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Effect of pre-emergence herbicide Flurochloridone on growth, yield and yield attributes of chickpea (*Cicer arietinum* L.)

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Abstract

A field experiment entitled "Effect of pre-emergence herbicide Flurochloridone on growth, yield and yield attributes of chickpea (*Cicer arietinum* L.)" was carried out during *Rabi* season of year 2019-20 and 2020-21 at Farm B of College of Agriculture, Ganjbasoda, Vidisha (M.P.). Experiment was carried out with six treatments *viz.*, T₁- Flurochloridone 20% CS @ 500 g a.i/ha, T₂- Flurochloridone 20% CS @ 625 g a.i/ha, T₃- Flurochloridone 20% CS @ 750 g a.i/ha, T₄- Pendimethalin 30% EC @ 1000 g a.i/ha, T₅- Weed free check and T₆- Weedy respectively laid out in randomized block design with four replication. The objective of the study was to find out the effect of Flurochloridone on growth and yield of chickpea. The application of Flurochloridone 20% CS @ 750 g a.i/ha as pre-emergence recorded significantly highest values of seed and straw yield and it was at par with Flurochloridone 20% CS @ 625 g a.i/ha during the both years. A similar trend was also found in growth parameters *viz.* plant height, no. of branches/plant, dry weight/plant and yield attributes *viz.* pods/plant, seeds/pods, seed index, harvest index under study.

Keywords: Pre emergence, herbicide, flurochloridone, growth, yield, chickpea

Introduction

Chickpea (*Cicer arietinum* L.) is an important vegetable protein (20–25%) and a good source of dietary fibre, starch, minerals and vitamins. It is typically low in fat, contains no cholesterol and is high in iron, potassium and magnesium. It is the second most crop, after soybean in India providing high-quality proteins for human and animal nutrition. Madhya Pradesh is ranked first amongst chickpea growing states of the India covering an area of about 1.93 million ha with production of 2.48 million tons and productivity 1288 kg/ha (Anonymous, 2021) ^[1]. Chickpea has the capacity to fix the atmospheric nitrogen up to 180 kg ha⁻¹ to the soil and play an important role in sustaining soil productivity (Baldev *et al.*, 1988) ^[2]. In India and Madhya Pradesh, its cultivation is mainly restricted to less fertile/marginal soil under rainfed conditions, higher weed infestation, effect of weather aberrations, lack of integration of nutrient supply sources, not utilizing the proper biofertilizer etc. which are major constraints for higher productivity. Weeds are the most underestimated form of biotic stress in agriculture and cause significant reduction up to 75% in chickpea yield (Bankoti *et al.*, 2021) ^[3]. Thus, management of weeds is nowadays observed as most remunerative practice in chickpea production to get guaranteed maximum yield and high quality of grain and straw. The best method of weed control is traditional method, but it is costlier and time consuming. Therefore, it is necessary to develop cheaper method of weed control, which is none other than herbicidal method. Chemical method of weed control can be very effective in killing the weeds before their emergence as well as after emergence. Keeping these facts in view, performance of herbicide was studied and assessing their influence on growth and yield of chickpea.

Materials and Methods

The present study was carried out at farm B of College of Agriculture, Ganjbasoda (23°85'N Latitude, 77°02'E Longitude) during *Rabi* season in year of 2019-20 and 2020-21 to study the effect of pre-emergence herbicide Flurochloridone on growth, yield and yield attributes of chickpea. The experiment was laid out in a randomized block design with six treatments, viz., T₁- Flurochloridone 20% CS @ 500 g a.i/ha, T₂- Flurochloridone 20% CS @ 625 g a.i/ha, T₃- Flurochloridone 20% CS @ 750 g a.i/ha, T₄- Pendimethalin 30% EC @ 1000 g a.i /ha, T₅- Weed free check (Hand weeding twice) and T₆- Weedy check with four replications. Chickpea seeds were treated with carrier-based Rhizobium 20 g/kg and PSB 40 g/kg seed and mixed well to ensure the inoculums to stick on to the surface of the seeds. The chickpea crop variety JG 12 was sown by hand, keeping the row distance of 30 cm and seed rate of 80 kg/ha on first fortnight of November and harvested in second week of March in respective years. The cultivation of crop was followed as per recommended zonal package of practices using fertilizer dose (20 kg N, 60 kg P₂O₅ and 20 kg K/ha). As per treatments, pre emergence application of Flurochloridone and Pendimethalin were applied next day of sowing. Foliar herbicides spray was done with knapsack sprayer using flat-fan nozzle in 500 litre of water/ha. Crop was irrigated at pre-flowering and pod development stage. Other agronomic management practices were followed as per the

standard recommendation and observation on growth, yield and yield contributing parameters were recorded as per standard procedure. Grain yield and straw yield altogether were considered as biological yield. Harvest index denotes the ratio of grain yield to biological yield multiplied by 100. The statistical analysis of the data was done as per procedure of analysis of variance using F-test.

Results and Discussion

Growth attributing characters

The growth characters were significantly influenced by different treatments (Table 1 & 2). In chickpea, growth characters like plant height and branches per plant are very important parameters, which directly influence the grain yield. Highest values of growth parameters were recorded with hand weeding while least values found in weedy check. The application of Flurochloridone 20% CS @ 750 g a.i/ha as pre-emergence improved significantly the growth characters viz. plant height, number of branches per plant and dry weight per plant and it was at par with Flurochloridone 20% CS @ 625 g a.i/ha during the both years. The increase in plant growth was attributed to the weed free environment at initial stage of crop growth and availability of nutrients to crop with the pre-emergence application of various herbicides (Singh *et al.*, 2014 and Bankoti *et al.*, 2021)^[7, 3].

Table 1: Effect of pre-emergence herbicide Flurochloridone on growth and yield attributes in chickpea during rabi 2019-20

Treatment Details	Plant height (cm)		No. of branches/plant (No.)		Dry weight/plant (g)	Pods/plant (No.)	Seeds/pods (No.)	Seed index (g)	Seed yield (q/ha)	Straw yield (q/ha)	Harvest index (%)
	At 60 DAS	At harvest	Primary	Secondary							
T ₁ - Flurochloridone 20% CS @ 500 g a.i/ha	33.93	47.36	4.05	5.72	17.76	34.60	1.32	16.32	8.79	15.67	35.93
T ₂ - Flurochloridone 20% CS @ 625 g a.i/ha	37.21	50.68	4.37	6.43	19.10	36.28	1.38	16.47	11.96	20.28	37.10
T ₃ - Flurochloridone 20% CS @ 750 g a.i/ha	37.63	51.22	4.58	6.55	19.85	37.81	1.41	16.61	12.60	20.72	37.82
T ₄ - Pendimethalin 30% EC @ 1000 g a.i/ha	35.05	48.50	4.15	5.92	18.70	34.95	1.34	16.39	9.48	16.72	36.18
T ₅ - Weed free check (Hand weeding twice)	38.89	52.35	4.71	6.67	20.32	38.35	1.47	17.18	13.45	21.52	38.46
T ₆ - Untreated control (Weedy check)	29.6	43.15	3.39	4.26	15.44	26.57	1.24	14.34	6.57	12.14	35.12
SEM+	0.59	0.62	0.21	0.24	0.56	0.91	0.04	0.28	0.54	0.88	0.74
CD	1.77	1.86	0.64	0.71	1.68	2.74	0.12	0.84	1.62	2.66	2.23

Table 2: Effect of pre-emergence herbicide Flurochloridone on growth and yield attributes in chickpea during rabi 2020-21

Treatment Details	Plant height (cm)		No. of branches/plant (No.)		Dry weight/plant (g)	Pods/plant (No.)	Seeds/pods (No.)	Seed index (g)	Seed yield (q/ha)	Straw yield (q/ha)	Harvest index (%)
	At 60 DAS	At harvest	Primary	Secondary							
T ₁ - Flurochloridone 20% CS @ 500 g a.i/ha	38.62	53.46	4.54	6.45	20.32	38.57	1.41	17.68	10.06	17.40	36.63
T ₂ - Flurochloridone 20% CS @ 625 g a.i/ha	41.95	56.78	4.82	7.19	22.39	41.66	1.48	18.64	13.48	21.28	38.78
T ₃ - Flurochloridone 20% CS @ 750 g a.i/ha	42.44	57.45	5.14	7.38	22.88	42.60	1.53	18.98	14.26	21.73	39.62
T ₄ - Pendimethalin 30% EC @ 1000 g a.i/ha	39.84	54.48	4.67	6.68	21.40	39.78	1.43	17.89	11.68	19.52	37.43
T ₅ - Weed free check (Hand weeding twice)	43.75	58.90	5.30	7.92	23.56	44.28	1.55	19.27	15.10	22.42	40.25
T ₆ - Untreated control (Weedy check)	33.21	48.34	3.77	4.96	17.67	30.57	1.30	15.44	7.18	13.01	35.56
SEM+	0.67	0.78	0.32	0.38	0.64	0.98	0.06	0.34	0.58	0.91	0.87
CD	2.02	2.35	0.96	1.14	1.93	2.95	0.18	1.02	1.76	2.74	2.62

Yield attributing characters

Two years data (Table 1 & 2) revealed that the various yield attributes, viz. number of pods/plant, number of seeds/pod and seed index were significantly influenced by application of Flurochloridone as against the rest of treatments and weedy check. The maximum number of pods/plant, number of seeds/pod and seed Index Were recorded in hand weeding as against minimum in weedy check. In herbicidal treatments post-emergence application of Flurochloridone 20% CS @ 750 g a.i/ha produced significantly higher number of pod per plant, seeds/pod, and seed index and it was at par with Flurochloridone 20% CS @ 625 g a.i/ha during study period. The impact of the

weed free environment maintained due to pre-emergence application of herbicides and manual hoeing meet the resources demand particularly nutrient, water and light to the crop at the critical stage on-site. The better initial growth promoted flowering and higher pod production because of timely supply of resources might have reduced shedding of flowers and pods (Yadav *et al.*, 2019)^[8]. The results are agreement with Khope *et al.*, (2011)^[5] and Rupareliya *et al.*, (2018)^[6].

Seed yield, straw yield and harvest index (%)

Data pertaining to seed and straw yield of chickpea was significantly influenced by different treatments (Table 1 & 2).

All the treated plots receiving either hand weeding or pre-emergence application of herbicides significantly produced higher seed and straw yields than weedy check (T₁). Weed free (T₅) plot produced maximum seed and straw yield closely followed by Flurochloridone 20% CS @ 750 g a.i/ha (T₃) and Flurochloridone 20% CS @ 625 g a.i/ha (T₂) during both the years. The next best treatment was Pendimethalin 30% EC @ 1000 g a.i/ha (T₄) and it was at par to Flurochloridone 20% CS @ 500 g a.i/ha (T₁). Weedy check (T₁) produced the lowest seed and straw yield. Yield enhancement over weedy check was because of shift of weed crop competition in favour of crop causes cumulative effect on yield attributes and seed index. Further, these treatments were associated with better weed control and decreased weed dynamics as well as improved yield attributing characters. The maximum crop grain yield and harvest index were recorded under 2 hand weeding treatment. It might be due to reduction in weed infestation, which enhances proper translocation of photosynthates from source to sink resulted in increase in harvest index (seed production ratio in total produce). The results found in the present study were also supported the findings of Dubey *et al.*, (2018)^[4].

Conclusion

According to two years findings the pre-emergence application of Flurochloridone 20% CS @ 625 g a.i/ha recorded better growth, yield and yield attributes of chickpea.

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