

## Efficacy of Different Herbicides in Chickpea (*Cicer arietinum* L.) under Irrigated Conditions of Punjab

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### ABSTRACT

A field experiment was conducted during the winter (**rabi**) seasons of 2003-04, 2004-05 and 2005-06 to assess the efficacy of pendimethalin, trifluralin and linuron in chickpea (*Cicer arietinum*) at Punjab Agricultural University Regional Station, Bathinda under irrigated conditions. All the herbicidal treatments reduced the dry matter of weeds significantly than weedy check. Pre-emergence application of pendimethalin at 0.75 kg/ha had minimum dry weight of weeds than other herbicidal treatments. Pendimethalin at 0.75 kg/ha was most effective in enhancing the yield attributes and resulted in maximum grain yield (1507 kg/ha). Amongst different weed control treatments, an application of pendimethalin at 0.75 kg/ha recorded the maximum net return (Rs. 11,149/ha) and benefit : cost ratio (1.43) followed by pendimethalin at 1.0 kg/ha.

**Key words :** PRE & PPI herbicides, soil moisture, herbicide efficacy

### INTRODUCTION

Chickpea (*Cicer arietinum*) is an important pulse crop of India as well as Punjab. Under Punjab conditions, it is generally grown under irrigated conditions. Chickpea, being slow in its early growth and short stature plant, is highly susceptible to weed competition and often considerable losses may occur if weeds are not controlled at proper time. Weeds reduce grain yield of chickpea upto an extent of 60% (IIPR, 1997). Weed infestation in winter pulses has been reported to offer serious competition and causes yield reduction to the extent of 75% in chickpea (Chaudhary *et al.*, 2005). At present, hand hoeing is the only method employed for controlling weeds in this crop. High cost and non-availability of labour at right time sometimes force the farmers for opting alternative, cheaper and easier method of chemical weed control. There is no herbicide recommended for weed control in gram sown under irrigated conditions in Punjab. Therefore, there is a need to identify effective herbicides and also to integrate various methods of weed control for effective and economical weed management in this crop.

### MATERIALS AND METHODS

A field experiment was conducted at Punjab Agricultural University Regional Station, Bathinda during the winter (**rabi**) season of 2003-04, 2004-05 and 2005-06. The soil was loamy sand in nature having pH 8.8, organic carbon (0.3%), phosphorus (17.0 kg/ha) and

potash (240 kg/ha). The experiment was laid out in randomized block design (RBD) with four replications. Twelve treatments comprising unweeded check, pendimethalin 0.50 kg/ha+1 HW 30 days after sowing, pendimethalin 0.75 kg/ha, pendimethalin 1.00 kg/ha, trifluralin 0.50 kg/ha+1 HW, trifluralin 0.75 kg/ha, trifluralin 1.00 kg/ha, trifluralin 1.25 kg/ha, isoproturon 0.75 kg/ha, isoproturon 0.94 kg/ha, linuron 0.94 kg/ha and two hand weedings 30 and 50 DAS. The chickpea variety sown during 2003-04 and 2004-05 was GPF 2 and during 2005-06 was PDG 4. The two different varieties grown during both the years were to verify the variation in efficiency of different herbicides due to change in genotype. The crop was sown in rows 30 cm apart with 45 kg/ha seed rate in first fortnight of November and harvested in first fortnight of April during all the three years of study. The crop was sown after applying heavy pre-sowing irrigation and only one irrigation in the first fortnight of January was given to save the crop from frost. Two sprays of insecticides were applied at pod formation to check the attack of pod borers uniformly on all the treatments as a precautionary measure.

### RESULTS AND DISCUSSION

#### Effect on Weeds

The weed flora observed in weedy check plots at 60 DAS was *Chenopodium album* L. (32.3%), *Melilotus* sp. (29.9%), *Phalaris minor* Retz. (19.8%),

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*Cynodon dactylon* (L.) Pers. (14.7%) and *Cyperus rotundus* (3.3%). All manual and herbicidal treatments alone and in combination significantly reduced dry matter of weeds as compared to unweeded control (Table 1). Application of pendimethalin @ 0.75 kg/ha recorded the lowest mean weed dry matter (0.73 q/ha) and it gave the highest mean weed control efficiency (82.52 %), but it was statistically at par with

pendimethalin @ 0.50 kg/ha+1 HW, pendimethalin @ 1.00 kg/ha, trifluralin @ 1.00 kg/ha, trifluralin @ 1.25 kg/ha, isoproturon @ 0.76 kg/ha and two hand weedings. Similar trend was recorded during all the three years of study. The maximum dry matter of weeds (1.77 q/ha) and lowest weed control efficiency (57.80%) were recorded in pre-emergence application of linuron @ 0.94 kg/ha.

Table 1. Effect of different weed control treatments on dry matter of weeds and weed control efficiency in chickpea

Treatments	Dry matter of weeds (q/ha)			Weed control efficiency (%)		
	2003-04	2004-05	2005-06	2003-04	2004-05	2005-06
Unweeded check	3.90	4.05	4.57	-	-	-
Pendimethalin 0.50 kg/ha+1 HW	1.00	0.70	0.90	74.36	82.72	80.31
Pendimethalin 0.75 kg/ha	0.70	0.60	0.90	82.05	85.19	80.31
Pendimethalin 1.00 kg/ha	0.75	0.70	0.83	80.77	82.72	81.84
Trifluralin 0.50 kg/ha+1 HW	1.25	1.20	1.73	67.95	70.37	62.14
Trifluralin 0.75 kg/ha	1.12	1.00	1.60	71.28	75.31	64.99
Trifluralin 1.00 kg/ha	1.10	0.85	1.30	71.79	79.01	71.55
Trifluralin 1.25 kg/ha	1.00	0.80	1.20	74.36	80.25	73.74
Isoproturon 0.75 kg/ha	1.30	1.00	1.80	66.67	75.31	60.61
Isoproturon 1.00 kg/ha	1.34	1.10	1.70	65.64	72.84	62.80
linuron 0.94 kg/ha	1.70	1.50	2.10	56.41	62.96	54.04
Two hand weedings (30 and 50 DAS)	0.96	0.70	0.83	75.38	82.72	81.84
LSD (P=0.05)	0.41	0.29	0.65	-	-	-

### Effect on Crop

All the weed control methods recorded significantly higher number of pods per plant as compared

to unweeded control during all the three years of study as well as mean of all the years (Table 2). The maximum mean number of pods per plant was recorded in pendimethalin @ 0.75 kg/ha (50.8) and minimum (29.6)

Table 2. Effect of different weed control treatments on seed yield, cost of cultivation, net return and benefit : cost ratio of chickpea

Treatments	Seed yield (kg/ha)				Mean cost of cultivation (Rs./ha)	Mean additional net return (Rs./ha) over control	Mean benefit : cost ratio (Rs./rupee)
	2003-04	2004-05	2005-06	Mean			
Unweeded check	800	720	996	839	10283	-	0.48
Pendimethalin 0.50 kg/ha+1 HW	1402	1412	1614	1476	12034	9810	1.23
Pendimethalin 0.75 kg/ha	1400	1440	1680	1507	11258	11149	1.43
Pendimethalin 1.00 kg/ha	1406	1426	1560	1464	11585	10042	1.29
Trifluralin 0.50 kg/ha + 1 HW	940	934	1312	1062	11799	2531	0.63
Trifluralin 0.75 kg/ha	1320	1120	1488	1309	10908	7905	1.18
Trifluralin 1.00 kg/ha	1410	1320	1516	1415	11116	9621	1.31
Trifluralin 1.25 kg/ha	1400	1420	1524	1448	11297	10039	1.33
Isoproturon 0.75/kg/ha	1220	1160	1324	1235	10718	6752	1.09
Isoproturon 1.00 kg/ha	1280	1300	1286	1289	10863	7587	1.15
Linuron 0.94 kg/ha	1160	1060	1136	1119	11083	4282	0.83
Two hand weedings (30 and 50 DAS)	1380	1520	1614	1505	12485	9886	1.19
LSD (P=0.05)	215.2	137.2	133.0	-	-	-	-

Rate of trifluralin : Rs. 400 /l, Pendimethalin : Rs. 390/l, Isoproturon : Rs. 290/kg, Linuron : Rs. 425/kg, Labour : Rs. 11/h.

in case of unweeded control. However, no significant difference was recorded in number of branches per plant among various treatments and similarly the plant height was not affected due to different treatments in 2003-04 and 2004-05 (data not given).

All the weed control methods produced significantly higher grain yield as compared to weedy check during all the three years (Table 2). Pre-emergence application of pendimethalin 0.75 kg/ha recorded the highest grain yield (1507 kg/ha) of chickpea during all the years and was at par with pendimethalin 0.50 kg/ha+one hand weeding, pendimethalin 1.00 kg/ha, trifluralin 1.00 kg/ha, trifluralin 1.25 kg/ha and two hand weedings. However, the grain yields recorded in trifluralin 0.50 kg/ha+one hand weeding, trifluralin 0.75 kg/ha, isoproturon 0.75 kg/ha, isoproturon 0.94 kg/ha and liuron 0.94 kg/ha were significantly lower than all the above said treatments. This confirms the findings of Yadav *et al.* (1983) and Singh *et al.* (1986).

## Economics

The net return and benefit : cost ratio varied with the different treatments (Table 2). Amongst the weed control treatments, application of pendimethalin at 0.75 kg/ha recorded the maximum net return (Rs. 11,149/ha) and benefit : cost ratio (1.43) followed by pendimethalin at 1.0 kg/ha.

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