Short communication

Indian Journal of Weed Science **46**(3): 300–301, 2014

Weed management in chickpea under irrigated conditions

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Received: 17 July 2014; Revised: 22 August 2014

Key words: Chickpea, Clodinafop-propargyl, Pinoxaden, Pendimethalin, Post-emergence, Weed control

In Haryana, the area under chickpea crop has reduced to 0.12 million hectare in 2008-09 from 1.06 million hectare in 1966-67 (Anonymous 2008). Among various barriers such as brackish irrigation water, hungry and discarded soils, lack of promising cultivars, improper fertilization, pest and diseases, poor weed management is one of the most important yield limiting factors in chickpea. Weed infestation in chickpea offer serious competition and cause yield reduction to the extent of 75% (Chaudhary *et al*. 2005). The initial 60 days period considered to be the critical for weed-crop competition in chickpea (Singh and Singh 1992). But with the increase in labour cost and scarcity of labour, manual weed control has become a difficult task in chickpea. Suitable herbicide for effective control of mixed weed flora is required for better adoption in this crop by farmers. Hence, present investigation was carried out to study the efficacy of different herbicides on mixed weed flora and their effect on growth and yield of chickpea at Kaul (Kaithal) in Haryana.

The soil of the experimental field was clay-loam, low in organic carbon and available nitrogen, medium in phosphorus, high in potash and alkaline in reaction. Chickpea variety '*C-235'* was sown on November 18, 2010. The experiment was laid out in randomized block design with twelve weed control treatments, *viz*. clodinafop 60 g/ha at 45 DAS, pinoxaden 50 g/ha at 45 DAS, clodinafop 60 g/ha at 45 DAS + one hoeing at 70 DAS, pinoxaden 50 g/ha at 45 DAS + one hoeing at 70 DAS, pendimethalin 1000 g/ha as pre-3m34g3nc3 (PE), trifluralin 1000 g/ha as pre-plant incorporation (PPI), pendimethalin 1000 g/ha as PE *fb* clodinafop 60 g/ha at 45 DAS, trifluralin 1000 g/ha as PPI *fb* clodinafop 60 g/ha at 45 DAS, pendimethalin 1000 g/ha as PRE *fb* pinoxaden 50 g/ha at 45 DAS, two hand weeding, weedy check and weed free. The experimnet was replicated thrice. Recommended package of practices except weed control treatments were followed for raising the crop. The density and dry weight of weds was recorded at 50 DAS and chickpea yield at harvest. WCE was calculated on the basis of dry weight of weeds.

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Chenopodium album, Medicago denticulata and *Phalaris minor* were the most dominant weeds in experimental area and constituted 44.6, 29.9 and 15.3% of the total weed population, respectively. Two hand weeding treatment recorded the lowest population of all the weed species. Among herbicides, pendimethalin and trifluralin treatments controlled *C. album, M. denticulate* and other species effectively and recorded significantly lower population than all other treatments. Pendimethalin *fb* pinoxaden recorded significant reduction in population of *C. album, M. denticulata, P. minor* and other species and it was statistically similar to pendimethalin *fb* clodinafop and pendimethalin alone. However, pendimethalin alone was significantly poor in reducing weed population of other species (Table 1). Chaudhary *et al.* (2005) also reported the control of monocot and dicot weeds by pendimethalin. *P. minor* was higher in trifluralin at 1000 g/ha as PPI among the herbicide treatments. Weed control efficiency was highest in weed free treatment. Two hand weeding was the next best treatment with WCE (84.3%) which was statistically alike to pendimethalin *fb* pinoxaden and pendimethalin *fb* clodinafop. Pinoxaden or clodinafop treatments effectively controlled *P. minor*. Yadav *et al.* (2009) reported excellent efficacy of pinoxaden 50 g/ha against grassy weeds in wheat crop especially resistant population of *P. minor.*

Weed free treatment recorded the highest number of branches and pods per plant, 100-seed weight and also seed yield (0.98 t/ha) which were statistically at par with two hand weeding, pendimethalin *fb* pinoxaden and pendimethalin *fb* clodinafop. No significant difference in weed control treatments was recorded in respect of number of grains/pod (Table 2). Weedy check produced 68% lower seed yield as compared to weed free which was attributed to the 42, 7, 16 and 43 per cent less number of pods/plant, grains/pod, 100-seed weight and branches over weed free, respectively. The higher values of these attributes are the indirect effect of better plant growth in weed free treatment. Sharma and Singh (2005) reported highest chickpea yield under weed free treatment followed by

Table 1. Effect of weed control treatments on weed growth and performance of chickpea

Treatment	Dose (g/ha)	Application time (DAS)	Density (no. / m^2)				WCE (%)	Pods/ plant	100 grain wt. (g)	No. of grains/ pod	Grain yield (t/ha)
			C. album	*Medicago denticulate*	*P.minor*	Other spp.					
Clodinafop	60	45	8.02 (63.40)	6.49 (43.33)	3.14 (8.86)	3.41 (10.63)	14.2	33.16	11.48	1.34	0.73
Pinoxaden	50	45	7.88 (61.26)	6.60 (42.64)	3.11 (8.73)	3.40 (10.56)	14.6	35.43	11.63	1.35	0.77
Clodinafop + one hoeing at 70 DAS	60	45	7.93 (61.73)	6.67 (43.54)	3.09 (8.57)	3.39 (10.52)	82.5	37.33	11.73	1.36	0.88
Pinoxaden + one hoeing at 70 DAS	50	45	7.89 (61.06)	6.50 (41.26)	3.08 (8.50)	3.36 (10.34)	82.9	37.46	12.01	1.38	0.88
Pendimethalin	1000	PRE	4.75 (21.60)	4.43 (18.70)	2.50 (5.27)	2.74 (6.53)	77.4	44.97	12.63	1.39	0.92
Trifluralin	1000	PPI	5.25 (26.40)	4.96 (23.66)	3.16 (9.08)	2.83 (7.02)	75.9	43.43	12.03	1.38	0.86
Pendimethalin *fb* clodinafop	1000 and 60	PRE and at 45 DAS	4.74 (21.50)	4.36 (18.07)	2.45 (5.03)	2.60 (5.80)	81.3	45.93	13.16	1.40	0.94
Trifluralin *fb* clodinafop	1000 and 60	PPI and at 45 DAS	5.04 (24.63)	4.56 (19.83)	3.03 (8.17)	2.77 (6.70)	77.0	41.64	11.89	1.38	0.90
Pendimethalin *fb* pinoxaden	1000 and 50	PRE and at 45 DAS	4.36 (18.06)	4.22 (16.89)	2.44 (4.96)	2.56 (5.56)	82.3	46.01	13.19	1.30	0.94
Two hand weeding		45 and 70 DAS	1 (0)	1 (0)	1 (0)	1 (0)	84.3	47.33	13.22	1.39	0.96
Weedy check			8.5 (72.06)	7.38 (53.50)	4.99 (24.0)	3.80 (13.50)	0.0	27.84	11.14	1.31	0.58
Weed free			1 (0)	1 (0)	1(0)		100	48.43	13.35	1.41	0.98
LSD(P=0.05)			0.43	0.26	0.14	0.12	3.84	3.50	0.48	NS	00.45

Figures in the parentheses indicate $(\sqrt{x+1})$ transformed data DAS = Days after sowing

two hand weeding at 25 and 45 DAS. The lower grain yield of chickpea was recorded in clodinafop or pinoxaden treated plots as these treatments failed to control broad leaf weeds which were dominant in the experimental field.

SUMMARY

Pendimethalin 1000 g/ha as pre-emergence effectively controlled C. *album, M. denticulata* and *Phalaris minor.* Pinoxaden 50 g/ha and clodinafop 60 g/ha as post-emergence were effective in controlling only *P. minor*. Pinoxaden and trifluralin were slightly phytotoxic to chickpea plants, which recovered later on. The highest grain yield was obtained in weed free treatment which was at par with two hand weeding, pre-emergence use of pendimethalin at 1000 g/ha *fb* pinoxaden at 50 g/ha applied at 45 DAS and pendimethalin at 1000 g/ha *fb* clodinafop at 60 g/ha applied at 45 DAS. Presence of weeds throughout crop season reduced the seed yield up to 68%.

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