

Weed management in potato (*Solanum tuberosum*) grown at different fertility levels in North-east hills

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ABSTRACT

A field experiment was conducted during the summer season (March–July) of 1995 and 1996 at Upper Shillong for controlling weeds in potato (*Solanum tuberosum* L.) crop grown at varying manuring schedule. All the weed-management practices significantly reduced the weed density and its biomass production within all the manuring schedules. Weed-control efficiency was 68, 65 and 58% with metribuzin. Farmyard manure alone or with fertilizers significantly increased the tuber yield compared with without farmyard manure. All the weed-management practices significantly increased the tuber reduction. Increase in tuber yield was 122, 97 and 94% with metribuzin, paraquat and cultural practices respectively over the control. The best combination was medium fertility level (100, 120 and 150 N, P_2O_5 and K_2O /ha and 15 tonnes/ha farmyard manure) along with pre-emergence spray of metribuzin which gave 17.2 tonnes/ha tuber yield.

Key words : Siomass, Farmyard manure (FYM), Weed management, Metribuzin, Paraquat, Cultural Practices, Tuber production

Weeds are the serious problem in North-east hills region to potato cultivation. Application of farmyard manure is a common practice in this region, which has lot of weed seeds hence problem gets aggravated due to farmyard manure and higher doses of fertilizer application. Slow growth of potato plants during early period coupled with wider spacing and high rainfall favours the weeds to grow at faster rate. To realize the maximum benefit of applied

costly inputs and higher yield, control of weeds in time is inevitable. Hence this study was undertaken to find out suitable management practice at different fertility levels.

MATERIALS AND METHODS

A field experiment was conducted during the summer season (March–July) of 1995 and 1996 at upper Shillong under rainfed condition. The crop received a total rainfall 1,507 mm during 1995 and 1,150

mm during 1996. The soil was sandy loam rich in organic matter (1.5%), with pH 5.2. The available N, P and K content of the soil was 175, 4.8 and 205 kg/ha respectively. In all there were 20 treatment combinations of manuring schedule, viz. 15 tonnes FYM/ha (M_1); 120, 120 and 60 kg N, P_2O_5 and K_2O /ha respectively (M_2); 50, 60 and 25 kg/ha + 15 tonnes FYM/ha (M_3); 100, 120 and 50 kg/ha + 15 tonnes FYM/ha (M_4); and 150, 180 and 75 + 15 tonnes FYM/ha (M_5) assigned in the main plots, and 4 weed-control measures, i.e. control, cultural practices (weeding, and earthing up), metribuzin @ 0.7 kg/ha and paraquat @ 0.5 kg/ha relegated in sub plots. The experiment was laid out in split-plot design with 4 replicates. Well-sprouted tubers of 'Kufri Megha' were planted in the last week of March at 50 cm $\times$ 20 cm spacing during both the years. Full earthing was done at planting. Metribuzin was sprayed as pre-emergence 1 week after planting and paraquat as post-emergence when 5% potato plants were emerged. Cultural practices were imposed when potato plants attain the height of 20–25 cm. Three sprays of Dithane M-45 mixed with Thiordan was done to save the crop from late blight and insect pests. Weed population and its fresh and dry biomass were recorded when crop was near maturity. A 100 g well mixed and chaffed fresh biomass of weeds from each plot was even-dried till constant weight and total fresh biomass of 1.0 m² converted into dry biomass on the basis of dried samples. The tubers were lifted from the field in the last week of July in 1995 and first week of August in 1996 and plot-wise tuber weight was recorded.

RESULTS AND DISCUSSION

The major weeds observed in the potato crop were *Spergula arvensis* L., *Digitaria cruciata* (nees) A. Camus, *Digitaria sanguinalis* L., *Echinochloa colonum* L., *Ambrosia artemisiifolia* L., *Gnaphalium luteoalbum* L., *Fagopyrum cymosum* L., *Cosmos bipinnatus* Cav., *Geranium napalense* L., *Cyperus rotundus* L., *Paspalum dilatatum* Poir, and *Cynodon dactylon* (L.) Pers. In the initial stage of crop *Spergula arvensis* L. was more prevalent in control plots but in later stage monocot weeds specially *Digitaria* and *Paspalum* spp. were found dominant,

Application of farmyard manure increased the total weed population by 8.2% over without farmyard manure. All the weed-management practices significantly reduced the weed density and its dry biomass (Table 1). Among herbicides, metribuzin @ 0.7 kg/ha was more effective than paraquat in all the manuring schedules. Singh and Lal (1994), Singh *et al.* (1984) and Singh (1984) observed similar results. The weed control was 68, 65 and 58% with metribuzin, cultural practices and paraquat respectively. Cultural method was equally effective but costly due to high cost of labour and time consuming than controlling weeds by herbicides. Lal (1992) and Jaiswal (1994) also reported similar observations. Paraquat also would be a good alternative if pre-emergence spary of herbicides delayed due to some reason.

Potato

Potato emergence was not affected due to manuring schedule or good management practices. Application of farmyard manure

Table 1. Effect of fertility levels and weed-management practices on the weed density and its dry biomass (mean data of 2 years)

Weed management practices (w)	Fertility levels					Mean
	M ₁	M ₂	M ₃	M ₄	M ₅	
<i>Monocot weeds/m²</i>						
Control	20.9 (436)	21.7 (471)	25.6 (666)	18.7 (348)	18.9 (358)	21.3 (454)
Cultural practices	21.0 (439)	13.2 (172)	17.5 (307)	14.1 (197)	14.7 (215)	16.2 (266)
Metribuzin 0.7 kg/ha	16.6 (276)	16.0 (256)	17.8 (315)	15.7 (246)	16.4 (268)	16.5 (272)
Paraquat 0.5 kg/ha	18.7 (350)	21.9 (477)	18.2 (332)	18.7 (349)	19.3 (373)	19.4 (376)
Mean	19.3 (375)	18.3 (344)	20.0 (403)	16.9 (285)	17.4 (304)	
<i>Dicot weeds/m²</i>						
Control	9.8 (96)	6.6 (43)	7.0 (48)	7.6 (57)	19.4 (108)	8.4 (70)
Cultural practices	15.3 (234)	9.2 (83)	14.1 (197)	12.8 (164)	10.7 (133)	12.6 (158)
Metribuzin 0.7 kg/ha	8.0 (63)	11.0 (121)	12.4 (152)	11.4 (130)	11.8 (138)	11.0 (121)
Paraquat 0.5 kg/ha	12.6 (159)	11.4 (128)	10.9 (118)	12.6 (157)	12.8 (164)	12.1 (145)
Mean	11.4 (138)	9.6 (94)	11.1 (129)	11.2 (127)	11.4 (131)	
<i>Weeds dry biomass (g/m²)</i>						
Control	20.8 (430)	23.1 (534)	25.3 (637)	19.4 (377)	21.7 (469)	22.1 (489)
Cultural practices	8.5 (72)	8.0 (63)	7.5 (55)	7.3 (53)	7.5 (55)	7.8 (60)
Metribuzin 0.7 kg/ha	7.6 (57)	7.4 (54)	7.6 (57)	6.7 (44)	6.4 (40)	7.1 (50)
Paraquat 0.5 kg/ha	8.9 (79)	10.8 (115)	8.8 (77)	9.1 (82)	8.4 (69)	9.2 (84)
Mean	11.6 (160)	12.3 (192)	12.3 (207)	10.6 (139)	11.0 (158)	
CD (P = 0.05)	M	W	M × W			
Monocot weeds	2.1	3.1	4.2			
Dicot weeds	1.7	2.3	NS			
Weeds dry biomass	NS	2.8	NS			

Details of fertility levels are given under Materials and Methods

Weed density and its biomass were transformed by $\sqrt{x+1}$ and actual values are given in parentheses

Table 2. Effect of manuring schedule and weed-management practices on the tuber yield (tonnes/ha) of potato (mean data of 2 years)

Weed-management practices (w)	Manuring schedule					Mean
	M ₁	M ₂	M ₃	M ₄	M ₅	
Control	6.4	5.2	6.7	7.9	6.6	6.5
Cultural practices	11.4	8.6	11.8	16.9	14.2	12.5
Metribuzin 0.7 kg/ha	12.5	10.7	14.6	17.2	16.9	14.4
Paraquat 0.5 kg/ha	11.7	9.7	12.1	16.7	14.1	12.8
Mean	10.5	8.6	11.3	14.7	13.0	
	M	W	M×W			
CD (P = 0.05)	1.1	0.9	2.1			

Details of manuring treatments are given under Materials and Methods

alone (M₁) or in combination with fertilizers significantly increased the tuber yield over without FYM (M₂). The total weed population was increased with FYM but due to favourable conditions created by FYM for potato plants smothered the tender weeds which emerged in later stage restrict its proper growth.

All the weed-control measures significantly increased the tuber yield over the control (Table 2). Pre-emergence spray of Metribuzin was significantly superior to post-emergence spray of Paraquat or cultural practices which were at par. The tuber yield was increased by 122, 97 and 94% with Metribuzin, Paraquat and cultural practices respectively over the control. Negative correlation was observed between weed biomass and tuber yield. Thakral *et al.* (1988) and Jaiswal and Lai (1996) also reported similar observations. The highest tuber yield was obtained with 100, 120 and 50 kg/ha of N, P₂O₅ and K₂O + 15 tonnes FYM/ha (M₄) along with Metribuzin spray.

Thus with optimum manuring schedule with proper and timely weed-control

measures potato yield could be doubled in the North-east region.

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