



Integrated weed management in chickpea

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Chickpea (*Cicer arietinum* L.) is the predominant crop among pulses in Madhya Pradesh occupying an area of 2722.36 thousand hectares with production of 3321.09 thousand tonnes and productivity 1.22 t/ha. Infestation of weeds is one of the major causes of poor productivity of chickpea. It is a poor competitor of weeds because of slow growth rate and limited leaf area development at early stages. Kumar *et al.* (2014) reported that presence of weeds throughout crop season reduced the seed yield of chickpea up to 68%. The predominant methods of weed control by mechanical hoeing and manual weeding over extensive scale have been declined because of shifting the agricultural labourers to industries for better and assured wages. The current trend and future development of intensive agriculture are likely to seek the help of chemicals as an effective weed control measures and replace the conventional method of weed control. Unfortunately till now, majority of the farmers are quite ignorant about the use of herbicides in chickpea. Mulching is also a good option to conserve moisture and reduce weeds. Mulch is used to cover soil surface around the plants to create congenial condition for the growth, reduce salinity and weeds (Bhardwaj 2013). The present experiment was aimed to find out the effective weed management practices for weed management in chickpea.

Experiment was conducted at Research Farm of College of Agriculture, Tikamgarh (M.P.) during Rabi season of 2015-16. The soil of the experimental field was clay loam in texture, medium in available nitrogen and potassium, high in available phosphorus with a pH of 7.3. The experiment was laid out in a randomized block design. The treatments comprised of pre-emergence pendimethalin 1.0 kg/ha, pendimethalin + hand weeding at 30 DAS, pendimethalin + hand hoeing at 30 DAS, alachlor 1.0 kg/ha, alachlor + hand weeding at 30 DAS, alachlor + hand hoeing at 30 DAS, straw mulch, weed mulch, weedy check and hand weeding twice at 20 and 40 DAS. Herbicidal spray solution was prepared by mixing the required quantity of herbicide as per the

recommended dose in water 500 liters/ha. In straw mulch treatment, paddy straw was spread uniformly after the germination with the rate of 5 t/ha, whereas in weed mulch plots, the uprooted weeds of nearby area was spread uniformly on the soil surface about 4-5 cm after the germination. Chickpea variety 'JG-315' was sown on 01 November 2015 using seed rate of 80 kg/ha. A basal dose of 20:60:20 N:P₂O₅:K₂O kg/ha was applied at the time of sowing. The observation on weed intensity and weed dry weight was recorded at 40 days after sowing with the help of quadrate of 1 metre square. Data on total weed intensity and dry weight were subjected to square root transformation ($\sqrt{x+0.5}$).

Weed flora

The prevalence of monocot weeds were found with relative density of 68.2% as compared to dicot weeds (24.2%). Among the monocots, *Cyperus rotundus* had the highest relative density (33.1%) followed by *Cynodon dactylon* (27.8%), while among dicots, *Launea pinnatifolia* registered the highest relative density of 13.3% followed by *Chenopodium album* (6.0%) and *Anagallis arvensis* (4.8%).

Weed growth

All the herbicidal treatments reduced the weed intensity and dry weight as compared to weedy check. Hand weeding twice was most effective and recorded minimum weed density and weed dry weight followed by pendimethalin at 1.0 kg/ha + hand weeding. Application of pendimethalin at 1.0 kg/ha + hand weeding and hand hoeing at 30 DAS and alachlor at 1.0 kg/ha + hand weeding and hand hoeing at 30 DAS recorded the lower weed intensity than their alone application. Kumar *et al.* (2010) also revealed that application of pendimethalin with one hand weeding significantly reduced the total weed density in chickpea. Hand weeding superseded over all the treatments and attained minimum weed biomass with highest weed control efficiency of 97.2% followed by pendimethalin 1.0 kg/ha + hand weeding at 30 DAS (92.9%), pendimethalin 1.0 kg/ha + hand hoeing at 30 DAS (90.4%) and alachlor + hand weeding (86.1%). Reduction in weed biomass

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Table 1. Effect of different treatments on weed intensity, weed dry weight, weed control efficiency, yield attributes, seed yield (t/ha) and economics of chickpea

Treatment	Weed intensity	Weed dry weight (g/m ²)	Weed control efficiency	No. of pods/plant	No. of seeds/pods	Seed weight/pod (g)	Test weight (g)	Seed yield (t/ha)	Net monetary return (x10 ³ /ha)	B:C Ratio
Pendimethalin 1.0 kg/ha as pre-emergence	6.78(45.7)	6.60(43.2)	73.51	77.00	2.33	0.25	17.43	1.57	47.34	2.98
Pendimethalin 1.0 kg/ha + hand weeding at 30 DAS	5.24(27.0)	3.25(10.1)	92.90	85.00	2.67	0.30	18.38	2.07	64.51	3.41
Pendimethalin 1.0 kg/ha + hand hoeing at 30 DAS	5.77(32.8)	4.23(17.5)	90.42	83.00	2.33	0.29	18.32	1.94	62.31	3.36
Alachlor 1.0 kg/ha as pre-emergence	7.41(54.4)	7.11(50.1)	60.41	70.67	2.67	0.24	17.30	1.51	45.77	3.00
Alachlor 1.0 kg/ha + hand weeding at 30 DAS	6.34(39.7)	3.88(14.5)	86.06	80.33	2.33	0.28	17.60	1.91	58.75	3.22
Alachlor 1.0 kg/ha + hand hoeing at 30 DAS	6.79(45.7)	4.39(18.8)	82.42	78.00	2.33	0.26	17.52	1.74	53.07	3.08
Straw mulch	7.79(60.2)	7.63(57.7)	53.83	63.00	2.00	0.23	17.20	1.19	31.71	1.95
Weed mulch	8.36(69.4)	8.33(68.9)	38.49	60.33	2.00	0.22	17.10	1.05	23.10	1.20
weedy check (control)	11.33(128)	12.8(164)	0.00	52.33	1.67	0.18	16.90	0.71	14.33	1.00
Two hand weeding at 20 and 40 DAS	3.98(15.3)	2.50(5.7)	97.19	88.33	2.67	0.32	18.59	2.38	75.74	3.73
LSD (P=0.05)	0.39	0.49		6.74	0.86	0.03	0.17	0.063		

Values in parentheses are original transformed to $\sqrt{x+0.5}$

and increased weed control efficiency under pre emergence application and alachlor followed by mechanical methods was due to complete removal of weeds at critical period of crop weed competition. The findings of Singh and Singh (2000) also revealed the effectiveness of integrated approach of pendimethalin + one hand weeding in reducing the weed biomass and increase in weed control efficiency of chickpea.

Yield attributes and economics

Yield attributing characters, viz. number of pods per plant, number of seeds per pod and test weight attained significantly higher values under two hand weeding followed by pre-emergence pendimethalin 1.0 kg/ha + hand weeding at 30 DAS (Table 1). Two hand weeding gave significantly higher yield attributes than rest of the treatments. Among the herbicidal treatments, pendimethalin + hand weeding at 30 DAS recorded significantly higher yield attributes than other herbicidal treatments. The results were in close conformity with Pedde *et al.* (2013). Straw mulch and weed mulch registered significantly lower yield attributing characters but was significantly higher than the weedy check.

Seed yield was significantly higher under all the weed control practices over weedy check. Two hand weeding at 20 and 40 DAS recorded the highest yield (2.38 t/ha) followed by pendimethalin 1.0 kg/ha + hand weeding at 30 DAS (2.07 t/ha). Pre-emergence application of pendimethalin 1.0 kg/ha and alachlor 1.0 kg/ha produced significantly higher seed yield over straw mulch and weed mulch.

The highest net monetary returns (~ 75739/ha) was obtained with two hand weeding followed by pendimethalin + hand weeding and pendimethalin + hand hoeing. Benefit cost ratio was the highest under two hand weeding (3.73) followed by pendimethalin + hand weeding (3.41) and pendimethalin + hand hoeing (3.36) whereas it was the lowest under weedy check (1.00). Gore *et al.* (2015) also reported that

application of pendimethalin 0.75 kg/ha + one hand weeding produced higher yield and gave highest net monetary returns and B:C ratio and found most effective and economical in controlling weeds and increasing the yield of chickpea.

SUMMARY

Hand weeding twice was most effective and recorded minimum weed density and weed dry weight followed by pendimethalin at 1.0 kg/ha + hand weeding and pendimethalin at 1.0 kg/ha + hand hoeing. Two hand weeding at 20 and 40 DAS recorded the highest yield (2.38 t/ha) followed by pendimethalin 1.0 kg/ha + hand weeding at 30 DAS (2.07 t/ha). Pre-emergence application of pendimethalin 1.0 kg/ha and alachlor 1.0 kg/ha produced significantly higher seed yield over straw mulch and weed mulch. The highest net monetary returns (~ 75739/ha) was obtained with two hand weeding followed by pendimethalin + hand weeding and pendimethalin + hand hoeing.

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