

Weed management in chickpea under irrigated conditions of western Rajasthan

O.L. Sharma

Agricultural Research Station, Rajasthan Agricultural University, Bikaner 334 006 (Rajasthan)

E-mail : sharma_ol@rediffmail.com

ABSTRACT

Field trials were conducted for 5 consecutive winter seasons during 2002-03 to 2006-07 to study the effect of weed management practices on seed yield of irrigated chickpea (*Cicer arietinum* L.). Results revealed two hand weeding at 20 and 40 DAS recorded lowest dry weight of both monocot and dicot weeds and higher weed control efficiency (61.5%). Among the herbicides, pre-planting and incorporation of fluchloralin at 0.75 kg/ha + 1 hand weeding at 30 DAS was most effective in reducing the dry weight of both monocot and dicot weeds at harvesting, ascertained highest seed yield (1530 kg/ha) over other treatments with net returns of Rs 16904/ha and maximum weed control efficiency (54.5 %). Seed yield recorded with this treatment was at par to pre-emergence pendimethalin at 0.75 kg/ha + 1 hand weeding 30 DAS treatment.

Keywords: Chickpea, Seed yield, Fluchloralin, Pendimethalin, Oxyfluorfen

Chickpea (*Cicer arietinum* L.) is an important pulse crop of western Rajasthan. Due to slow initial growth, it suffers badly by severe competition with weeds for nutrients, light, water and space and result into heavy reduction in yield. About 40-45% reduction in yield of chickpea due to severe infestation of weeds was estimated (Singh and Singh 1992). In irrigated chickpea crop, weeds germinate and grow fast in many flushes. Herbicide alone is not most effective and economical weed control measure under such condition. Keeping in view this fact, the present investigation was undertaken to find out the suitable and effective weed management practice to control weeds during critical period of crop-weed interference in chickpea crop.

MATERIALS AND METHODS

Field experiments were conducted on chickpea cv. RSG 469 (*Samrat*) for 5 consecutive winter seasons during the years 2002-03 to 2006-07 at Agricultural Research Station, Bikaner (Rajasthan). The soil of experimental field was sandy loam in texture and alkaline in reaction (pH 8.3) with low in available N (80.75 kg/ha) and P (12.25 kg/ha) and medium in available K (149 kg/ha) contents. Twelve treatments consisted with different chemical, chemical + cultural and cultural weed management practices including a weedy check were tested in a randomized block design with 3 replications. Crop was sown in second week of November during each year by drilling 80 kg seeds per hectare in rows at 30 cm distance. A uniform dose of 20.0 kg N and 40 kg P/ha was applied at the time of sowing. Pre-plant incorporation and pre-emergence herbicides were applied one day before and after sowing, respectively using a Knapsack sprayer

with a spray volume of 600 litres/ha. Weed dry weight was recorded by placing a quadrat of 0.25 m² at 3 random places in each plot and then weighed for both monocot and dicot weeds separately after oven drying 45 days after sowing and harvesting. Observations on yield attributing characters and seed yield were recorded. Weed control efficiency was calculated as per the formula of Patil and Patil (1983). The weed index was calculated as per formula suggested by Gill and Kumar (1969). The net monetary returns were also determined of each treatment.

RESULTS AND DISCUSSION

Effect on weeds

Both monocot and dicot weeds were observed in the experimental fields. Among monocot weeds, *Cynodon dactylon* L (4.0 %) and *Cyperus rotundus* L (7.0 %) were predominant in the weedy check plot while dicot weeds viz. *Melilotus alba* Medikus (7.0 %), *Melilotus indica* L. (9.0 %), *Anagallis arvensis* L (13.0 %), *Convolvulus arvensis* L. (11%), *Rumex dentatus* L. (17.0%), *Asphodelus tenuifolius* L. (14.5 %) and *Chenopodium album* L. (17.5 %) also showed their presence. All the treatments receiving weed control measures effectively controlled both monocot and dicot weeds over weedy check (Table 1). Among the herbicides, fluchloralin at 0.75 kg/ha applied as pre-planting incorporation + 1 hand weeding at 30 days after sowing (DAS) was found to be more effective in reducing the dry weight of both monocot and dicot weeds followed by pendimethalin applied at 0.75 kg/ha as pre-emergence + 1 hand weeding at 30 DAS. The dry weight was lowest for both monocot and dicot weeds with pre-planting and incorporation of fluchloralin at 1.0 kg/ha.

Table 1 Effect of weed control practices on weed dry matter and weed control efficiency of chickpea (Mean for 5 years)

Treatments	Dose (kg/ha)	Weed dry matter (g/m ²)			At harvest			WCE (%)
		At 45 DAS			Monocot	Dicot	Total	
Fluchloralin PPI	0.75	(19)	(23)	(42)	(70)	(87)	(157)	45.5
		4.5	4.9	6.5	8.4	9.4	12.6	
Fluchloralin PPI <i>fb</i> 1 HW	0.75	(11)	(16)	(27)	(77)	(70)	(147)	49.0
30 DAS		3.5	4.1	5.3	8.8	8.4	12.2	
Fluchloralin PPI	1.00	(5)	(7)	(12)	(59)	(72)	(131)	54.5
		2.4	2.8	3.6	7.7	8.5	11.5	
Pendimethalin PE	0.75	(21)	(24)	(45)	(94)	(79)	(179)	38.0
		4.7	5.0	6.8	9.7	8.9	13.4	
Pendimethalin PE <i>fb</i> 1 HW	0.75	(14)	(18)	(32)	(81)	(73)	(154)	46.5
30DAS		3.9	4.4	5.7	9.0	8.6	12.4	
Pendimethalin Pre-emergence	1.00	(7)	(8)	(15)	(65)	(84)	(149)	48.3
		2.8	3.0	4.0	8.1	9.2	12.2	
Oxyfluorfen Pre-emergence	0.15	(22)	(25)	(47)	(90)	(111)	(201)	30.2
		4.8	5.1	6.9	9.5	10.6	14.2	
Oxyfluorfen PE <i>fb</i> 1 HW	0.15	(16)	(19)	(35)	(87)	(112)	(199)	31.0
30 DAS		4.1	4.5	6.0	9.4	10.6	14.4	
Oxyfluorfen Pre-emergence	0.30	(8)	(10)	(18)	(70)	(87)	(157)	45.5
		3.0	3.3	4.3	8.4	9.4	12.6	
Weedy check	-	(26)	(28)	(54)	(135)	(153)	(288)	-
		5.2	5.4	7.4	11.7	12.4	17.0	
One HW at 30 DAS	-	(14)	(23)	(37)	(84)	(102)	(186)	35.4
		3.9	4.9	6.1	9.2	10.1	13.6	
Two HW at 20 and 40 DAS	-	(7)	(8)	(13)	(55)	(60)	(111)	
		2.8	3.0	3.1	7.5	7.8	10.6	61.5
LSD (P=0.05)		-	-	1.4	-	-	2.6	-

Figures in parenthesis are original values, which were transformed to $\sqrt{x+1}$, HW- Hand weeding, DAS- Days after sowing, PPI - Pre planting and incorporation, WCE - Weed control efficiency

Table 2 Effect of weed control practices on yield attributes, yield, weed index and net monetary returns of chickpea (mean for 5 years)

Treatments	Dose (kg/ha)	Yield attributes			Yield (kg/ha)		Weed index (%)	NMR (Rs/ha)
		Pods/ plant	Seeds/ pod	Test weight (g)	Seed	Stover		
Fluchloralin PPI	0.75	49.5	1.3	123.0	1190	1370	22.7	13484
Fluchloralin PPI <i>fb</i> 1 HW 30 DAS	0.75	54.0	1.3	123.8	1530	1720	0.6	16904
Fluchloralin PPI	1.00	52.1	1.3	123.0	1430	1610	7.1	15302
Pendimethalin PE	0.75	48.2	1.3	123.1	1000	1240	35.1	10552
Pendimethalin PE <i>fb</i> 1 HW 30DAS	0.75	52.9	1.3	123.5	1540	1780	-	16675
Pendimethalin Pre-emergence	1.00	51.5	1.3	123.0	1060	1270	31.2	10995
Oxyfluorfen Pre-emergence	0.15	47.9	1.3	123.1	930	1410	39.6	10905
Oxyfluorfen PE <i>fb</i> 1 HW 30 DAS	0.15	51.8	1.3	123.2	1190	1450	22.7	13157
Oxyfluorfen Pre-emergence	0.30	50.2	1.3	123.2	1210	1390	21.4	12981
Weedy check	-	39.5	1.3	122.8	540	1540	64.9	6730
One HW at 30 DAS	-	47.8	1.3	123.2	930	1340	39.6	11525
Two HW at 20 and 40 DAS	-	54.1	1.3	123.9	1360	1510	11.7	1492
LSD (P=0.05)		2.5	0.1	0.14	50.72	62.80	-	-

PPI - Pre-planting and incorporation, PE - Pre-emergence, HW - Hand weeding, DAS - Days after sowing, NMR - Net monetary returns

Weed-control efficiency (61.5%) was maximum with two hand weedings done at 20 and 40 DAS. Among herbicides, maximum weed-control efficiency (54.5%) was recorded in pre-plant and incorporation of fluchloralin at 1.0 kg/ha followed by its pre plant and incorporation at 0.75 kg/ha *fb* 1 hand weeding at 30 DAS (49.0 %). The lowest weed-control efficiency (30.2 %) was recorded in pre-emergence oxyfluorfen at 0.15 kg/ha.

Effect on crop

All the weed-control measures had significantly positive impact on yield attributes and seed yield of chickpea over weedy check (Table 2). The significantly lowest values of pods /plant (39.5), seeds /pod (1.28), test weight (122.8 g) and seed yield (540 kg/ha) were recorded under weedy check. Highest reduction in seed yield was also recorded in weedy check where the weed index was 64.9 % due to unhindered growth of weeds. Highest values of these parameters were recorded with preemergence pendimethalin at 0.75 kg/ha *fb* 1 hand weeding at 30 DAS where the seed yield was 1540 kg/ha. However, the seed yield recorded with this treatment was at par with that recorded (1530 kg/ha) with pre-plant and incorporation of fluchloralin at 0.75 kg/ha *fb* 1 hand weeding at 30 DAS. Both the treatments might have suppressed maximum weeds during the critical period of crop weed competition and favoured better utilization of available resources, *viz.*, nutrient, light, water and space. These results are in

agreement with the findings of Dungerwal *et al.* 2002. Minimum reduction in seed yield was recorded with pre plant and incorporation of fluchloralin at 0.75 kg/ha *fb* 1 hand weeding at 30 DAS treatment with weed index 0.6 % where the growth of weeds might have hindered during critical period of growth.

Maximum net monetary returns of Rs 16904/ha was recorded in pre plant and incorporation of fluchloralin at 0.75 kg/ha *fb* 1 hand weeding at 30 DAS treatment. By registering net monetary returns Rs 16675/ha pre-emergence pendimethlin at 0.75 kg/ha *fb* 1 hand weeding at 30 DAS found to be the next best treatment.

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