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Aman Kumar
Research Scholar, Department of Agriculture (Agronomy), Faculty of Agriculture and Veterinary Sciences, Mewar University, Chittorgarh, Rajasthan, India

Bhagwan Suman
Assistant Professor, Faculty of Mewar University, Chittorgarh, Rajasthan, India

Rajendra Bairwa
Assistant Professor, Faculty of Mewar University, Chittorgarh, Rajasthan, India

Falguni Chaturvedi
Assistant Professor, Faculty of Mewar University, Chittorgarh, Rajasthan, India

Manohar Lal Meghwal
Assistant Professor, Faculty of Mewar University, Chittorgarh, Rajasthan, India

Corresponding Author:
Aman Kumar
Research Scholar, Department of Agriculture (Agronomy), Faculty of Agriculture and Veterinary Sciences, Mewar University, Chittorgarh, Rajasthan, India

The effect of integrated weed management on growth and yield of chickpea (*Cicer arietinum* L.) in sub humid zone of Rajasthan

Aman Kumar, Bhagwan Suman, Rajendra Bairwa, Falguni Chaturvedi and Manohar Lal Meghwal

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Abstract
A field experiment was conducted at Research Farm of Mewar University, Chittorgarh (Rajasthan) during *rabi* season, 2024-25 on loamy sand soil, which consisted nine treatments *viz*., weedy check-T_1, Weed free-T_2, one hand weeding 25 DAS-T_3, Oxyfluorfen 100 g a.i./ha Pre emergence-T_4, Oxyfluorfen 100 g a.i./ha Pre emergence+one hand weeding 25 DAS T-$_5$, Imazethapyr 50 g a.i./ha Post emergence (25 DAS) T-$_6$, Imazethapyr 50 g a.i./ha 25 DAS + one hand weeding 50 DAS T-$_7$, Oxyfluorfen 100 g a.i./ha Pre emergence + Imazethapyr 50 g a.i./ha 25 DAS T-$_8$ and Oxyfluorfen 100 g a.i./ha Pre emergence + Imazethapyr 50 g a.i./ha 25 DAS + one hand weeding 50 DAS T-$_9$ in randomized block design (RBD). The chickpea *var*. RSG-888 was used for experiment.
Results clearly showed that application of weed free (T_2) significantly increased plant height, number of branches plant^{-1}, number of pods plant^{-1} and seed yield of chickpea as compare to rest of the treatments and statistically being at par with Oxyfluorfen 100 g a.i./ha Pre emergence + Imazethapyr 50 g a.i./ha 25 DAS + one hand Weeding 50 DAS (T_9) whereas lowest value recorded under control.

Keywords: Chickpea, weed, yield, herbicides

Introduction
Pulses stand a strategic position in the agriculture economy of our country. They contain high percentage of quality protein three times more than cereals. Pulses contain vitamin B, minerals and also contain a certain quality fiber, which is desirable in human diet because of medical consideration. Pulse crops enrich the soil through symbiotic nitrogen fixation from atmosphere. Besides being a rich source of protein, they maintain soil fertility through biological nitrogen fixation in soil and thus, play a vital role in sustainable agriculture. The World Health Organization recommends a per capita consumption of pulses at 80 g/day and the Indian Council of Medical Research (ICMR) has recommended a minimum consumption of 40 g/day. It has a wide range of adaptability due to short growth period, high tonnage capacity and outstanding nutritional values of food, feed and forage (Patel *et al*., 2020) [9]. Among the various constraints to low productivity of chickpea, inadequate use of fertilizers and lack of improved package of practices are important.
Chickpea (*Cicer arietinum* L.) is an important grain legume in Asia. Being a rich and cheap source of protein, it can help people to improve the nutritional quality of their diet. Chickpea is relatively of minor importance on the world market but it is extremely important for local trade in numerous tropical and subtropical regions. It is grown and consumed in large quantities from South East Asia to India and in the Middle East and Mediterranean countries. Chickpea is the third most important pulse crop in the world after French bean (*Phaseolus vulgaris* L.) and field peas (*Pisum sativum* L.).
Weed infestation is one of the major biotic factor which is limiting growth and productivity of chickpea crop. Yield reduction in chickpea ranges from 35% to 80% (Raman and Krishnamoorthy 2005) [11] depending on the type and weed flora associated with the crop. Integrated weed management (IWM) in chickpea is essential for minimizing weed competition during the early growth stages, which can significantly reduce yield. A combination of cultural, mechanical, and chemical methods is employed for effective weed

control. Practices such as timely sowing, use of clean seeds, narrow row spacing, and one or two intercultivations are effective. Herbicides like pendimethalin (pre-emergence) and imazethapyr (post-emergence) have also shown promising results when integrated with manual weeding. Studies have shown that integrated approaches significantly improve yield and weed control efficiency compared to individual methods (Tiwari *et al*., 2015) [14].

Materials and Methods

The field experiments were carried out during *rabi* season (2024-25) to study the "The effect of integrated weed management on growth and yield of chickpea (*Cicer arietinum* L.) in sub humid zone of Rajasthan" in randomized block design (RBD) with consisted nine treatments *viz*., weedy check-T_1, Weed free-T_2, one hand weeding 25 DAS-T_3, Oxyfluorfen 100 g a.i./ha Pre emergence-T_4, Oxyfluorfen 100 g a.i./ha Pre emergence+one hand weeding 25 DAS T-$_5$, Imazethapyr 50 g a.i./ha Post emergence (25 DAS) T-$_6$, Imazethapyr 50 g a.i./ha 25 DAS + one hand weeding 50 DAS T-$_7$, Oxyfluorfen 100 g a.i./ha Pre emergence + Imazethapyr 50 g a.i./ha 25 DAS T-$_8$ and Oxyfluorfen 100 g a.i./ha Pre emergence + Imazethapyr 50 g a.i./ha 25 DAS + one hand weeding 50 DAS T-$_9$ at Research Farm, Mewar University, Chittorgarh (Rajasthan). The experimental farm is geographically located at 075º88'99" E longitude and 26º81'17" N latitude and this region falls under agro-climatic zone IV A of Rajasthan. The experimental fields were clay loam and the soil fertility status contained available nitrogen (137.8 kg ha^{-1}) by Subia and Asija 1996, available phosphorus (16.3 kg ha^{-1}) by Olsen *et al*. 1954 and available potassium (250.12 kg ha^{-1}). The organic carbon content was from 0.34-0.38 percent. The weekly mean maximum and minimum temperatures were of temperature during both summers (40.6° C) and winters (2.7° C). The mean relative humidity fluctuated from 63.50 to 91 percent during the crop season. The average rainfall is 557 mm per annum, which is mostly received during july to september. The sporadic showers during winters are also common, which are probably observed during this period. The observation were recorded at harvest was analysed by statistical methods (Fisher, R.A. 1950) [3].

Result and Discussion

It is clear from the result of present study that, weed free (T_2) significantly increased plant height (48.32 cm), number of branches/plant (9.6) at harvest which being statistically at par with Oxyfluorfen 100 g a.i./ha Pre emergence + Imazethapyr 50 g a.i./ha 25 DAS T-$_8$. Whereas, lowest value of were recorded under check weed (T_1). This indicates that the sequential use of herbicides in combination can effectively suppress weed competition and support crop growth almost equivalent to manual weeding or completely weed-free conditions. These results align with the findings of Patel *et al*. (2013) [10], who reported that a combination of pre- and post-emergence herbicide application in chickpea resulted in better growth parameters due to prolonged weed control during the critical growth period. Similarly, Singh and Singh (2017) [12] also demonstrated that integrated weed management approaches involving herbicides significantly improved plant height and branching in chickpea, attributing it to reduced crop-weed competition for nutrients, water, and light. The poor growth observed under the weedy check (T_1) treatment highlights the adverse impact of uncontrolled weed infestation, which hampers resource availability to the crop. This is consistent with observations by Kumar *et al*. (2018) [6], who noted substantial reductions in chickpea growth under untreated weedy conditions. The comparable performance of the herbicide-based integrated treatment (T_8) to the weed-free check demonstrates the potential of IWM to serve as an effective and labor-saving alternative to manual weeding, especially under labor-scarce conditions. Such approaches not only ensure effective weed control but also promote sustainable and economically viable chickpea production.

Further; yield parameters *viz*., number of pods $plant^{-1}$ (35.7), seed yield (24.8 q/ha) of chickpea significantly higher recorded under weed free plot (T_2) which being statistically at par with Oxyfluorfen 100 g a.i./ha Pre emergence + Imazethapyr 50 g a.i./ha 25 DAS T-$_8$. Whereas lowest value of both were registered under control (T_1). This indicates that effective weed control throughout the crop growth period plays a critical role in enhancing reproductive efficiency and final yield in chickpea. The increase in yield attributes under weed-free and herbicide-treated plots may be attributed to the reduction in crop-weed competition, which ensures better availability of nutrients, moisture, and sunlight to the crop during critical growth stages. These findings are in close conformity with Yadav *et al*. (2015) [15], who observed significantly higher pod numbers and seed yield in chickpea under integrated weed management systems compared to untreated controls. Jat *et al*. (2014) [5] also reported that sequential application of pre- and post-emergence herbicides can improve yield traits by maintaining a relatively weed-free environment during the critical period of crop-weed competition.On the other hand, the lowest number of pods per plant and seed yield were observed under weedy check (T_1), highlighting the substantial yield losses incurred due to uncontrolled weed growth. Similar trends were reported by Kumar *et al*. (2016) [7], who found that chickpea yields were reduced by over 50% under unweeded conditions, primarily due to excessive competition from dominant weed flora such as *Chenopodium album* and *Phalaris minor*. The comparable performance of the integrated herbicide treatment (T_8) with the weed-free check emphasizes the potential of herbicide-based weed management as a viable and efficient alternative to manual weeding, especially in large-scale or mechanized chickpea cultivation systems.

Table 1: Effect of weed management practices on growth parameters at harvest of chickpea

Treatments	Growth parameters	
	Plant height (cm)	**Number of branches/plant**
T_1:Control (Weedy check)	39.22	5.8
T_2:Weed free	48.32	9.6
T_3:One hand weeding 25 DAS	41.20	6.4
T_4:Oxyfluorfen100 g a.i./ha Pre emergence	40.00	6.8
T_5:Oxyfluorfen100 g a.i./ha Pre emergence + one Hand weeding 25 DAS	44.41	7.7

T_6:Imazethapyr 50 g a.i./ha Post emergence (25 DAS)	41.50	7.3
T_7:Imazethapyr 50 g a.i./ha 25 DAS + one hand Weeding 50 DAS	45.20	8.8
T_8:Oxyfluorfen100 g a.i./ha Pre emergence + Imazethapyr 50 g a.i./ha 25 DAS	42.40	8.3
T_9:Oxyfluorfen100 g a.i./ha Pre emergence + Imazethapyr 50 g a.i./ha 25 DAS + one hand Weeding 50 DAS	47.70	9.3
SEm±	1.61	0.29
CD (P=0.05)	4.64	0.84
CV(%)	10.08	9.34

Table 2: Effect of weed management practices on yield parameters at harvest of chickpea

Treatments	Yield parameters	
	Number of pods/ plant	Seed yield (q/ha)
T_1:Control (Weedy check)	29.8	12.3
T_2:Weed free	35.7	24.8
T_3:One hand weeding 25 DAS	31.5	15.2
T_4:Oxyfluorfen100 g a.i./ha Pre emergence	31.0	14.6
T_5:Oxyfluorfen100 g a.i./ha Pre emergence + one Hand weeding 25 DAS	32.9	17.2
T_6:Imazethapyr 50 g a.i./ha Post emergence (25 DAS)	32.7	16.1
T_7:Imazethapyr 50 g a.i./ha 25 DAS + one hand Weeding 50 DAS	35.0	22.6
T_8:Oxyfluorfen100 g a.i./ha Pre emergence + Imazethapyr 50 g a.i./ha 25 DAS	32.8	19.1
T_9:Oxyfluorfen100 g a.i./ha Pre emergence + Imazethapyr 50 g a.i./ha 25 DAS + one hand Weeding 50 DAS	35.4	23.7
SEm±	1.27	0.70
CD (P=0.05)	3.68	2.02
CV(%)	8.09	9.23

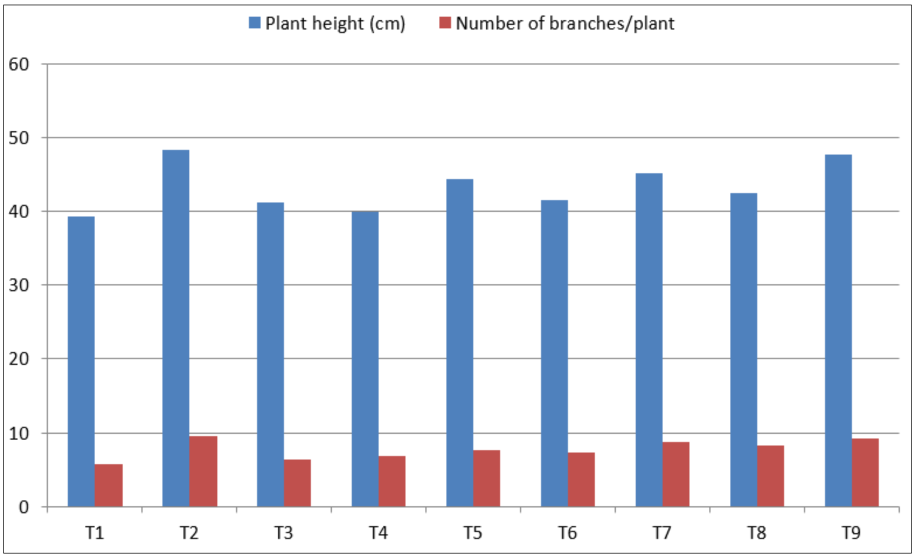

Table 1: Effect of weed management practices on growth parameters at harvest of chickpea

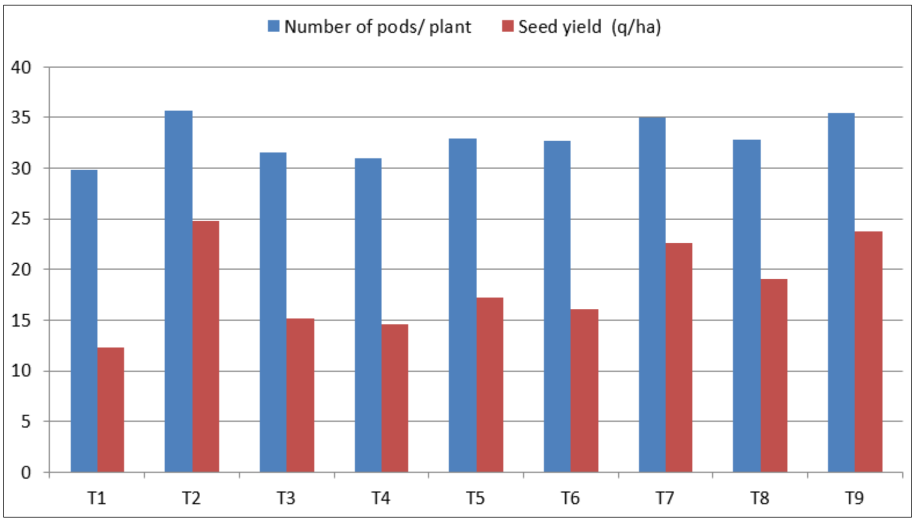

Table 2: Effect of weed management practices on yield parameters at harvest of chickpea

Conclusion
Based on the results of one year experimentation, it may be concluded that the Application of Oxyfluorfen 100 g a.i./ha Pre emergence + Imazethapyr 50 g a.i./ha 25 DAS T_8 found suitable to produce good yield of chickpea.

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