Journal of Rural Advancement
[ISSN: 2347-2561 (P); 2583-6102 (E)]
Vol. 10, Issue 02, October, 2022

Weed dynamics, weed control efficiency, crop growth and yield attributes of chickpea in response to chemical weed management

Devrani Gupta, Dinesh Sah, A. H. Kalhapure, Deo Kumar* and G. S. Panwar

Department of Agronomy

*Department of SSAC,
Banda University of Agriculture and Technology, Banda (U.P.) India

Abstract

A field experiment was conducted at the Research Farm of the College of Agriculture, Banda University of Agriculture and Technology, Banda. The climate of this region is typically semi-arid, characterized by extremes of temperatures during both summers and winters. The experiment was conducted in a randomized complete block design (RCBD) with 10 treatment combinations of pre and post-emergence herbicides. Among herbicides pre-emergence application of Imazethapyr 40g alone or in combination with pendimethalin or oxyfluorfen significantly reduced weed density, and weed dry weight and proved efficient in managing sedge weeds. The highest weed control efficiency recorded at all three stages of crop growth was associated with Pendimethalin 1000g PE fb Imazethapyr 40g PoE. Application of Pendimethalin 1000g PE fb Quizalofop-ethyl 50g PoE markedly influenced the yield and yield attributes of chickpea.

Key words: Chemical Weed Management, Weed Dynamics, Chickpea, Growth, Yield Attributes

Introduction

Pulse owe important and diverse role in farming system as well as in the human diet in several developing and developed countries. Pulses contribute substantially to food production system by enriching the soil through biological nitrogen fixation and improving soil physical conditions. Among the grain legumes, chickpea (*Cicer arietinum* L.) is an important and unique food legume. Chickpea (*Cicer arietinum* L.) is one of the most important *rabi* (winter) pulse crop of India and occupies first position among the pulses. In India it is grown on acreage of 10.17 million hectares and producing 11.35 million tones with productivity of 1116 kg ha^{-1} during 2019-20. In Uttar Pradesh, chickpea is successfully cultivated on an area of 0.62 M ha with productivity of 1371 kg ha^{-1} (Anonymous, 2020).

In spite of the significance of this crop in human and animal diet average productivity of the crop in Uttar Pradesh and Bundelkhand region is low. The low productivity of this crop is due to various biotic and abiotic stresses. Among the various biotic stresses, weeds are the major one which causes severe yield loss in pulses. Due to initial slow growth of pulses, weeds emerge first and gain competitive advantage over the crop and exhibit smothering effect on crop. The early emergence and fast growth of the

weeds lead to severe crop-weed competition for resources. Crop weed competition causes heavy reduction in growth and yield of chickpea and lessens the profitability Chopra *et al.,* (2003). About 40-45% reduction in yield of chickpea due to severe infestation of weeds is estimated Chaudhary *et al.,* (2005). The yield reduction due to weed invasion varied with the crop, weed density, critical period of crop weed competition, crop management and agro climatic conditions. The initial 60 days period considered too critical for weed crop competition in chickpea Singh and Singh (2000), but continuously facing of the scarcity of labour and increase in labour cost, manual weed control has become a difficult task. Introduction of new molecules of herbicides has made it possible to control a wide spectrum of weeds in chickpea effectively at a remunerative cost. Keeping these facts in view, an investigation was under taken to test the performance of pre and post-emergence herbicides either alone or in combination in chickpea.

Materials and methods

Field experiment was conducted at Research Farm of College of Agriculture, Banda University of Agriculture and Technology, Banda, Uttar Pradesh. The research farm of College of Agriculture, Banda University of Agriculture and Technology, Banda (U.P) is situated between Latitudes 24° 53′ and 25° 55′ N and Longitudes 80° 07′ and 81° 34′ E and having an altitude of 168m above mean sea level. The climate of this region is a typically semi-arid, characterized by extremes of temperatures during both summers and winters. All together crop during growing season received 47.1 mm rainfall in 4 rainy days. The soil of experimental field was silty clay (Inceptisols) shallow, flat, well drained and moderately fertile, being low in available organic carbon, phosphorus and high in potassium and sulphur.

Field experiment was conducted in randomized block design (RBD) with 10 treatments (Weedy check, weed free upto 60 DAS, Pendimethalin 1000g Pre emergence + 1HW, Oxyfluorfen 100g Pre-emergence +1 HW, Imezathapyr 40g 20 DAS as Post emergence, Quizalofop-ethyl 50g 25 to 30 DAS as Post emergence, Pendimethalin 1000g Pre emergence fb Imezathapyr 40g Post emergence, Pendimethalin 1000g Pre-emergence fb Quizalofop-ethyl 50g Post-emergence, Oxyfluorfen 100g Pre-emergence fb Imezathapyr 40g Post emergence, Oxyfluorfen 100g Pre emergence fb Quizalofop-ethyl 50g Post emergence. Chickpea variety JG 14 was used for sowing at spacing of 30x10 cm in 1st week of November 2019 by following standard agronomic practices. Treatments like pre-emergence herbicides were applied next day after sowing whereas post-emergence herbicides were applied 20 and 25 DAS as per treatment by using a Knapsack sprayer fitted with flat fan nozzle. Observations recorded as per need on weed and crop.

Results and discussion

In experimental field all together 10 major weeds observed (Table 1). The important weed species that were found to infest the experimental field were *Cynodon dactylon*, *Cyperus rotundus, Eclipta alba, Digera arvensis, Chenopodium album*, *Anagalis arvensis*, *Chenopodium murale*, *Euphorbia dracunculoides*, *Asphodelus tenuifolius* and *Vicia sativa*. Survey of the experimental field exposed that weedy check plots were heavily invaded by *Cyperus rotundus* (116.3 m^{-2}) followed by broad leaved weeds (29.3 m^{-2}) and *Cynodon dactylon* (4.3 m^{-2}). Among several broad leaf weeds *Eclipta alba* observed in majority. Other broad leaf weeds were *Digera arvensis, Chenopodium album*, *Anagalis arvensis*, *Chenopodium murale*, *Euphorbia*

dracunculoides, *Asphodelus tenuifolius* and *Vicia sativa*. Density of *Eclipta alba* dominating weed species among broad leaves efficiently suppressed by application of Imazethapyr, Pendimethalin and Oxyfluorfen alone or in combination.

Among three categories of weeds were present in experimental field sedges were in majority followed by BLWs and NLWs. Similar observations also reported by Kumar *et al*., (2015). Density of broad-leaved weeds reduced significantly by application of Pendimethalin 1000g PE *fb* Imazethapyr 40g PoE (T_7) similarly drastic reduction in density of grassy weeds noted when herbicide Quizalofop-ethyl 50g PoE (T_6) applied during 20-25 DAS. At harvest number of *Cyperus rotundus* were 29.7, 31 and 32.7 m^{-2} under weed control treatments *viz* Pendimethalin 1000g PE *fb* Imazethapyr 40g PoE (T_7), Imazethapyr 40g PoE (T_5) alone and Oxyfluorfen100g PE *fb* Imazethapyr 40g PoE (T_9), respectively proved efficient in managing of sedge weeds (Table 2). Marked difference was observed in total weed density (m^{-2}) with various weed control measures. Among the herbicidal treatments lowest total weed density (37 m^{-2}) was observed with the application of Pendimethalin 1000g PE *fb* Imazethapyr 40g PoE (T_7) which was found on par to Oxyfluorfen100g PE *fb* Imazethapyr 40g PoE (T_9) and significantly superior over rest of the treatments. This might be due to its broad-spectrum control. The mode of action of Imazethapyr inhibits ALS or AHAS enzymes responsible for the synthesis of three branched chain amino acids such as leusine, isoleusine and valine. Similarly, pre and post emergence application of herbicides found effective against grassy weeds.

Weed dry weight produced under weed free condition was lowest (2.6g) while it was highest (31.2g) under weedy check condition. Among the herbicidal treatments the lowest weed dry weight (10.0 g) was recorded with the application of Pendimethalin 1000g PE *fb* Imazethapyr 40g PoE (T_7) which was statistically at par with Pendimethalin 1000g PE *fb* 1 HW (T_3), Pendimethalin 1000g PE *fb* Quizalofop-ethyl 50g PoE (T_8) and Oxyfluorfen100g PE *fb* Imazethapyr 40g PoE (T_9) and found significantly superior over rest of the treatments (T_4, T_5, T_6 and T_{10}). Difference in weed dry weight was as per control exerted by several treatments on weeds. Accumulation of poor dry matter of weeds due to reduced weed density through effective destruction of weeds. On the other hand, inhibition of germination and growth of weeds following application of different herbicides might have reduced the weed growth through arresting different metabolic activities and thus causing mortality of weeds and ultimately reducing weed dry weight.

Among the different weed management practices, highest weed control efficiency of 100% at 60 DAS, 93.9 % at 90 DAS and 91.6 % at harvest, observed with the treatment T_2 (weed free). Among several herbicidal treatments maximum weed control efficiency at all the stages of crop growth observed with T_7 (Pendimethalin 1000g PE *fb* Imazethapyr 40g PoE) which was closely followed by T_3 (Pendimethalin 1000g PE *fb* 1 HW) at 60 and 90 DAS and at harvest. It is evident from the data that with advancement of crop stage weed control efficiency decreased gradually. At 60 DAS and 90 DAS maximum WCE was 77.4 % noticed under it was observed significantly superior over rest of the treatments. Maximum WCE 76.5, 73.2 and 68.0 % obtained under Pendimethalin 1000g PE *fb* Imazethapyr 40g PoE (T_7) which was statistically on par with Pendimethalin 1000g PE *fb* 1 HW (T_3) and Pendimethalin 1000g PE *fb* Quizalofop-ethyl 50g PoE (T_8). This is due to eliminations of all types of weeds either by hand weeding or application of herbicides in these treatments. This is well proven

fact that as weed dry weight decreased weed control efficiency increased. Treatment which gave poor weed control efficiency produced more weed dry weight than other treatments.

Among the different weed management practices, taller plant (39.3cm), maximum number of branches (6.6 nos.) and higher dry matter accumulation (19.5g/plant) was associated with Pendimethalin 1000g PE *fb* Quizalofop-ethyl 50g PoE (T_8). The increase in growth character under Pendimethalin 1000g PE *fb* Quizalofop-ethyl 50g PoE treated conditions might be attributed due to the reduction in crop weed competition, reduced nutrient removal by weeds and provides better environment for growth and development of crop. Vivek *et al.,* (2008) was of the opinion that reduced crop weed competition leads to enhanced growth attributes.

Various weed control parameters exert marked influence on number of pods per plant (31.6 nos.), seeds per pod (1.2 nos.) and higher seed index (25g) while influence was non-significant. Higher value of seed /pod and test weight was associated with T_2 (Weed Free) and T_8 (Pendimethalin 1000g PE *fb* Quizalofop-ethyl 50g PoE) while minimum with weedy check. The efficient weed control measures reduced weed density and biomass resulting in improvement of yield related traits. Many reports support such role of herbicide application in improving the yield related traits through efficient weed management Chander *et al.,* (2014).

References

Anonymous. 2020. *Pocket book of Agricultural Statistics 2020*. Directorate of Economics and Statistics, Department of Agriculture Co-operation and Farmers' Welfare, Ministry of Agriculture and Farmers' Welfare, Govt. of India, New Delhi 2020.

Chander N, Kumar S, Rana S S and Ramesh. 2014. Weed competition, yield attributes and yield in soybean- wheat cropping system as affected by herbicides. *Indian J. Agronomy* **59**(3): 377-384.

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 Sciences* **37**: 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 N, Hazra K K, Yadav S L and Singh S S. 2015. Weed dynamics and productivity of chickpea under pre and post emergence application of herbicides. *Indian J. Agronomy* **60**(4): 570-575.

Singh S and Singh A N. 2000. Crop-weed competition in chickpea: Challenges and strategies for the New Millenium. *In National Symposium on Agronomy*, p 199. Nov 15-18, GAU Campus, Junagadh.

Vivek R, Singh N S and Tomar S S. 2008. Effect of weed interference on weeds and productivity of black gram. *Indian J. of Weed Science* **40** (1&2): 65-67.