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Research Article

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Integrated weed management in chickpea under Doon Valley conditions

Pratap Jambuvant Khose*, Laxman Somanath Vyvahare and Prashant Balashaheb Shinde
Doon (P.G). College of Agriculture Science & Technology, Selaqui, Dehradun, Uttarakhand 248 01,1india
Corresponding author e-mail: pratap.khose90@gmail.com
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ABSTRACT
A field experiment was conducted during Rabi season 2017-2018 at Doon (PG) College of agriculture science and technology Dehradun (Uttarakhand) using four herbicides combined with Hand weeding for effectively controlling of both groups of weeds, their effect on production economics on chickpea. The experiment was carried out in Randomized Block Design with three replications. The treatments consist of eleven weed management practices. We observed Weed free up to 60 days recorded minimum and significantly lowest total weed counts compared to rest of treatment then One hand hoeing at 15 DAS + one hand weeding at 30 DAS, pendimethalin 30 EC pre-emergence 0.700 kg/ha *fb* then one hand weeding at 30 DAS, pendimethalin 30 EC PE 700 g/ha. Weed index was recorded highest i.e 100 per cent with treatment weed free up to 60 days. The important growth attribute, *viz.* plant height, number branches/plant, crop dry matter accumulation and important yield contributing characters, *viz.* number pods/plant, number of seeds/pods, text weight, growth values, *viz*. grain and straw yield significantly in the treatment weed free up to 60 days and it as at per with one hand hoeing at 15 DAS + one HW at 30 DAS, pendimethalin 30 EC pre-emergence 0.700 kg/ha *fb* then one hand weeding at 30 DAS, pendimethalin 30 EC PE 700 g/ha. Economic study revealed that, the maximum net monetary returns were obtained with the treatment weed free up to 60 DAS (Rs 40758/ha) but it was at per with treatment one hand hoeing at 15 DAS + one hand weeding at 30 DAS, (Rs 29770/ha), pendimethalin 30 EC PE 700 g/ha, (29429/ha), pendimethalin 30 EC Pre-emergence 0.700 kg/ha *fb* then one hand weeding at 30 DAS, (Rs 27361/ha).Where, B:C ratio (2.20) is highest in also with the treatment weed free up to 60 DAS.
Keywords: weed flora, weed control efficiency, Weed dry weight, and yield.

INTRODUCTION

Chickpea is very useful as well as important pulse crops of India, which are cultivated under conserved soil moisture and irrigated situations. The production of chickpea has fallen due to several constraints such as biotic and abiotic factors. Among the biotic constraints wilt, dry root rot and blight are the chief constraints in Karnataka. In adding to that, the weeds also result in main damage in yield by challenging for space, nutrients, water and light. Poor weed supervision is one of the most important yield preventive factors in chickpea. Weeds should eliminate plant nutrients from soil as compare to crops. Under rain fed condition, weeds use maximum water and increase severity of drought and results in a less crop yield. Maximum weed species which are faster growth in nature and higher than chickpea and prevent crop growth, absorbs sunlight, and disturb photosynthesis and plant productivity adversely (Rao 2000). Normally, controlling of weeds farmers do physical weeding. But with the increase in labor cost and scarcity of labor, manual weed control has become a difficult task in chickpea, chickpea is very susceptible to weed competition and weeds affect up to 75% yield loss (Chaudhary *et al*. 2005). Weed management in chickpea is a key component of plant protection thus increasing production potential of the crop. Therefore, the work was assumed to detect the effect of various weed management practices on productivity of chickpea under Doon valley conditions.

MATERIALS AND METHODS

A field experiment entitled "Integrated Weed management in Chickpea *(Cicer arietinum* L.) Under Doon valley condition" was conducted during *rabbi* season 2017-18 at, Doon (P.G.) College of Agriculture Science and Technology, Selaqui, Dehradun (Uttarakhand). The experimental soil was sandy loam in texture, with pH 7.4, having low availability of N (115.20 kg/ha), medium available P (17.92 kg/ha) and high in available K (119.0 kg/ha). The weed control treatments of comprised of pendimethalin 700 g/ha as pre- emergence (PE); pendimethalin (PE) 0.700 kg/ha + one (HW) at 30 DAS; oxyflurofen PE 0.90 kg/ha; oxyflurofen PE 0.90 kg/ha + one HW at 30 DAS; metribuzin PE 0.200 kg/ha+ one HW at 30 DAS; Imazethapyr EPoE 0.050 kg/ha at 20 DAS; one hand

hoeing at 15 DAS + one HW at 30 DAS, weed free up to 60 DAS and weedy check. The treatment was laid out in a randomized block design with three replications. The PE Pendimethalin was sprayed after sowing on wet soil and PoE was applied at 3 days after sowing (DAS) with the help of knap-sack sprayer fitted with flood-jet nozzle with release rate of 600 L water/ha. Variety of was grown 'Pant G-186" on November 2017.

The total and relative values of density, frequency, standing value index and summed dominance ratio for each of the weed was stately by following standard process and intention for weed survey as followed by AICRP on Weed Management (ICAR), by plotting one-meter square quadrats in randomized manner (Raju 1997). The weeds were dehydrated in oven till a constant weight and then converted into g/m2 using the proper formula.

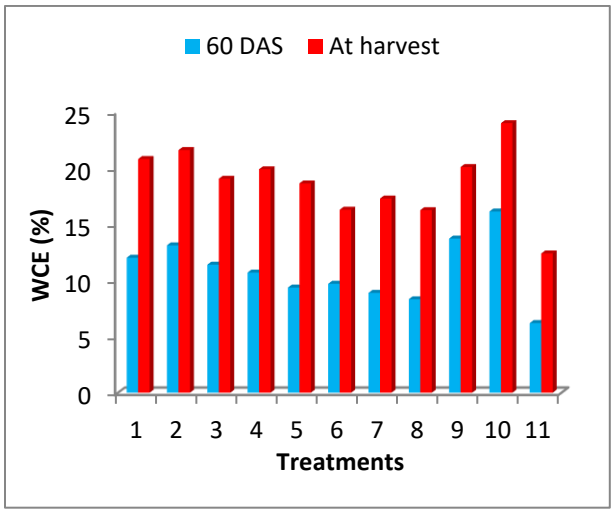

Fig.1. Weed control efficiency at 60 DAS & Harvest

RESULTS AND DISCUSSION

Weed flora

Weed flora present in the experiment during 2017-18 was collected and grouped as broad-leaved weeds, grasses and sedges *Cynodon dactylon* L. *and Dactyloctenium aegyptium* L., *Bracharia mutica* L., *Cyperous rotondus* L., among broad leaved weeds, *Convolvulas arvensis* L., *Chenopodium album* L., *Parthenium hysterophrus* L., *Melilotus indica* L., weeds during of growing season, similar result were reported by Ratnam *et al.,* (2011).

Effect on weeds

The weed density and weed dry weight was significantly different in weed control practices with the weed free up to 60 DAS recorded significantly lower density of monocot and dicot weeds. At all the treatments weed free up to 60 days after sowing gave the best management of monocot and dicot weeds than other treatments because initially weed were controlled by hand weeding 30 DAS and whatever weeds emerged later were effectively removed by subsequent of hand weeding carried out at 60 DAS. This result is similar by Kachhadiya *et al. (*2009). The weed density and dry weight of monocot and dicot weeds in control plot were significantly the highest than rest of the treatments.

Weed index and weed control efficiency

Minimum weed index (0.00 %) and maximum weed control efficiency (Table 1) at 30 and 60 DAS and at harvest were observed were observed at hand weeding carried out at 30 and 60 DAS. The lower weed index and higher weed control efficiency of treatment of weed free up to 60 DAS, higher efficiency of the herbicides at early growth stage and one hand weeding at advanced stage was effective in directing weed dry matter in the various combined approaches of weed management. This result is similar to Ruparelia *et al.* (2017).

Yield attributes and yield

The higher plant height of chickpea crop was recorded at 60 DAS and at harvest under the treatment of weed free up to 60 DAS. Crop dry matter accumulation at 60 DAS, number of pods/plant number of branches and test weight were recorded significantly higher at harvest under treatment weed free up to 60 DAS, pendimethalin 30 EC PE 0.700 kg/ha *fb* then one HW at 30 DAS, oxyflurofen 23.5 EC PE 0.90 kg/ha.

Inter-culturing followed by weed free up to 60 DAS. The seed and stover yield were also significantly higher under the treatment of HW twice at 30 and 60 DAS followed by the treatment weed free up to 60 DAS, One hand hoing at 15 DAS + one HW at 30 DAS, pendimethalin 30 EC PE 0.700 kg/ha *fb* then one HW at 30 DAS whereas weedy check, recorded the lowest yield attributes, seed and stover yield of chickpea due to higher weed density (Table 2). Removal of weed at early stage in the season reduced crop-weed competition. Due to controlling higher growth and yield parameters of chickpea where probable reasons for higher seed yield in weed free up to 60 DAS treatment. These results are in accordance with the findings of Gore *et al.* (2015) and Singh and Jain (2017).

Economic implication

Net monetary returns and Benefit: Cost ratio was higher under the weed free up to 60 DAS. Then other weed management practices. The result similar accordingly Gore *et al.* (2015), *fb* the treatment), one hand hoeing at 15 DAS + one HW at 30 DAS.

CONCLUSION

For effective control of weeds and higher seed yield as well as economical returns under the treatments weed free up to 60 DAS, followed by one hand hoeing at 15 DAS + one HW at 30 DAS.

Table 1. Weed density, weed dry weight and weed control efficiency at different days influenced different weed management practices

Treatment	Total density of weeds (no/m^2)				Dry weight of weeds (g)				Weed control efficiency (%)	
	Monocot		Dicot		Monocot		Dicot			
	30 DAS	60 DAS	30 DAS	60 DAS	30 DAS	60 DAS	30 DAS	60 DAS	30 DAS	60 DAS
Pendimethalin 30 EC PE 700 g/ha	13.70 (174)	11.6 (125.33)	12.89 (167.00)	11.96 (138)	0.39 (2.01)	0.95 (0.92)	1.73 (3.03)	1.78 (3.19)	87.09	88.85
Pendimethalin 30 EC (PE) 700 g/ha *fb* then one (HW) at 30 DAS	11.72 (!41)	10.24 (105)	12.24 (151)	10.07 (101.67)	1.28 (1.61)	0.88 (0.81)	1.70 (2.97)	1.64 (2.69)	21.73	87.73
Oxyflurofen 23.5 EC PE 0.90 kg/ha	15.00 (226)	11.74 (139.33)	13.63 (186.35)	11.26 (127)	1.52 (2.41)	1.01 (1.04)	1.94 (3.83)	1.94 (3.79)	86.34	86.87
Oxyflurofen 23.5 EC PE 0.90 kg/ha then one HW at 30 DAS	14.19 (205)	12.94 (169.33)	14.34 (204)	11.91 (142)	1.63 (2.78)	1.08 (1.17)	2.01 (4.07)	2.06 (4.30)	84.97	85.35
Metribuzin 70% WP PE 0.200 kg/ha	14.44 (211)	13.11 (174.33)	14.34 (206)	12.52 (157)	1.74 (3.15)	1.18 (1.40)	2.31 (5.45)	2.25 (5.13)	81.15	82.31
Metribuzin 70% WP PE 0.200 kg/ha *fb* one HW at 30 DAS	15.45 (239)	14.09 (199.33)	15.80 (251)	15.27 (157)	2.09 (4.45)	2.92 (8.73)	2.99 (9.16)	3.21 (10.60)	70.42	46.62
Imazethapyr 10 % SL EPoE 0.25 kg/ha at 30 DAS	140.72 (219)	13.00 (169.67)	14.48 (210)	13.17 (173.67)	1.85 (3.55)	1.62 (2.76)	2.41 (5.95)	2.45 (6.05)	79.01	76.72
Imazethapyr 10 % SL EPoE 0.050 kg/ha at 30 DAS	14.95 (224)	13.62 (186.33)	16.13 (265)	16.48 (216.67)	1.93 (3.88)	1.88 (3.73)	2.62 (7.03)	2.68 (7.21)	76.20	70.94
One hand hoeing at 15 DAS + HW 30 DAS	9.42 (90)	8.65 (75.00)	12.33 (160.67)	8.84 (78.67)	1.18 (1.42)	0.83 (0.71)	1.38 (1.90)	2.41 (2.01)	92.64	92.61
Weed free upto 60 DAS	7.46 (56)	5.69 (36.00)	8.97 (81.33)	7.90 (63.67)	0.97 (0.95)	0.70 (0.51)	1.32 (1.77)	2.14 (1.30)	93.94	94.96
Weedy check	16.49 (272)	14.93 (244)	20.88 (440.67)	20.79 (433.33)	5.38 (29.15)	3.61 (13.14)	3.96 (15.98)	4.39 (19.82)	0.08	0.12
LSD (p=0.05)	Sig 6.23	Sig 6.87	Sig 8.34	Sig 8.41	Sig 10.21	Sig 12.53	Sig 9.21	Sig 11.92	Sig 3.76	Sig 3.07
All Figures are subjected to transformed values to square root (√x+0.5).										

Table 2. Weed index, Plant height, crop dry matter accumulation, number of branches, yield attributes, yield and economics of chickpea as influenced by different weed management practices economics

Treatment	Weed Index (%)	Plant height (cm)		Crop dry matter accumulation at 60 DAS (g)	Number of branches /plants	Number of pods /plants	Seed index (g)	Seed yield (kg/ha)	Stover yield (kg/ha)	Net returns (Rs/ha)	B:C ratio
		30 DAS	60 DAS								
Pendimethalin 30 EC PE 700 g/ha	10.48	20.5	42.60	12.02	14.69	45.40	22.50	1598	1198	29429	1:8
Pendimethalin 30 EC (PE) 700 g/ha *fb* then one (HW) at 30 DAS	6.22	20.43	41.94	13.12	15.10	47.40	23.13	1660	2010	27361	1:6
Oxyflurofen 23.5 EC PE 0.90 kg/ha	14.53	19.79	41.41	11.40	13.85	44.80	21.10	1510	1932	57512	1:7
Oxyflurofen 23.5 EC PE 0.90 kg/ha then one HW at 30 DAS	21.25	19.25	40.10	10.70	13.40	41.52	20.60	1390	1740	17837	1:4
Metribuzin 70% WP PE 0.200 kg/ha	29.54	18.62	39.00	9.36	12.76	39.89	19.90	1247	1640	17403	1:5
Metribuzin 70% WP PE 0.200 kg/ha *fb* one HW at 30 DAS	39.38	14.67	36.11	9.70	11.20	36.99	16.20	1151	1050	8106	1:2
Imazethapyr 10 % SL EPoE 0.25 kg/ha at 30 DAS	39.86	17.80	39.09	8.89	12.16	39.14	18.80	1045	1420	8739	1:25
Imazethapyr 10 % SL EPoE 0.050 kg/ha at 30 DAS	41.99	16.57	38.79	8.32	11.75	38.43	17.00	1015	1271	8348	1:23
One hand hoeing at 15 DAS + HW 30 DAS	4.26	20.84	42.90	13.73	15.10	45.90	23.80	1691	2241	29770	1:7
Weed free up to 60 DAS	00	21.08	43.60	16.14	15.44	47.40	25.20	1775	2277	40758	2:25
Weedy check	70.99	12.62	33.73	6.20	9.63	28.4	19.00	534	540	18533	0:5
LSD P=(0.05)	NS	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	-	-

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