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BS Parihar
Subject Matter Specialist Agronomy, Krishi Vigyan Kendra, Kawardha, Chhattisgarh, India

BP Tripathi
Senior Scientist & Head, Krishi Vigyan Kendra, Kawardha, Chhattisgarh, India

PK Sinha
Krishi Vigyan Kendra, Kawardha, Chhattisgarh, India

Corresponding Author:
BS Parihar
Subject Matter Specialist Agronomy, Krishi Vigyan Kendra, Kawardha, Chhattisgarh, India

Assessment of chemical weed management in chickpea (*Cicer arietinum* Linn.)

BS Parihar, BP Tripathi and PK Sinha

Abstract
Pulses are an integral part of Indian Agriculture. The Chickpea is an annual legume of the family Fabaceae. It contains 18-22 per cent high quality protein. There are several constraints in the Chickpea one of them is weeds which often poses serious problem. Labour saving and eco-friendly weed management technology in Chickpea, which includes herbicides, can prove more economical and beneficial. Weed management by pendimethalin 30EC @1000g a.i./ha at 2 DAS found superior for Yield, Weed control efficiency, Gross return, Net return and benefit :cost ratio over No use of herbicide with Delayed manual weeding and weed management by Oxyfluorfen 23.5EC @ 125g a.i./ha at 2 DAS. In the *Vertisol* of Chhattisgarh.

Keywords: Chickpea, weed management, pendimethalin, oxyfluorfen etc.

Introduction
Chickpea is an important *Rabi* season pulse crop and a key source of protein. Besides rich source of proteins, pulses are not only important for sustainable agriculture enriching the soil through biological nitrogen fixation but also fit in the various cropping system without disturbing the main crop. Chickpea can fix up to 140 kg nitrogen/ha. In a growing period (Poonia and Pithia 2013). In Chhattisgarh Chickpea is cultivated in 393.78 thousand ha area with average productivity of 1100kg/ha (Anonymous. 2013-14) [1]. Chickpea occupies 85160 ha in *Rabi* season with the average productivity of 1175 kg/ha In the Kabirdham district of Chhattisgarh. Weed management is essential for any current system of agricultural production. Weed competes with crop plants for moisture, nutrients, light and space. In addition, they are also serve as an alternate host for several insect pests and pathogens. Meanwhile, weeds are considered the number one problem in all major Chickpea producing area. Even with advanced technologies, producers note high losses due to interference by weeds. Chickpea is a poor weed competitor to weeds because of slow growth rate and limited leaf development at the early stage of crop growth and establishment, if weed management is neglected under these conditions resulting in yield loss of 40 to 87 percent (Solh and Pala 1990; Chaudhary *et al*. 2005) [6, 2]. 30 to 60 days period considered to be the critical for crop-weed completion in chickpea (Kumar and Singh 2010) [3]. Timely weed management plays an important role in successful cultivation of the crop.
Generally, for the weed management, farmer do Manual weeding, but the manual weed management is always laborious, expensive, time consuming, uneconomical and needs to be often repeated at different intervals, as compared to chemical weed management. Weed management with herbicides is an effective, quick in action and time saving (Ahmed *et al*. 2005). The per unit yield of the crop can improve with adoption of effective weed control methods.

Materials and Methods
The experiment was conducted during *Rabi* season of 2016-17&2017-18 in the field of four farmers of Kabirdham district of Chhattisgarh. The experiment was conducted on *Vertisols*. *Vertisol* is fine and belongs to the sub-group *chromustert*. Experimental soil, locally known as Kanhar, was clayey. It is dark in colour, heavy clay (50-55%) whose colour ranges from light to dark brown in the surface layer and brown to brownish black in the deeper layer. Lime concretions are usually present. Soil is neutral in reaction. Experiment consists of four replication and three treatments. Treatment first (T_1) was farmers practice i.e. delayed manual weeding, treatment second (T_2) was Spray of Pendimethalin 30EC @1000g a.i. /ha, at 2 DAS and treatment third (T_3) was spray of Oxyfluorfen 23.5EC @ 125g a. i. / ha at 2 DAS. The weed counting was done at randomly selected spots by using the quadrate. The crop from each

plot was harvested separately. The seeds were separated from straw by threshing. The weight of seeds was recorded and expressed in q $ha^{-1.}$ Cost of production for all treatments was worked out on the basis of the prevailing input and market price of the produce. The net return ha^{-1} was calculated by deducting the cost of production $ha^{-1}$from the gross return ha^{1}. Ultimately, net return per rupees (cost: benefit ratio) invested was calculated treatment wise to assess the economic impact of the treatments by dividing the net return $ha^{-1}$by the cost of production.

Result and Discussion

The recorded data are presented in table-1. The maximum seed yield (15.36q/ha^{-1}) was obtained under treatment weed management by Pendimethalin 30EC @1000g a.i. /ha, at 2 DAS. The lowest seed yield was recorded under treatment no use of herbicide with Delayed manual weeding. The increase in yield under Pendimethalin 30EC @1000g a.i. /ha, at 2 DAS was due to proper utilization of moisture, nutrients, sunlight and space by the chickpea crop in the absence of weed competition. Better weed management also resulted in greater translocation of food materials to the reproductive parts and reflected in superiority of yield attributing characters and ultimately to higher yield. Similar results were also noted by Singh and Mukherjee (2009) [4] & Singh *et al.* (2011) [5]. The lower seed yield (12.45q/ha^{-1}) with No use of herbicide with Delayed manual weeding might be also due to higher weed interference. The lower weed population and higher weed control efficiency also resulted in higher grain yield.

Major weeds in the experimental fields are *Medicago denticulata, Convolvulus arvensis, Chenopodium album, Melilotus indica and Anagallis arvensis.* Maximum weed density of these weeds was observed throughout the period of investigation under No use of herbicide with Delayed manual weed. Pendimethalin 30EC @1000g a.i. /ha, at 2 DAS was found more effective in reducing weed density of weeds than other treatments.

Economics of chickpea production in terms of net return and benefit cost ratio was calculated for as presented in table-1.The data reveals that the maximum net return(Rs.39090ha^{-1}) and benefit: cost ratio (2.75) was obtained under Pendimethalin 30EC @1000g a.i. /ha, at 2 DAS

Table 1: The data reveals that the maximum net return

Treatment	Yield (q ha^{-1})			% change in Yield			Parameter* (No. of Weed/$m^{2)}$			Net Income Rs/ha			B:C Ratio		
No use of herbicide, Delayed manual weeding	12.35	12.55	12.45	-	-	-	51	48	49.50	26070	26800	26435	2.11	2.14	2.13
Pendimethalin 30EC @1000g a.i. /ha, at 2 DAS	14.96	15.75	15.36	21.13	25.50	23.37	16	14	15	37090	41050	39090	2.63	2.87	2.75
Oxyfluorfen 23.5EC @ 125g a. i. / ha at 2 DAS	13.61	14.10	13.86	10.20	12.35	11.32	20	18	19	31700	37720	32750	2.40	2.49	2.44

Conclusion

The treatment Use of Pendimethalin 30EC @1000g a.i. /ha, at 2 DAS for weed management in chickpea showed promising effect on minimum weed density, highest weed control efficiency, highest yield, economical return in terms of net return and benefit: cost ratio.

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