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Evaluation Of Different Herbicides In Gladiolus (Gladiolus Grandiflorus L.)

Z. A. Bhat, M. Q. Sheikh

Regional Research Station, Wadura, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, (J&K) India
Email: zahoorflori2003@gmail.com

ABSTRACT: An experiment was carried out at Regional Research Station, Wadura, SKUAST- Kashmir during 2012-2013 to evaluate different herbicides in gladiolus. The experiment consisted of eight different herbicides, cultural practices as weed control treatment and unweeded control and were replicated thrice in randomised block design. Among four herbicides i.e atrazine, metribuzin, butachlor and pendimethalin each with two concentrations, the better growth and flowering characters were achieved with pendimenthlin @1.0 kg a.i ha^{-1} and pendimenthlin @0.75 kg a.i ha^{-1} which were followed by butachlor and weed free treatments. Similarly, weed density, fresh and dry weight as well as weed control efficiency was recorded lowest in pendimethalin @ 0.75 kg a.i ha^{-1} treatments which were followed by atrazine and metribuzin treatments, while the unweeded treatment recorded highest values of these parameters.

Keywords: Herbicides, growth, flowering, weed dry matter, WCE, gladiolus

1 INTRODUCTION

Gladiolus (Gladiolus grandiflorus L.) popularly known as sword lily, is an ornamental bulbous plant native to South Africa [1]. Gladiolus (Gladiolus grandiflorus L.) belongs to the family Iridaceae and is herbaceous perennial. In the modern era, floriculture is gaining importance as a good source of income apart from giving pleasure and happiness. In this regard, Gladiolus or sword lily (Gladiolus spp.) has gained much importance as a cut flower or for garden display [2]. Gladiolus is widely cultivated, economically important flowering plants. The luxuriance unique colorful spikes of some height demanding Gladiolus cultivars have attained immense importance in the community of flower lovers [3]. The modern Gladiolus cultivars offer a diversity of colors, shapes, and sizes available in few other flowering plants. It is cultivated in almost all countries of the world where spring and summer conditions are favorable [4]. Weeds cause heavy damage to crop by competing with them for water, nutrients, light and space besides acting as alternate hosts to a number of pathogens and insect pests. Hence, a clean and weed free environment is one of the aspects of the better farming. Generally, 4-5 hand weddings are required in Gladiolus. Employing labour would increase the cost of cultivation and affects successful commercial flower crop production and more over manual weeding if not done properly may damage plants or corms [5]. Hence, an alternative method would be to use herbicides which can be practically effective and economical in reducing weed competition at right time by which it is possible to obtain higher flower yields. Though several chemicals are found effective in eradicating weed flora, the precise weed management programme will vary for each production area and depends up on the herbicide approved, soil type, rain fall, prevalent weed species etc. Since very little information is available on the effect of herbicides on productivity of gladiolus especially under the temperate conditions of Kashmir Valley. In view of this an experiment was conducted with an objective to control the weeds and improve the plant growth and yield.

2 MATERIALS AND METHODS

A field experiment to evaluate different herbicides for control of weeds in gladiolus was carried out during kharif 2012 and 2013 at Regional Research Station, Wadura SKUAST-K. The experiment was laid out in randomised block design with three replications. Uniform sized corms were planted with spacing of 40 x 20 cm in 2.0 x 2.0 m plot. The experimental area was tilled three times thoroughly followed by clod breaking, removal of weeds etc. Then the field was leveled and well rotten farmyard manure was applied @ 20 t ha^{-1} and mixed thoroughly with the soil. A basal dose of phosphorus, potassium and half dose of nitrogen through di-ammonium phosphate, muriate of potash and urea was applied uniformly to each plot before planting of corms, respectively. The remaining half dose of nitrogen was applied at 4^{th} leaf stage. Corms were selected according to grades and dipped in 0.2 per cent bavistin for 15 minutes one day before planting as a protective measure against fungal diseases. Irrigation, weeding cum hoeing and planting protection measures were carried out as and when required. Staking and tying of spikes was also done to avoid lodging. The experiment consisted of 10 treatments viz., T1: atrazin @1.0 kg a.i ha^{-1}, T2: atrazin @1.5 kg a.i ha^{-1}, T3: metribuzin @0.25 kg a.i ha^{-1}, T4: metribuzin @0.50 kg a.i ha^{-1}, T5: butachlor @1.00 kg a.i ha^{-1}, T6: butachlor @1.5 kg a.i ha^{-1}, T7: pendimenthlin @0.75 kg a.i ha^{-1}, T8: pendimenthlin @1.0 kg a.i ha^{-1}, T9: unweeded and T10: weed free. The required quantity of herbicides was dissolved in water (@ 750 L/ha) and applied by Knapsack sprayer on the next day after planting. Observations pertaining to different parameters of vegetative growth, flowering and spike parameters were recorded from five randomly selected plants from each plot in each replication. The weeds were counted on 25 and 50 days after planting (DAP). For counting of weeds, a quadrate (50 × 50 cm) measuring 0.25 m^2 was placed randomly at two sites per plot and weeds growing within this quadrate were counted and then computed for one square meter area. For dry weight, weed samples were dried in an oven at 60°C for 48 hours and then weighed. The final data was expressed as gram per square meter (g/m^2). The weed control efficiency was calculated by the following formula

$$\text{WCE (\%)} = \frac{DW1 - DW}{DW1}$$

Where,
DW1 is dry weight of weeds in unweeded control and
DW is weed dry weight of treatments.

The data was pooled and analyzed using ANOVA, and the critical difference (CD) values at 5% level of significance were computed as described by [6].

3. RESULTS AND DISCUSSION

The height of plant is an important growth character directly linked with the productive potential of plant in terms of yield. The data presented in Table 1 showed that unweeded treatment produced gladiolus with least height (40.25 cm). This may be attributed to higher weed densities under the treatment that had compete with gladiolus for nutrients, soil moisture, height and carbon dioxide. Among herbicide treatments, pendimenthlin @0.75 kg a.i ha^{-1} at par with pendimenthlin @1.0 kg a.i ha^{-1} produced significantly taller plants (70.30 and 70.0 cms) than other treatments. This was probably due to better weed control with the treatments that enabled lower densities of weeds to compete with crop for resources. Similar results were also reported by [7] and [8]. Days taken to sprouting was not affected significantly by application of herbicides, however, unweeded treatment took maximum number of days (21.40) for crop to reach sprouting. This could be attributed to the fact that reduced competition with weeds for nutrients might have enhanced the vegetative phase of crop. The number of leaves per plant differed significantly among the treatments (Table 1). The unweeded treatments (T9) recorded least number of leaves/plant (6.12). This might be attributed to severe competition of high weed densities for resources viz; sunlight, moisture and nutrients thereby making gladiolus plants weaker enough to produce less leaves which was closely followed by atrazine @1.5 kg a.i ha^{-1}, while the treatment pendimenthlin @1.0 kg a.i ha^{-1} at par with pendimenthlin @0.75 kg a.i ha^{-1}, weed free, butachlor @1.5 kg a.i ha^{-1} and butachlor @1.0 kg a.i ha^{-1} produced significantly more number of leaves as compared to other treatments. These results are in line with [7] who reported that significantly more number of leaves was noticed in weed free treatment at the time of harvesting followed by pendimethalin @1.0 kg a.i. ha^{-1}. Significantly higher spike length was recorded in pendimenthlin @1.0 kg a.i ha^{-1} being at par with butachlor @1.5 kg a.i ha^{-1}, butachlor @1.0 kg a.i ha^{-1} and pendimenthlin @1.0 kg a.i ha^{-1}, while lower spike length was observed in no weeding treatment. This could be attributed to better control of weeds in early growth stages of crop which provided the crop plants optimum environment to utilize growth resources efficiently resulting in better growth of crop. Similar results were also reported by [9]. No harmful effect of pendimethalin was also observed by [10] on gladiolus. Number of florets per spike and floret diameter recorded under T7 and T8 (pendimenthlin @0.75 and 1.0 kg a.i ha^{-1}, respectively) treatments were significantly higher than other weed control treatment as well as weed free treatment. In fact reduced weed competition due to application of pendimenthlin allowed the crop stand growth better and utilize the available nutrients especially which is because of its cell division and cell elongation role improved number of florets/spike and floret diameter. From the results it is clear that in unweeded treatment, the crop might have been adversely affected by weeds due to heavy competition for nutrients, water, light, vertical and horizontal space which leads to poor growth and unacceptable quality. The results presented in Table 2 showed that weed control treatments pendimethalin @ 0.75 kg a.i. ha^{-1} and pendimethalin @ 1.0 kg a.i. ha^{-1} recorded the lowest weed density and weed dry matter. This could be attributed to the fact that application of pendimenthlin might have caused the death of relative weeds from starvation and oxidative damage caused by break down in electron transport process because the herbicide functions by binding to the plasto-quinone binding protein in photosynthesis II [11]. As a result of lower weed density, weed dry matter got also reduced considerably. The minimum dry matter accumulation in pendimethalin treated plots may be attributed to better control of weeds and suppression of weed growth [12]. The variability in weed densities in different treatments can be attributed to the fact that some herbicides are more effective for weed control than others [13] and [14]. Similarly, the herbicides that showed slightly higher density of weeds and their dry weights may be due to lower herbicidal activity of these chemicals thereby could not be able to control newly emerged weeds up to longer periods [15]. The present findings are in agreement with the earlier reports of [8] and [16]. The weed control efficiency (WCE) in different treatments ranged between 16.52% and 83.09%. Maximum WCE was noticed with pendimethalin @ 0.75 kg a.i ha^{-1} (83.09 %) which was closely followed by pendimethalin @ 1.0 kg a.i ha^{-1} (82.90 %), whereas minimum WCE was noticed in T5 (butachlor @1.0 kg a.i ha^{-1}). Similar findings were obtained by [5] and [7].

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Table 1. *Effect of different herbicides on growth and flowering in gladiolus*

Treatment	Days taken to sprouting	Plant height (cm)	No. of leaves /plant	Spike length (cm)	No of florets /spike	Floret diameter (cm)
T1: Atrazin @1.0 kg a.i ha^{-1}	20.32	60.12	6.35	67.40	10.58	8.30
T2: Atrazin @1.5 kg a.i ha^{-1}	20.51	59.45	6.15	68.01	10.72	8.35
T3: Metribuzin @0.25 kg a.i ha^{-1}	20.42	59.14	6.30	67.25	10.60	8.40
T4: Metribuzin @0.50 kg a.i ha^{-1}	20.30	57.15	6.35	70.10	11.00	8.45
T5: Butachlor @1.00 kg a.i ha^{-1}	20.60	65.25	7.00	80.00	12.00	9.00
T6: Butachlor @1.5 kg a.i ha^{-1}	20.75	65.14	7.10	80.40	12.30	9.20
T7: Pendimenthlin @0.75 kg a.i ha^{-1}	20.17	70.00	7.15	81.25	14.05	10.25
T8: Pendimenthlin @1.0 kg a.i ha^{-1}	20.14	70.30	7.24	82.33	14.25	10.55
T9: Unweeded	21.40	40.25	6.12	60.20	10.15	7.00
T10: Weed free	20.20	66.30	6.85	74.80	11.90	9.00
SEm ±	0.385	1.019	0.353	1.965	0.397	0.282
CD (P= 0.05)	NS	3.18	1.10	6.13	1.24	0.88

Table 2. *Effect of different herbicides on weed population, weed fresh weight, weed dry weight and weedy control efficiency in gladiolus*

Treatment	Weed Population	Weed fresh weight (g)	Weed dry weight (g)	WCE (%)
T1: Atrazin @1.0 kg a.i ha^{-1}	8.09	335.14	86.15	51.24
T2: Atrazin @1.5 kg a.i ha^{-1}	8.14	332.98	87.56	52.35
T3: Metribuzin @0.25 kg a.i ha^{-1}	8.35	340.14	89.24	53.99
T4: Metribuzin @0.50 kg a.i ha^{-1}	8.13	330.25	82.08	55.20
T5: Butachlor @1.00 kg a.i ha^{-1}	15.15	715.14	180.25	16.52
T6: Butachlor @1.5 kg a.i ha^{-1}	14.00	656.20	165.09	22.86
T7: Pendimenthlin @0.75 kg a.i ha^{-1}	3.25	120.20	28.45	83.09
T8: Pendimenthlin @1.0 kg a.i ha^{-1}	3.10	110.33	24.30	82.90
T9: Weed free	18.25	872.15	205.45	-
T10: Unweeded	18.15	860.65	207.45	-
SEm ±	0.843	2.923	1.147	-
CD (P= 0.05)	2.63	9.12	3.58	-

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