Poll Res. 42 (2) : 201-204 (2023)

ISSN 0257–8050

DOI No.: http://doi.org/10.53550/PR.2023.v42i02.004

WEED DYNAMICS AND PRODUCTIVITY OF CHICKPEA AS AFFECTED BY WEED MANAGEMENT PRACTICES

SWATI SHIV[1], S.B. AGRAWAL[1], BADAL VERMA[1*], PUSHPENDRA SINGH YADAV[1], RICHA SINGH[2], MUSKAN PORWAL[1], JITENDRA SISODIYA[1] AND RAGHAV PATEL[2]

[1]*Department of Agronomy, College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur 482 004, M.P., India*

[2]*Department of Agronomy, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior 474 002, M.P., India*

(Received 6 September, 2022; Accepted 16 November, 2022)

ABSTRACT

***Rabi* pulses are typically cultivated on marginal cropland with little maintenance. Weed growth has greater space to grow during the initial slow vegetative phase of crop. Crop weed competition results in resource distribution, which significantly reduces crop yield. To understand the effect of different weed management practices on weed dynamics and productivity of chickpea, a field experiment was conducted at Forestry Research Farm, Department of Forestry, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (MP) during the *Rabi* season of 2020-21. The field experiment was laid out in randomized block design (RBD) with nine treatments and replicated thrice. Nine treatments were pendimethalin at 1000 g/ha, atrazine at 1000 g/ha, oxyflorfen at 100 g/ha, imazethapyr at 900 g/ha, pendimethalin at 500 g/ha + oxyflorfen at 50 g/ha, pendimethalin at 500 g/ha + imazethapyr at 450 g/ha, imazethapyr at 450 g/ha + atrazine at 500 g/ha, including hand weeding at 30 DAS and weedy check. The broad-leaf weeds, *Medicago denticulate, Chenopodium album, Vicia sativa* (L.) and *Anagallis arvensis* (L.) were dominant. In the case of grassy weeds, *Cyperus rotundus* (L.), *Cynodon dactylon* (Pers.) and *Avena fatua* (L.) are dominant weeds. Significant reduction in total weed density and dry weight was recorded under the application of pendimethalin at 500 g/ha + imazethapyr at 450 g/ha. In comparison, high values of growth parameters and seed yield were recorded with the application of pendimethalin at 1000 g/ha.**

KEY WORDS: Chickpea, Pendimethalin, Rabi pulses, Weed dynamics, Weed management practices

INTRODUCTION

Chickpea (*Cicer arietinum* L.) is the world's third most crucial pulse crop after french bean and field pea. Chickpea are grown in an area of 8.3 million ha with an annual production of 7.7 million tonnes, registering an average productivity of 928 kg/ha (Ministry of Agriculture, 2013). It accounts for 32 per cent (6.42 million ha) of the total pulse area and 49 per cent (5.47 million tons) of total pulse production in India (Rupareliya *et al*., 2018). Chickpea, being slow in their early growth and short stature, is highly susceptible to weed competition and often have considerable yield losses of up to 75 per cent (Chaudhary *et al*., 2005). The early emergence and fast growth of the weeds lead to severe crop-weed competition for light, moisture, nutrients and space, which culminates in a heavy reduction in the growth and yield of chickpea and lessens the profitability (Chopra *et al*., 2003). Generally, farmers adopt manual weeding for the control of weeds. However, with the increase in labour cost rate and scarcity, manual weed control has become problematic in chickpea. Weed control in chickpea in the initial stages of crop growth is vital since crop-weed competition is maximum. The grain yield of chickpea was reduced by 17.1% due to competition with weeds during the first 30 days of sowing, which increased to about 50% when weeds competed with the crop for the entire crop season. The initial 60 days period is considered to be critical with weed-crop competition in chickpea (Singh and Singh, 1992). A suitable herbicide for effectively controlling mixed weed flora is required for better adoption in chickpea. The introduction of herbicides has enabled it to effectively control a broad spectrum of weeds in pulses at a remunerative cost. Considering this fact, the present investigation was undertaken to find a suitable and effective weed management practice to control weeds during crop-weed interference in chickpea crop.

MATERIALS AND METHODS

A field experiment was conducted during the winter (*Rabi*) season of 2020-21 at Forestry Research Farm, Department of Forestry, JNKVV, Jabalpur (23º09' N, 79º58' E and 411.78 meters above mean sea level). The climate is semi-humid subtropical, receives 15.20 mm rainfall, and the mean weekly maximum and minimum temperature ranged from 22.2 to 40.8 ºC and 4.2 to 22.5 ºC, respectively, during the crop growth period. The soil of the experimental site is silty clay loam in texture having pH 7.3, with medium organic carbon content (0.48%), average electrical conductivity (0.33 ds/m) and medium in available nitrogen (216.00 kg/ha), available phosphorus (16.95 kg/ha) and available potassium (182.00 kg/ha). The treatments were arranged in a randomized block design with nine treatments and three replications. Nine treatments consisted of various weed management practices, i.e. pendimethalin at 1000 g/ha, atrazine at 1000 g/ha, oxyflorfen at 100 g/ha, imazethapyr at 900 g/ha, pendimethalin at 500 g/ha + oxyflorfen at 50 g/ha, pendimethalin at 500 g/ha + imazethapyr at 450 g/ha, imazethapyr at 450 g/ha + atrazine at 500 g/ha, hand weeding (one) at 30 DAS and weedy check. All the herbicides are applied as pre-emergence (PE) applications. The chickpea seed was used at 80 kg/ha, and sowing was done at a depth of 5 cm with a uniform distance of 30 cm between rows. The crop was given a recommended dose of fertilizers, i.e. 20 kg N, 60 kg P_2O_5, and 20 kg K_2O/ha through urea, single super phosphate, and murate of potash, respectively. Data collected on the experimental crop's growth, development and quality were tabulated and statistically analyzed as per the standard analysis of variance to draw a valid conclusion.

RESULTS AND DISCUSSION

Weed flora

The major grassy weeds were *Cyperus rotundus* (L.), *Cynodon dactylon* (Pers.) and *Avena fatua* (L.) and broad-leaved weeds were *Medicago denticulate*, *Chenopodium album, Vicia sativa* (L.) and *Anagallis arvensis* (L.) observed in the experimental field. The *Medicago denticulate* was the most dominant weed, with a relative density of 36.90%, followed by *Cynodon dactylon* (18.83%).

Weed density and dry weight

Total Weed density recorded at 60 DAS (Table 1) showed significant influence due to different weed management practices. Among herbicidal applications, the lowest weed density was recorded in the pre-emergence application of pendimethalin at 500 g/ha + imazethapyr at 450 g/ha (4.40/m^2) because it is active in the surface layer of the soil, where it controls annual weeds as they germinate. This treatment is at par with imazethapyrat 450 g/ha + atrazine at 500 g/ha. However, among all the weed control treatments, the lowest weed density was recorded in hand weeding treatment. At the same time, the highest weed density was recorded in the weedy check treatment (7.42/m^2). Herbicidal application with one-hand weeding significantly reduced the total weed density in chickpea (Kumar *et al*., 2014) and other crops (Verma *et al*., 2022).

Significant variation in total weed dry weight was recorded due to different weed-management practices (Table 1). A cursory glance at the data indicated that higher weed dry weight was recorded in the weedy check treatment, while the lowest weed dry weight was recorded in the hand weeding treatment. However, among herbicidal treatments, the application of pre-emergence herbicide pendimethalin at 500 g/ha + imazethapyr at 450 g/ha recorded significantly minimum weed dry weight that established its superiority over other treatments (Chandrakar *et al*., 2015).

Plant height

The application of weed management practices significantly influenced plant height at 60 DAS (Table 1). The highest plant height was observed with the application of pendimethalin at 1000 g/ha (33.62 cm), which is at par with imazethapyrat 450 g/ha + atrazine at 500 g/ha. However, hand weeding recorded the highest plant height among all the weed control treatments and was found superior due to minimal weed competition stress. In comparison, the weedy check recorded the lowest plant height.

Branches per plant

Branches/plants were recorded higher with the hand weeding treatment (Table 1). Moreover, among herbicidal treatments, pendimethalin at 1000 g/ha recorded the maximum branches/ plant (6.33) compared to other treatments. The weed-free environment around a single plant provided more favourable development conditions resulting in better branch expression than other treatments. Minimum branches/plant was observed with weedy check treatment, and Poonia and Pithia (2013) found similar findings.

Root nodules per plant

Data on root nodules/plant presented in Table 2 shows that different weed control treatments significantly affected the number of root nodules/ plants at 60 DAS. The number of root nodules was considerably higher with the application of pendimethalin at 1000 g/ha (18.21), followed by pendimethalin at 500 g/ha + oxyflorfen at 50 g/ha. Among all the weed control treatments, minimum root nodules were recorded with weedy check treatments and maximum root nodules were found under hand weeding treatment.

Dry weight of nodules

Weed control practices significantly influenced Nodules dry weight (Table 2). Pre-emergence application of pendimethalin at 1000 g/ha (0.10 g) and atrazine at 1000 g/ha (0.09 g) resulted in significantly higher nodules dry weight than other treatments. In a weedy check, the lowest dry weight of nodules was recorded. Kumar *et al.* (2015) also recorded higher nodulation number and dry weight under effective weed-management practices in chickpea.

Pods per plant

Complete data analysis revealed a significant variation in the pods/plant (Table 2). Application of

Table 1. Influence of weed control treatments on total density, total dry weight of weeds and growth parameters at 60 DAS.

Treatments	Weed density (No./m^2)	Weed dry weight (g/m^2)	Plant height (cm)	Branches/ plant
Pendimethalin at 1000 g/ha	4.80(22.56)	7.43(54.68)	33.34	6.33
Atrazine at 1000 g/ha	5.15(26.02)	7.25(52.11)	32.67	5.93
Oxyflorfen at 100 g/ha	4.92(23.71)	7.04(49.79)	33.00	6.27
Imazethapyr at 900 g/ha	4.86(23.09)	6.64(43.61)	32.67	5.07
Pendimethalin at 500 g/ha+ oxyflorfen at 50 g/ha	4.80(22.53)	7.04(49.02)	32.33	5.10
Pendimethalin at 500 g/ha+ imazethapyr at 450 g/ha	4.40(18.84)	6.45(41.07)	32.56	6.24
Imazethapyr at 450 g/ha+ atrazine at 500 g/ha	4.57(20.43)	6.81(45.93)	33.33	6.12
Hand weeding (one)	3.21(9.82)	3.78(13.77)	31.34	6.34
Weedy check	7.42(54.55)	8.42(70.38)	30.80	5.06
CD (P=0.05)	0.27	0.42	2.70	0.32

Table 2. 'Influence of weed control treatments on yield attributes and yield of chickpea

Treatments	Root nodules/ plant 60 DAS	Dry weight of nodules 60 DAS	Pods/ plant	Seed yield (kg/ha)
Pendimethalin at 1000 g/ha	18.21	0.10	25.67	1703
Atrazine at 1000 g/ha	14.26	0.09	22.00	1484
Oxyflorfen at 100 g/ha	15.42	0.08	25.00	1556
Imazethapyr at 900 g/ha	13.21	0.09	22.34	1462
Pendimethalin at 500 g/ha+ oxyflorfen at 50 g/ha	17.59	0.08	24.00	1639
Pendimethalin at 500 g/ha+ imazethapyr at 450 g/ha	12.63	0.06	24.23	1608
Imazethapyr at 450 g/ha+ atrazine at 500 g/ha	13.61	0.08	24.67	1502
Hand weeding (one)	19.62	0.12	26.67	1806
Weedy check	12.42	0.06	21.33	1129
CD (P=0.05)	0.59	0.003	1.33	11.27

pendimethalin at 1000 g/ha resulted in significantly higher pods/plant (25.67) over weedy check treatment (21.33). However, hand weeding recorded the highest pods/plant among all the weed control treatments. It was presumably due to higher weed control efficiency and crop growth rate under these treatments. Rathod *et al*. (2017) also reported similar findings.

Seed yield

Seed yield is an important parameter that decides a particular treatment's efficiency and superiority over other treatments. Seed yield varied significantly due to different weed control treatments (Table 2). Application of pre-emergence herbicide, i.e., pendimethalin at 1000 g/ha, recorded significantly higher seed yield (1703 kg/ha) over other weed management treatments. The lowest seed yield was observed in the weedy check treatment. However, hand-weeding treatment recorded the highest seed yield. The higher yields under hand weeding might be due to the early removal of weeds from the crop, minimized crop weed competition creating a weed-free environment (Yadav *et al*., 2018).

CONCLUSION

It is concluded that pendimethalin at 500 g/ha + imazethapyr at 450 g/ha can be used in chickpea to control weeds effectively. While, pendimethalin at 1000 g/ ha could be applied to enhance seed yield and productivity.

ACKNOWLEDGEMENTS

The author(s) gratefully acknowledge the Department of Agronomy, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (MP) for providing the research facilities to carry out this research.

REFERENCES

Chandrakar, Shiv, Sharma, Akanksha and Thakur, Dinesh Kumar, 2015. Effect of chickpea (*Cicer arietinum* L.) varieties and weed management practices on quality parameters, nutrient content and uptake by crop and weed. *International Journal of Agricultural Sciences*. 11(2): 217-220.

Chaudhary, B.M., Patel, J.J. and Delvadia, D.R. 2005. Effect of weed management practices and seed rates on weeds and yield of chickpea. *Indian Journal of Weed Science*. 37(3&4): 271-272.

Chopra, N., Chopra, N.K. and Singh, H.P. 2003.Loss in seed yield and quality due to weed stress in chickpea (*Cicer arietinum* L.). *Indian Journal of Agricultural Sciences*.73 (6): 350-351.

Kumar,Narendra, Hazra, K.K., Yadav, S.L. and Singh, S.S. 2015. Weed dynamics and productivity of chickpea (*Cicer arietinum*) under pre- and post-emergence application of herbicides. *Indian Journal of Agronomy*. 60 (4): 570-575.

Kumar, N., Nandal, D.P. and Punia, S.S. 2014. Weed management in Chickpea under irrigated condition. *Indian Journal of Weed Science*. 46(3): 300-301.

Ministry of Agriculture.2013. Agricultural Statistics at a Glance, Directorate of Economics and Statistics, Government of India, New Delhi.

Poonia, T.C. and Pithia, M.S. 2013. Pre and post emergence of herbicides for weed management in chickpea. *Indian Journal Weed Science*. 45(3): 223-225.

Rathod, Pandit S., Patil, D.H. and Dodamani, B.M. 2017. Integrated weed management in chickpea (*Cicer arietinum* L.) under rainfed conditions of Karnataka, India. *Legume Research*. 40(3): 580-585.

Rupareliya, V.V., Chovatia, P.K., Vekariya, S.J. and Javiy, P.P. 2018. Evaluation of pre and post emergence herbicides in chickpea (*Cicer arietinum* L.). *International Journal of Chemical Studies*. 6(1):1662-1665.

Singh, G. and Singh, D. 1992. Weed-crop competition studies in chickpea (*Cicer arietinum* L.). *Indian Journal of Weed Sciences*. 24(1&2) : 1-5.

Verma, Badal, Bhan, Manish, Jha, A.K., Singh, Vikash, Patel, Rajendra, Sahu, M.P. and Kumar, Vijay, 2022. Weed management in direct-seeded rice through herbicidal mixtures under diverse agroecosystems. *AMA, Agricultural Mechanization in Asia, Africa and Latin America*. 53(4): 7299-7306.

Yadav, Vijay Laxmi, Shukla, U.N., Raiger, P.R. and Mandiwal, Mukesh, 2019. Efficacy of pre and post-emergence herbicides on weed control in chickpea (*Cicer arietinum* L.). *Indian Journal of Agricultural Research*. 53(1): 112-115.