ADITUM Journal of Agricultural Research Pesticides and Biofertilizers

Open Access Research Article

Integrated Weed Management in Chickpea Under Doon Valley of Uttarakhand

Pratap Jambuvant Khose*, Laxman Somanath Vyvahare and Prashant shinde
Doon (P.G). College of Agriculture Science & Technology, Selaqui, Dehradun, Uttarakhand 248 011 India.

Article Info

Received: December 06, 2021
Accepted: December 30, 2021
Published: January 10, 2022

***Corresponding author:** Pratap Jambuvant Khose, Doon (P.G). College of Agriculture Science & Technology, Selaqui, Dehradun, Uttarakhand 248 011 India.

Citation: Pratap Jambuvant Khose, Laxman Somanath Vyvahare and Prashant shinde. (2022) "Integrated Weed Management in Chickpea Under Doon Valley of Uttarakhand.", Journal of Agricultural Research Pesticides and Biofertilizers, 3(1); DOI:http;//doi.org/01.2022/1.1052.

Abstract

A field experiment was conducted during *rabi* season 2017-2018 at research farm of Doon (P.G.) College of Agriculture Science and Technology, Selaqui, Dehradun (Uttarakhand). 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 (T_9), Pendimethalin 30 EC Pre-emergence @ 0.700 kg a.i. ha^{-1} *fb* then one hand weeding at 30 DAS (T_2), Pendimethalin 30 EC PE @ 700 g ha^{-1},(T_1). 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^{-1}, crop dry matter accumulation and important yield contributing characters *viz.*, number pods plant^{-1}, number of seeds pod^{-1}, text weight, growth values *viz.*, grain and straw yield significantly in in the treatment Weed free up to 60 days and it as at per with One hand hoeing at 15 DAS + one hand weeding at 30 DAS (T_9), Pendimethalin 30 EC Pre-emergence @ 0.700 kg a.i. ha^{-1} *fb* then one hand weeding at 30 DAS (T_2), Pendimethalin 30 EC PE @ 700 g ha^{-1},(T_1). Economic study revealed that, the maximum net monetary returns were obtained with the treatment Weed free up to 60 DAS (Rs 40758 ha^{-1}) but it was at per with treatment One hand hoeing at 15 DAS + one hand weeding at 30 DAS (T_9),(Rs 29770 ha^{-1}), Pendimethalin 30 EC PE @ 700 g ha^{-1},(29429 ha^{-1}), Pendimethalin 30 EC Pre-emergence @ 0.700 kg a.i. ha^{-1} *fb* then one hand weeding at 30 DAS (T_2),(Rs 27361 ha^{-1}).Where, B:C ratio (2.20) is highest in also with the treatment Weed free up to 60 DAS.

Introduction:

Cereals are a staple food for many people around the world including Bangladesh; however, they are also a major dietary source of toxic arsenic (As). Most agricultural lands of Bangladesh are contaminated with arsenic (59 out of 64 districts are arsenic contaminated according to IAEA, 2002), which can be accumulated to high levels in the grains of cereals cultivated in these regions, posing serious health risks to consumers. Arsenic has two forms such as trivalent (ASIII) and pentavalent (AsV), thus it has larger atomic radius, more electron clouds, relative higher reaction affinity (ASIII) to thiol group/sulfhydryl group (-SH) groups than other divalent cations (Most and Papenbrock 2015). As such this notorious heavy metal being efficiently absorbed in skin, lung, kidney, liver, and bladder than any other heavy metals. Though, the level of arsenic contamination and its consequence has been well studied in rice, however, a similar study has not been performed in other cereals (like wheat, maize, barley, and foxtail millet, etc) despite their increasing trend of production and end-use. Hence, to save the nation, it is imperative to develop cereals that will contain reduced levels of arsenic. Genetic engineering strategies could be employed to develop a variety that will retain a lower amount of toxic arsenic. Therefore, the level of arsenic in the existing cereals has to be determined as a starting point towards lower arsenic variety development. Thus, the arsenic content in the minor cereals available in PBD and grown in Joydebpur soil (Barley, Foxtail millet, Proso-millet, Finger-millet, Pearl-millet, Buckwheat, Oat, Quinoa, and BARI–Sorghum 1) were determined in this experiment. The primary arsenic status of these cereals may have given clues for designing the appropriate breeding program in the future.

Key words: chickpea; herbicides; pre-emergence; weeds and weed dry weight

1. 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 an 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.

2. Materials and Methods:

A field experiment entitled "Integrated Weed management in Chickpea *(Cicer arietinum* L.) Under Doon valley condition" was conducted during *rabi* season 2017-18 at, Doon (P.G.) College of Agriculture Science and Technology, Selaqui, Dehradun (Uttarakhand). The soil of the experiment field was sandy loam in texture, low available nitrogen (115.20 kg ha^{-1}), medium available phosphorus (17.92 kg ha^{-1}) and high potassium (119.0 kg ha^{-1}) and neutral pH 7.4. The experiment was carried out in Randomized Block Design with three replications. The treatments consist of eleven weed management practices Viz. Different weed management practices were done as per the treatments in the experiment. are Pendimethalin 30 EC PE @ 700 g ha^{-1},(T_1) Pendimethalin 30 EC Pre-emergence @ 0.700 kg a.i. ha^{-1} *fb* then one hand weeding at 30 DAS (T_2),then use Oxyfiurofen 23.5 EC Pre-emergence @ 0.90 kg a.i. ha^{-1} (T_3), and Oxyflurofen 23.5 EC Pre-emergence @ 0.90 kg a.i. ha^{-1} then one hand weeding at 30 DAS (T_5), Metribuzin 70% WP PE @ 0.200 kg a.i. ha^{-1} *fb* one hand weeding at 30 DAS (T_6), Imazethapyr 10% SL EPoE @ 0.25 kg and 0.050 kg a.i ha^{-1} at 20 DAS in (T_7) & (T_8) Then One hand hoeing at 15 DAS + one hand weeding at 30 DAS (T_9), Weed free up to 60 DAS (T_{10}) Weedy check (T_{11}). The chickpea variety Pant G-186 was grown at test crop on November 26, 2017 and harvesting April 12, 2018.Weed control efficiency (WCE) was calculated by the following formula.

$$WCE\ (\%) = \frac{WCC - WCT}{WCC} X100$$

3. Results and Discussion:

3.1. Effect on Weeds:

The experiment field was dominated *Cynodon dactylon, Phalaris minor, Bracharia mutica, Cyperous rotondus* of monocot weeds and *Convolvulas arvensis, Chenopodium album, Parthenium hysterophrus, Melilotus indica* of dicot weeds during of growing season, similar result were reported by Ratnam *et al.,* (2011). The weed density and weed dry weight was significantly differ 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 (T_{10}) 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.

3.2. Weed index and weed control efficiency:

Minimum weed index (0.00 %) and maximum weed control efficiency (Table1) 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).

3.3. 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 $plant^{-1}$ number of branches and test weight were recorded significantly higher at harvest under treatment weed free up to 60 DAS (T_{10}), Pendimethalin 30 EC Pre-emergence @ 0.700 kg a.i. ha^{-1} *fb* then one hand weeding at 30 DAS (T_2), Oxyfiurofen 23.5 EC Pre-emergence @ 0.90 kg a.i. ha^{-1} (T_3).

Treatments	Density of weeds (no. m^{-2})				Dry weight of weeds (g)				Weed control efficiency (%)	
	Monocot		Dicot		Monocot		Dicot			
	30 DAS	60 DAS	30DAS	60 DAS	30 DAS	60 DAS	30 DAS	60DAS	30 DAS	60 DAS
T_1	**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
T_2	**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
T_3	**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
T_4	**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
T_5	**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
T_6	**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
T_7	**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
T_8	**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
T_9	**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
T_{10}	**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
T_{11}	**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
SEm±	0.44	0.43	0.63	0.56	0.10	0.11	0.12	0.16	1.52	1.20
CD at 5%	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig
CV%	6.23	6.87	8.34	8.41	10.21	12.53	9.21	11.92	3.76	3.07

Table 1: Weed density, weed dry weight and weed control efficiency at different days influenced different weed management practices All Figures are subjected to transformed values to square root ($\sqrt{x+0.5}$).

Treat-ment	Weed Index (%)	Plant height (cm)		Crop dry matter accumulation at 60 DAS (g)	Number of branches $plant^{-1}$	Number of pods $plnat^{-1}$	Seed index (g)	Seed yield (kg ha^{-1})	Stover yield (kg ha^{-1})	Net returns (Rs ha^{-1})	B:C ratio
		30 DAS	60 DAS								
T_1	10.48	20.5	42.60	12.02	14.69	45.40	22.50	1598	1198	29429	1:8
T_2	6.22	20.43	41.94	13.12	15.10	47.40	23.13	1660	2010	27361	1:6
T_3	14.53	19.79	41.41	11.40	13.85	44.80	21.10	1510	1932	57512	1:7
T_4	21.25	19.25	40.10	10.70	13.40	41.52	20.60	1390	1740	17837	1:4
T_5	29.54	18.62	39.00	9.36	12.76	39.89	19.90	1247	1640	17403	1:5
T_6	39.38	14.67	36.11	9.70	11.20	36.99	16.20	1151	1050	8106	1:2
T_7	39.86	17.80	39.09	8.89	12.16	39.14	18.80	1045	1420	8739	1:25
T_8	41.99	16.57	38.79	8.32	11.75	38.43	17.00	1015	1271	8348	1:23
T_9	4.26	20.84	42.90	13.73	15.10	45.90	23.80	1691	2241	29770	1:7
T_{10}	00	21.08	43.60	16.14	15.44	47.40	25.20	1775	2277	40758	2:25
T_{11}	70.99	12.62	33.73	6.20	9.63	28.4	19.00	534.00	540	-18533	0:5
SEm±	4.15	0.83	1.66	0.43	0.75	1.85	9.45	88.5	84.08	-	-
CD at 5%	NS	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	-	-
C.V. %	28.42	7.87	7.18	6.99	9.87	7.76	7.90	11.47	8.85	-	-

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

Inter-culturing followed by Weed free up to 60 DAS. The seed and stover yield were also significantly higher under the treatment of hand weeding twice at 30 and 60 DAS followed by the treatment Weed free up to 60 DAS (T_{10}), One hand hoeing at 15 DAS + one hand weeding at 30 DAS (T_9), Pendimethalin 30 EC Pre-emergence @ 0.700 kg a.i. ha^{-1} *fb* then one hand weeding at 30 DAS (T_2) whereas weedy check, recorded the lowest yield attributes, seed and stover yield of chickpea due to higher weed density (Table2). 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).

Economic Implication:

Net monetary returns and Benefit: Cost ratio was higher under the Weed free up to 60 DAS (T_{10}). Then other weed management practices. The result similar accordingly Gore *et al*,.(2015), Followed by the treatment), One hand hoeing at 15 DAS + one hand weeding at 30 DAS (T_9).

4. Conclusion:

For effective control of weeds and higher seed yield as well as economical returns under the treatments Weed free up to 60 DAS (T_{10}), followed by One hand hoeing at 15 DAS + one hand weeding at 30 DAS (T_9).

5. References:

1. Anonymous, (2016). Directorate of Economics and Statistics. Department of Agriculture and Cooperation. Ministry of Agriculture, Government of India.
2. Anonymous, 2016. Directorate of Economics and Statistics. Department of Agriculture, Government of Uttarakhand.
3. Chaudhary, B.M.,Patel, J. J. and Delvadia, D. R. 2005. Effect of Weed management Practice and seed rates on weeds and yield of chickpea. *Indian J. Weed Sci.* 37:271-272.
4. Gore, A.K., Gobade, S.M. and Patil, P.V., 2015. Effect of pre- and post-emergence herbicides on yield and economics of chickpea (*Cicer arietinim* L.). International Journal of Tropical Agriculture © Serial publications, ISSN: 0254-8755.
5. Kacchadiya, S. P., Savaliya, J. J., Bhalu, V. B. Pansurya, A.G. and Savaliya, S. G. 2009 . Evaluation of herbicide for weed management in chickpea (*Cicer arietinum* L.) *Legume Res*. 32.(4): 293-297.
6. Ratnam, M., Rao, A.S. and Reddy, T. Y. 2011. Integrated weed management in chickpea (*Cicer arietinum* L.). *Indian Journal of Weed Science*, 43(1 & 2): 70-72.
7. Rao, V.S. (2000). Principles of Weed Science. Oxford and IBH publishing Co. Pvt .Ltd. New Delhi, p.124.
8. Ruparelia, V.V., Chovatia, P.K., Vekariya, S.J. and Javiya, P.P., 2017. Evaluationof pre and post-emergence herbicides in chickpea (*Cicer arietinum* L.). International Journal of chemical studies, 6 (1): 1662-1665.