Poll Res. 42 (1) : 116-118 (2023)

ISSN 0257–8050
DOI No.: http://doi.org/10.53550/PR.2023.v42i01.018

BIO-EFFICACY OF PINOXADEN AS POST-EMERGENCE HERBICIDE AGAINST WEEDS IN WHEAT CROP

RAGHAV PATEL, A.K. JHA, BADAL VERMA*, RAHUL KUMBHARE AND RICHA SINGH

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

(Received 10 September, 2022; Accepted 4 November, 2022)

ABSTRACT

A field study was carried out during the *rabi* season 2020-21 to identify weed species and investigate the efficacy of post-emergence herbicides on weeds and their effect on wheat grain yield at AICRP on Wheat, JNKVV, Jabalpur (M.P.). Seven different treatments were applied, namely pinoxaden at 40 g *a.i.*/ha, pinoxaden at 45 g *a.i.*/ha, pinoxaden at 90 g *a.i.*/ha, clodinafop propargyl at 90 g *a.i.*/ha, sulfosulfuron at 25 g *a.i.*/ha as post-emergence (25 DAS), hand weeding at 30 DAS and weedy check. The highest number of individuals was recorded for *Medicago denticulata* (30.82%), *Cichorium intybus* (29.94%), *Phalaris minor* (15.60%), *Chenopodium album* (15.32%) and *Anagallis arvensis* (8.30%). All the herbicide treatments provided significant control of weeds causing significant reduction in density of target weed flora and improved the grain yield compared with the weedy check. The highest mortality of weeds (41.12%) was recorded where pinoxaden at 90 g *a.i.*/ha was applied. However, pinoxaden at 45 g *a.i.*/ha is the most effective and best option for higher values of growth parameters, yield attributes and maximum wheat grain yield.

KEY WORDS : Grain yield, Herbicides, Pinoxaden, Post-emergence, Weeds

INTRODUCTION

Wheat (*Triticum aestivum* L.) is the important cereal crop used as the staple food by most of the world's population and is cultivated over a wide range of climatic conditions. It occupies a prime position among the world's food crops in terms of acreage and production. It is India's second most important cereal crop, next to rice (Anonymous, 2015). Wheat contains almost 55% of the carbohydrates and 20% of the food calories as food for consumers and farmers. In India, wheat contributes an annual production of 95.85 Mt, covering an area of 30.47 Mha and productivity of 3.15 Mt per hectare (DES, 2014). Wheat is infested by diverse weed flora comprising grasses and broad-leaved weeds. Nearly 50% of the wheat yield reduction was observed due to some dominant weed flora appearing early and interfering with crop growth because of frequent irrigations. Weed controlling manually in wheat is expensive and time-consuming. Therefore, most wheat growers depend on chemical herbicides for easy application and effective weed control. Hence, a study was undertaken to keep the weeds below the threshold level and assess the effect of different herbicides on crop growth and yield performance of wheat.

MATERIALS AND METHODS

A field experiment was conducted to investigate the growth and yield of wheat under different weed control treatments at AICRP on wheat, JNKVV, Jabalpur, Madhya Pradesh. The site is located at 23°9' North latitude and 79°58' East longitudes with an altitude of 411.78 meters above the MSL. It has a typically sub-tropical and sub-humid climate with hot dry summers and cool dry winters. The soil of the experimental field was neutral in pH with normal electrical conductivity and was well-

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drained. The soil is clay in texture with 7.3 pH and has about 0.63% SOC. The experiment was laid out in a randomized block design with seven weed control treatments comprising pinoxaden at 40, 45 and 90 g *a.i.*/ha, clodinafop propargyl at 90 g *a.i*/ha, sulfosulfuron at 25 g *a.i.*/ha applied at 25 DAS, hand weeding (30 DAS) and weedy check replicated three times. The crop was sown on 13 November 2020. This experiment applied a uniform dose of fertilizers (120 N: 60 P_2O_5: 40 K_2O) kg per hectare. The weed density and dry biomass of weeds were recorded at 60 DAS. All other recommended agronomic practices and plant protection measures were adopted to raise the crop.

RESULTS AND DISCUSSION

Effect on weeds

The experimental field was full of weeds comprised of both dicots and monocots. Among the total weeds, dicots weeds (84.4%) were more prominent as compared to monocots (15.6%). The weed flora under dicots includes species like *Medicago denticulata* (30.82%), *Cichorium intybus* (29.94%), *Chenopodium album* (15.32%) and *Anagallis arvensis* (8.30%), whereas Phalaris minor (15.60%) was only grassy weed under monocot.

Different weed control treatments significantly reduced the density of total weeds compared to the weedy check (Table 1). The least number of total weeds were observed under hand weeding (3.18/m^2), whereas weedy check accounted for the highest density of the same (11.21/m^2). Among all the herbicidal treatments, the application of pinoxaden at 90 g *a.i.*/ha exerted the maximum herbicide effect. It caused the highest reduction in total weed density, which was statistically at par with pinoxaden at 45 g a.i./ha.

Weed management practices significantly reduced the dry weight of weeds (Table 1). Adoption of hand-weeding at 30 DAS resulted in significantly less weed dry matter. Lower weed dry weight was recorded in this treatment because removing weeds at the critical period of crop growth accounted for less count of total weeds. Further, lower dry weight of weeds was registered with pinoxaden at 90 g *a.i.*/ha (9.78 g/m^2) because pinoxaden acts as an inhibitor of fatty acid synthesis resulting in necrosis and controls the establishment of many weeds. However, it was on par with pinoxaden at 45 g a.i./ha. While the highest dry weight of weeds was recorded with a weedy check because weeds were allowed to grow in the plot throughout the crop growth period, ultimately increasing the dry weight of weeds under this treatment. These results confirm the findings of Sarvadamana *et al.* (2019) and Nanher *et al*. (2015).

The crop yield is directly proportional to weed-control efficiency (WCE) and different weed-management practices in wheat. The WCE at 60 DAS was the maximum in hand-weeding and this was closely followed by pinoxaden at 90 g a.i./ha and pinoxaden at 45 g a.i./ha (Table 1), and this was the best treatments among the herbicides in terms of higher WCE. Our results support the findings of Meena *et al*. (2019).

Effect on crop

Growth and yield components, viz. plant height, number of tillers/m^2, and test weight are vital parameters for assessing the impact of weed control treatments on yield. Applying pinoxaden at 45 g *a.i.*/ha resulted in a marked increase in yield attributes and weed control efficiency, which had significantly higher grain over the weedy check (Table 2). Amongst herbicidal treatments, pinoxaden

Table 1. Effect of different weed management practices on total weed density, dry weight and weed control efficiency in wheat

Treatments	Total weed density (no./m^2) 60 DAS	Total weed dry weight (g/m^2) 60 DAS	WCE (%) 60 DAS
Pinoxaden at 40 g *a.i.*/ha	7.62 (57.63)	10.14 (102.49)	36.68
Pinoxaden at 45 g *a.i.*/ha	7.52 (56.10)	10.07 (100.87)	37.70
Pinoxaden at 90 g *a.i.*/ha	7.23 (51.81)	9.78 (95.30)	41.12
Clodinafop Propargyl at 60 g *a.i.*/ha	7.73 (59.26)	10.25 (104.68)	35.21
Sulfosulfuron at 25 g a.i./ha	7.84 (61.07)	10.26 (104.88)	35.33
Hand weeding	3.18 (9.65)	4.22 (17.34)	89.28
Weedy check	11.21 (125.16)	12.74 (161.88)	00
CD (P=0.05)	0.11	0.15	-

Table 2. Effect of different weed management practices on growth parameters, yield attributes and yield of wheat

Treatments	Plant height (cm) (60 DAS)	Number of tillers/m^2 (60 DAS)	Test weight (g)	Grain yield (t/ha)
Pinoxaden at 40 g *a.i.*/ha	60.33	385.12	41.21	4.63
Pinoxaden at 45 g *a.i.*/ha	64.33	403.52	42.33	5.36
Pinoxaden at 90 g *a.i.*/ha	61.33	395.32	41.86	5.01
Clodinafop Propargyl at 60 g *a.i.*/ha	60.36	386.36	41.97	5.23
Sulfosulfuron at 25 g a.i./ha	60.66	390.14	40.42	5.12
Hand weeding	69.30	420.55	42.35	5.81
Weedy check	57.70	350.50	41.10	3.21
CD (P=0.05)	2.77	16.08	NS	277.75

at 45 g *a.i.*/ha exhibited significantly higher plant height (64.33 cm), number of tillers/m^2 (403.52), and 1,000-grain weight (42.33 g). However, hand-weeded plots recorded the maximum and proved significantly superior to herbicidal treatments.

Herbicide treatments had a convincing effect on the grain yield of the wheat crop. Compared to the control plots, all herbicide-treated plots showed increased grain yields (Table 2). Pinoxaden at 45 g a.i./ha performed the best, giving the grain yield of 5.36 t/ha. The higher grain yield under this treatment due to better control of weeds favoured higher uptake of nutrients and water, which helped the plant to keep superior growth parameters viz., plant height, number of tillers, enhanced photosynthetic activity, and partitioning of assimilates resulting in improved yield attributes and test weight by less weed count and dry weight of weeds. While among the weed control treatments, hand weeding resulted in the best grain yield. Due to the maximum infestation of weeds, the lowest grain yield of wheat was recorded in the untreated control plots. The results also conform with the findings of Pal *et al.* (2016).

CONCLUSION

Based on the results presented, Post-emergence application of pinoxaden at 90 g *a.i.*/ha is advisable for reducing the weed pressure and their effective control, while pinoxaden at 45 g *a.i.*/ha could be applied for higher grain yield and more net returns in wheat.

ACKNOWLEDGEMENTS

The author is thankful to the College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (MP) for providing the necessary facilities to carry out this work.

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