EC @ 1.0 lha^{-1}	126.80	58.40	39.59	15.95	238.00	28.15	23.46
Weed free (2 HW + earthing up)	40.33	28.30	10.00	7.20	310.93	77.75	0.00
Weedy check (Control)	370.00	97.30	52.00	25.30	194.00	0.00	37.61
S. Em. ±	11.86	3.14	2.08	0.92	10.83	-	-
C.D. (P = 0.05)	29.57	7.69	5.09	2.25	26.53	-	-

in conjunction with earthing up gave the highest tuber yield (310.93 q ha^{-1}) which was 37.60 % higher over the weedy check. Weed free situation and earthing up might have caused better soil condition for higher tuber yield. Significantly higher tuber yield was well reflected in significantly low density and biomass of weeds under this treatment. This result was in conformity with the findings of Ray *et al* (2003). Bhattacharya *et al.* (1989) also observed that none of herbicidal treatments were as effective as hand weeding (twice) in increasing tuber yield. Application premix formulation of Pendimethalin + Clomazone (30+15 EC) @ 450 +225 gha^{-1} registered the second highest tuber yield (278.80 q ha^{-1}) of potato which was highly superior to the other herbicidal treatments viz. Pendimethalin @ 0.750 lha^{-1} , Alachlor @ 1.0 lha^{-1} and weedy check but statistically at par with the Prometryn , Pendimethalin @ 750 gha^{-1}, and Clomazone. Mukhopadhyay *et al.* (2002) observed that pre-emergence application of Prometryn 50 WP at 0.75 and 1.00 kg a.i. ha^{-1} effectively controlled both monocot and dicot weeds and maximize the tuber yield of potato. Since few weeds were present in the herbicidal treatments, there were less crop weed competition for available nutrients and moisture which ultimately increase the tuber yield. Tripathi *et al* (2001) also observed similar results. Bhattacharya *et al.* (1989) got better results by application of Pendimethlin at 2.0 lha^{-1} and Alachlor at 3.0 lha^{-1} on potato, however, in this trial these chemicals failed to produce better effect might be due to use of lower doses.

Weed control efficiency (WCE) and weed index (WI)

Among different control methods combined operation of hand weedings and earthing up showed the maximum weed control efficiency of 77.75 % followed by premix formulation of Pendimethalin + Clomazone (30 + 15 EC) @ 450 +225 gha^{-1}. The hand weeding of early emerged monocot and dicot weeds along with earthing up at 30 DAP allowed lower weed density and biomass and this resulted in better crop growth which in turn suppressed the weed growth in comparison to other treatments. This supported by the findings of Dixit and singh (1999). Minimum weed index value of 10.33 was recorded under premix formulation of Pendimethalin + Clomazone (30 + 15 EC) @ 450 +225 gha^{-1}. Data presented in Table 1 show the range of weed index from 37.61 % to 10.33 %, indicating the extent of yield reduction owing to the weed competition.

REFERENCES

Bhattacharya, S.P.; Baidya, D. and Mandal, B.K. 1989. Relative performance of different herbicides for controlling weeds in potato in plains of West Bengal. *J. Indian Potato Assoc.* **16** (1&2): 24-28.

Dixit, A. and Singh, H.P, 1999, Weed management in potato. *(In:) Abstract, Global Conference on Potato*, held at New Delhi, 6-11 Dec., 1999, pp 146.

Lal, S.S. and Dua, V.K. 2003, Weeds and their management. *(In:) The Potato Production and Utilization in the Subtropics* (S.M. Paul Khurana, J.S. Minhas and S.K. Pandey, Eds.) Malhotra Publishing, New Delhi. pp 121-129.

Mukhopadhyay, S.K.; Ray, D. and Chettri, M. 2002. Evaluation of Prometryn 50 WP as a herbicide in potato (*Solanum tuberosum*.L) *Orissa J. hort.* **30** (1): 64-67.

Ray, D., Chettri, M. and Mukhopadhyay, S.K. 2003. Efficacy of premix formulation of Clomazone and Pendimethalin herbicides in potato. *Crop Res.* **26** (1): 106-109.

Sharma, J.J., Sharma, G.D. and Sood Sonia, 2004, Weed management in potato under dry control weeds in potato (*Solanum tuberosum* L.). *(In :) Lead papers and Abstract, First Biennial conference in the New Millennium on Eco-friendly weed management Options for Sustainable Agriculture,* held at Bangalore, 23-24 May, pp 116-117.

Yadav, A.; Malik, R.K.; Banga, R.S. and Kumar, S 1999. Chemical weed control in potato (*Solanum tuberosum*) *Indian J. Agron.* **44:** 830-834